

## Courses of Study

$$
1994-1995
$$

## Cornell University Calendar

## Fall Semester

Residence halls open
Freshman orientation begins
New-student orientation begins
Registration-course exchange
Instruction begins
Physical education classes begin
Fall recess: instruction suspended
Instruction resumes
Pre-course enrollment for spring

Family Weekend
Homecoming weekend
Thanksgiving recess:
instruction suspended, 1:10 p.m.
Instruction resumes
Instruction ends
Study period
Final examinations begin
Final examinations end
Residence halls close

## Winter Session

Variable periods between
December 25 and January 18

## Spring Semester

Residence halls open for continuing students
Residence halls open for new students
Registration-course exchange
Instruction begins
Physical education classes begin
Spring recess: instruction suspended
Instruction resumes
Pre-course enrollment for fall
Instruction ends
Study period
Final examinations begin
Final examinations end
Residence halls close (students who are graduating may stay through Commencement Day)
Senior Week
Commencement

## Summer Session 1995

Three-week session
Eight-week session
Six-week session

## 1994-95

Friday, August 19
Friday, August 19
Friday, August 19
Tuesday-Wednesday, August 23-24
Thursday, August 25
Monday, Seprember 5
Saturday, October 8
Wednesday, October 12
Wednesday, October 19Wednesday, November 2
Friday-Sunday, November 4-6
Saturday, September 17
Wednesday, November 23
Monday, November 28
Saturday, December 3
Sunday-Wednesday, December 4-7
Thursday, December 8
Friday, December 16
Saturday, December 17

Monday, December 261994
Saturday, January 21, 1995

Sunday, January 15
Monday, January 16
Thursday-Friday, January 19-20
Monday, January 23
Monday, February 6
Saturday, March 18
Monday, March 27
Wednesday, March 29-Wednesday, April 12
Saturday, May 6
Sunday-Wednesday, May 7-10
Thursday, May 11
Friday, May 19
Saturday, May 20
Sunday-Saturday, May 21-27
Sunday, May 28

Wednesday, May 31-Friday, June 23
Monday, June 12-Tuesday, August 8
Monday, June 26-Tuesday, August 8

1995-96
Friday, August 25
Friday, August 25
Friday, August 25
Tuesday-Wednesday, August 29-30
Thursday, August 31
Monday, September 4
Sunday, October 7
Wednesday, October 11
Wednesday, October 25-
Wednesday, November 8
TBA
TBA
Wednesday, November 22
Monday, November 27
Saturday, December 9
Sunday-Wednesday, December 10-13
Thursday, December 14
Friday, December 22
Saturday, December 23

Tuesday, December 26 1995-
Saturday, January 20, 1996

Sunday, January 14
Monday, January 15
Thursday-Friday, January 18-19
Monday, January 22
Monday, January 29
Saturday, March 16
Monday, March 25
Wednesday, March 27-Wednesday, April 10
Saturday, May 4
Sunday-Wednesday, May 5-8
Thursday, May 9
Friday, May 17
Saturday, May 18
Sunday-Saturday, May 19-25
Sunday, May 26

Wednesday, May 29-Friday, June 21
Monday, June 10-Tuesday, August 6
Monday, June 24 Tuesday, August 6

The dates shown in this calendar are subject to change at any time by official action of Cornell University
In this calendar, the university has scheduled classes, laboratories, and examinations on religious holidays. It is the intent of the university that students who miss those activities because of religious observances be given adequate opportunity to make up the missed work.
The Law School and College of Veterinary Medicine calendars differ in a number of ways from the university calendar. Please consult the catalogs of those colleges for details.
The courses and curricula described in this catalog, and the teaching personnel listed herein, are subject to change at any time by official action of Comell University.
The rules and regulations stated in this catalog are for information only and in no way constitute a contract between the student and Cornell University. The university reserves the right to change any regulation or requirement at any time

## This catalog was produced by Media Services at Cornell University.

# CORNELL <br> $\begin{array}{llllllllll}U & N & I & V & E & R & S & I & T & Y\end{array}$ 

## Courses of Study

## $1994-1995$

## Cornell University

## (USPS 132-860)

Volume 86 of the series "Cornell University" consists of nine catalogs, of which this is number six, dated August 1, 1994. Issued twice in February, once in May, once in June, once in July, three times in August, and once in November. Published by Media Services, Comell University, Comstock Hall, Ithaca, NY 14853-0901. Secondclass postage paid at Ithaca, New York.
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> Cornell University is committed to assisting those persons with disabilities who have special needs. A brochure describing services for persons with disabilities may be obtained by writing to the Office of Equal Opportunity, Cornell University, 234 Day Hall, Ithaca, New York $14853-2801$. Other questions or requests for special assistance may also be directed to that office.

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## Corrections or suggestions for changes in this catalog may be sent to

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Abbreviations and symbols used in this catalog:

| M | Monday | S-U | Satisfactory-Unsatisfactory |
| :--- | :--- | :--- | :--- |
| T | Tuesday | disc | discussion |
| W | Wednesday | lab | laboratory |
| R | Thursday | lec | lecture |
| F | Friday | rec | recitation |
| S | Saturday | sec | section |
|  |  | TBA | To be announced |
|  |  | \#.a | geographic breadth |
|  |  |  | historical breadth |

Courses with names and descriptions enclosed in
brackets-[ 1-are not offered fall 1994 and spring 1995.

## CORNELL UNIVERSITY—GENERAL INFORMATION

## Introduction

Courses of Study contains information primarily concerned with academic resources and procedures, college and department programs, interdisciplinary programs, and undergraduate and graduate course offerings of the university. Not included in this publication is information concerning the Medical College and the Graduate School of Medical Sciences, located in New York City. A student handbook describing life at Cornell will be distributed to all new incoming students. In addition, each new student receives the Policy Notebook, which summarizes pertinent university policy. Students should consult with their college's advising office for specific information on academic policies and procedures, degree programs and requirements.
Student responsibility and regulations. The Campus Code of Conduct describes the regulations and policies for maintaining public order on campus. The Code of Academic Integrity and other statements of student responsibility are set forth in the Policy Notebook. Publications are available for viewing on CUINFO, the university's electronic information system, and in print at the various university libraries, the Student Life Union, the Office of the Dean of the University Faculty, the Office of University Counsel, the Office of the Judicial Administrator, and the college offices.
The following is a list of offices and information sources for admission information:
Undengraduate admissions. Information pertinent to prospective applicants is available from the Undergraduate Admissions Office, 410 Thurston Avenue, Ithaca, New York 14850-9988 (telephone: 607/255-5241).
Graduate School. Information pertaining to admission to the Graduate School may be obtained by contacting the Graduate School, 100 Sage Graduate Center, Ithaca, New York 14853-6201 (telephone: 607/255-4884)
Law School. Admission information for the Law School is available from the Law School, Myron Taylor Hall, Ithaca, New York 148534901 (telephone: 607/255-5141).
Samuel Curtis Johnson Graduate Scbool of Management. Information is available from the Office of Admissions, 315 Malott Hall, Ithaca, New York 14853-4201 (telephone: 607/255-2327).
College of Velerinary Medicine. Admission information is available from the Admissions Office, Schurman Hall, Cornell University, Ithaca, New York 14853-6401 (telephone: 607/253-3000).
Medical College and Graduate School of Medical Sciences. Information regarding admissions is available from the Office of Admissions, 1300 York Avenue, New York, New York 10021 (telephone: 212/746-1067).

## CUINFO/GOPHER

It is not possible to keep this single-volume course list completely up-to-date. The most current information regarding course schedules, sections, rooms, credits, and registration procedures may be found on CUINFO, Cornell's electronic information source, and in the Course and Time Roster and the Course and Room Roster, each issued twice a year by the Office of the University Registrar. You may access CUINFO using either telnet or gopher. Telnet to port 300 on host gopher2.cit.cornell.edu. To use gopher, connect to gopher.cit.cornell.edu. Students are also advised to consult individual college and department offices for up-to-date course information.

## EXPLANATION OF COURSE NUMBERING SYSTEMS

## The course levels have been assigned as

 follows:100-level course-introductory course, no prerequisites, open to all qualified students
200-level course-lower-division course, open to freshmen and sophomores, may have prerequisites
300 -level course-upper-division course, open to juniors and seniors, prerequisites
400-level course-upper-division course, open to seniors and graduate students, 200- and 300 -level course prerequisites or equivalent
500-level course-professional level (e.g., management, law, veterinary medicine)
600-level course-graduate-level course, open to upper-division students
700 -level course-graduate-level course
800-level course-master's level, thesis, research
900 -level course-doctoral level, thesis, research
The list of courses that follows is arranged in two broad groups.
Group 1: Divisions that offer both under-graduate- and graduate-level courses
Agriculture and Life Sciences
Architecture, Art, and Planning
Arts and Sciences
Biological Sciences
Engineering
Hotel Administration
Human Ecology
Industrial and Labor Relations
Nutritional Sciences
Officer Education
Group 2: Graduate professional divisions
Law
Management
Veterinary Medicine

There are no courses offered by the Graduate School as a unit; graduate-level courses are contained in the various departments that offer the instruction.
Within each division, courses are generally arranged in alphaletical order by department and in numerical order within the departments. All courses, 0-999 are briefly described for those divisions (group 1) offering instruction to both undergraduate and graduate students. Courses in the graduate professional divisions (group 2) are designated by number and title only.

## ACCREDITATION

Cornell University is accredited by the Middle States Association of Colleges and Schools. Requests to review documentation supporting its accreditation should be addressed to the Vice President for Academic Programs and Planning, Cornell University, 433 Day Hall, Ithaca, New York 14853-2801.

## Advanced Placement

## CREDIT FOR ADVANCED PLACEMENT

1. Definition and Purpose of Advanced Placement Credit
Advanced placement credit is college credit that students eam before they matriculate as freshmen. Students may use credit they receive for advanced placement to satisfy degree requirements only as specified by the individual college at Cornell. Although such credit counts toward the bachelor's degree, its primary purpose is to exempt students from introductory courses and to place them in advanced courses. Its value is that it allows students to include more advanced courses in their undergraduate curricula.
2. Advanced placement credit may be earned from one of the following:
a. Achieving the requisite score on a departmental examination at Cornell (usually given during Orientation Week) or from the Advanced Placement Examinations from the College Board Admissions Testing Program (ATP). The requisite scores which vary by subject, are determined by the relevant departments at Comell, and are published elsewhere in the Courses of Study.
b. Passing a regular course taught at an accredited college to college students and approved by the relevant department at Cornell. Some departments have delegated the review of courses to college staff according to guidelines they have formulated. Some departments review each request individually. Some departments accept

> credit from virtually all accredited colleges; some do not.

Credit for international credentials is evaluated individually.
Advanced placement credit is established by each department and administered by each college.
Please note: Cornell University does not accept credit for courses sponsored by colleges but taught in high schools to high school students, even if the college provides a transcript of such work. Students who have taken such courses may, however, take the appropriate Advanced Placement Examination offered by the College Board Admissions Testing Program in Princeton, New Jersey, to qualify for credit as in paragraph $2 a$ above.
This statement was agreed upon by members of the Committee on Academic Records and Registration, 30, November 1990.
The final decision for awarding advanced placement credit at Cornell rests with each individual college. The appropriate department of instruction within the university sets the standards of achievement that must be met for advanced placement and recommends AP credit for those who meet the standards. This recommendation is almost always based on some examination score. For policies governing advanced placement in a specific college, see the academic information section for that college. Students need not accept advanced placement. They may repeat the course, thereby relinquishing the advanced placement credit.
The Advanced Placement (AP) Program of the College Entrance Examination Board (CEEB) is the best known and most generally used of the programs that provide students with an opportunity to document participation in a college-level curriculum at the secondary level.

## Advanced placement examinations.

Examinations sponsored by the Advanced Placement Program of the College Entrance Examination Board are considered. Entering freshmen should have their scores sent to their college or school office (see the list at the end of this section). Placement and credit on the basis of these examinations will usually be determined during the summer, and students will be notified before course scheduling.
Departmental advanced standing exami-
nations. In certain subjects, students may also qualify for advanced placement or credit, or both, on the basis of departmental examinations given on campus during orientation week. A schedule of these examinations will appear in the orientation booklet that will be mailed to entering students in late summer. The departments that award advanced placement and credit on the basis of CEEB Advanced Placement Examinations or departmental examinations are shown below.
Transfer of credit. Entering freshmen who have completed college courses for which they want to receive credit toward their Cornell degree should send transcripts and course descriptions to their college or school office (see the list at the end of this section). The award of credit or placement for such courses is determined by the appropriate departments according to individual school and college guidelines. Because policy for using advanced placement credit varies
according to each college's or school's professional and academic goals, students should consult their college or school office to determine how they may use such credit.
Foreign credentials. Information regarding Cornell's advanced standing policy for foreign credentials may be obtained by contacting the Associate Director of International Admissions, Cornell University, 410 Thurston Avenue, Ithaca, New York 14850-2488, U.S.A. Students holding foreign credentials who feel they may be eligible for advanced standing consideration should contact the International Students and Scholars Office before enrollment for clarification of the advanced standing policy.
Written inquiries. Many department, school, and college offices encourage students to contact them with any questions they may have. Addresses given in the following sections may be completed by adding Ithaca, New York 14853.

## Forwarding of scores and transcripts.

Entering freshmen should have their advanced placement test scores sent to their school or college registrar's office.
College of Agriculture and Life Sciences 177 Roberts Hall
College of Architecture, Art, and Planning B2 West Sibley Hall
College of Arts and Sciences
M46 Goldwin Smith Hall
College of Engineering
170 Olin Hall
School of Hotel Administration 138 Statler Hall
College of Human Ecology
N101 Van Rensselaer Hall
Scbool of Industrial and Labor Relations 101 Ives Hall

## BIOLOGICAL SCIENCES

The Division of Biological Sciences grants advanced placement credits and exemption from introductory biology courses based on superior performance on the CEEB Advanced Placement Examination in biology.
Any student who earns a score of 5 on this examination may elect to receive eight credits and be permitted exemption from all introductory biology courses.
Students not majoring in biological sciences who score a 4 or 5 may receive, respectively, six or eight advanced placement credits. This will satisfy the distribution requirement in biological sciences for students in the College of Human Ecology, half of the distribution requirement in biological sciences for students in the College of Arts and Sciences through the Class of 1995, and a portion of the group $B$ distribution requirement for students in the College of Agriculture and Life Sciences. For students in the College of Arts and Sciences in the class of 1996 and beyond, credits may be applied to the Group 1 distribution area in accordance with regulations stipulated by the college.
Biological sciences majors who receive a score of 5 may receive eight credits and be exempt from all introductory biology courses or elect to receive four credits and select one of the options allowed for majors with a score of 4. The student receiving a score of 4 must fulfill the introductory biology requirement by
taking Biological Sciences 101-102, 101/103, $102 / 104$, or $103-104$ or 105 or 106 (Biological Sciences, Lectures and Laboratory). These students should consult information available in the course office ( 1140 Comstock Hall) and in the Biology Center ( 216 Stimson Hall) to determine which semester to take to complete the introductory biology requirement. For students in doubt, Biological Sciences 101/103 is advised. These students will receive a total of eight introductory biology credits (four advanced placement credits plus four course credits).

## CHEMISTRY

The Department of Chemistry offers two sequences that satisfy prerequisites for further work in the department: Chemistry 207-208, an eight-credit sequence that includes qualitative analysis, and Chemistry 215-216, a nine-credit sequence that includes qualitative and quantitative analysis.
Freshmen may qualify for advanced placement and advanced standing credits in chemistry by satisfactory performance on the CEEB Advanced Placement Examination in chemistry or by passing an advanced standing examination offered by the department. A score of 5 on the CEEB examination entitles a student to four credits. A student may earn four or eight credits by suitable performance on the departmental examination. To take the departmental examination students must sign up beforehand with Mrs. Virginia Marcus, in 158 Baker Laboratory.
The specific course in which a student will register after having received a certain advanced placement standing will be decided by consultation between the student, his or her adviser, and the professors teaching the courses. Students receiving advanced placement who are interested in a major in chemistry or a related science should consider taking Chemistry 215-216 and should consult the Chemistry 215 instructor.

## CLASSICS

For advanced placement and credit in Latin and Greek, students should consult the Department of Classics, Comell University, 120 Goldwin Smith Hall.
Latin. Credit and placement are determined on the basis of a departmental examination. A student who is permitted to register in a 300 -level course will be given six advanced placement credits.
Greek and Modern Greek. Credit and placement are determined on the basis of a departmental examination. For Ancient Greek, a student who is permitted to register in a 300 -level course will be given six advanced placement credits. For Modern Greek, a student who is determined by the examiner to be at an advanced level will be given six advanced placement credits.

## COMPUTER SCIENCE

Students who receive a score of 4 or 5 on the CEEB Advanced Placement Examination in computer science will receive four advanced placement credits and may take Computer Science 211,212 , or 222 (provided, in the case of Computer Science 222, the mathematics

## Summary of Credit and Placement

| Subject | Score | Advanced Placement Credit | Placement |
| :---: | :---: | :---: | :---: |
| Arabic | Department of Near Eastern Studies determines credit and placement based on departmental examination. |  |  |
| Biology | 5 (majors) | 8 credits or 4 credits | Placement out of all introductory courses. Students may choose to accept only 4 credits and follow the guidelines for majors with a score of 4. |
|  | 4 (majors) | 4 credits | 4 AP credits awarded after completion of any combination of 4 credits from 101-104 or 105 or 106. Consult department to determine which semester to take to complete introductory biology. |
|  | 5 (nonmajors) | 8 credits | Placement out of all introductory courses. |
|  | 4 (nonmajors) | 6 credits | Placement out of 109-110. Does not always satisfy the prerequisite for second- and third-level courses in biology. |
| Chemistry $\ddagger$ | 5 | 4 credits | Department determines placement. |
| Computer science | 4,5 | 4 credits | Placement out of C.S. 100. |
| Economics | 4,5 | 3 credits | 3 credits each for micro and macro; 6 credits maximum. |
| English | 4,5 | 3 credits |  |
| French language | 4,5 | 3 credits | Department of Modern Languages and Linguistics determines placement. Students may earn additional credit by taking CASE examination. $\dagger$ |
| French literature | 4,5 | 3 credits (and proficiency) | Department of Romance Studies determines placement. |
| German language | 4,5 | 3 credits | Department of Modern Languages and Linguistics determines placement. Students may earn additional credit by taking CASE examination. $\dagger$ |
| German literature | 4,5 | 3 credits (and proficiency) | Department of German Studies determines placement. |
| American government and politics | 4,5 | 3 credits | Placement out of Government 111. |
| Greek, Ancient and Modern | Department of Classics determines credit and placement based on departmental examination. |  |  |
| Hebrew | 4,5 | 3 credits | Department of Near Eastern Studies determines placement based on departmental examination. |
| American history | 4,5 | 4 credits |  |
| European history | 4,5 | 4 credits |  |
| History of art | 4.5 | 3 credits |  |
| Italian literature | 4,5 | 3 credits (and proficiency) | Department of Romance Studies determines placement. |
| Latin | Department of Classics determines credit and placement based on departmental examination. |  |  |
| Mathematics BC (excluding engineering students) | $\begin{aligned} & 4,5 \\ & 2 \text { or } 3 \end{aligned}$ | 8 credits 4 credits | Placement out of 111, 112. Permission to take 221, 293, or 213. Placement out of 111. No advanced placement credit for students who take 111. Permission to take 112 or 192. |
| Mathematics AB (excluding | 4,5 | 4 credits | Placement out of 111. Permission to take 112, 122, or 192. |
| engineering students) | 3 | 4 credits | Placement out of 111. Permission to take 112 or 192. |
|  | 2 | none | Students are strongly urged to take the mathematics placement examination. |
| Music | Department determines credit and placement based on departmental examination. |  |  |
| Physics B $\ddagger$ | 4,5 | 8 credits | Placement out of Physics 101-102. |
|  | 3 | 4 credits | Placement out of Physics 101. |
| Physics B, | 5 |  |  |
| and Mathematics BC $\ddagger$ | 4,5 | 4 credits in physics | Student may choose placement out of Physics 112 or 207 instead or Physics 101-102. |
| Physics C-Mechanics $\ddagger$ | 4,5 | 4 credits | Student may choose placement out of Physics 112 or 207 , or placement into Physics 116 with no AP credit. For more information, contact department representative. |
| Physics C—Electricity and Magnetism $\ddagger$ | 5 | Student may choose 4 credit For more information, con | for Physics 213 or placement into Physics 217 with no AP credit. act department representative. |
| Psychology | 4,5 | 3 credits |  |
| Sociology | Department determines credit and placement. |  |  |
| Spanish language | 4,5 | 3 credits | Department of Modern Languages and Linguistics determines placement. Students may earn additional credit by taking CASE examination. $\dagger$ |
| Spanish literature | 4,5 | 3 credits (and proficiency) | Department of Romance Studies determines placement. |

tCornell Advanced Standing Examination. Contact the Department of Modern Languages and Linguistics, 203 Morrill Hall.
$\ddagger$ In the College of Arts and Sciences, AP credit may be used to satisfy half the distribution requirement in science.
prerequisites are met). These credits may be used to satisfy the requirement in computer programming for students in the College of Engineering or half the distribution requirement in mathematics for students in the College of Arts and Sciences.
Freshmen may also earn four credits by suitable performance on a departmental examination to be given during orientation week. Students who receive a score of 3 on the CEEB Advanced Placement Examination may choose, at their own risk and in consultation with their advisers, to go directly into a 200 -level course without receiving credit for Computer Science 100. These students are strongly urged to take the departmental placement test. To take the departmental examination, students must sign up beforehand in the Undergraduate Office, 303 Upson Hall.

## ECONOMICS

Students with a strong background in introductory economics may, with the consent of the instructor, register for intermediate courses without taking Economics 101-102.

## ENGLISH

The English department will grant 3 credits to students who score 4 or 5 on the CEEB Advanced Placement Examination. The credits are granted automatically: no application to the department is required
Students who receive scores of 700 or better on the CEEB College Placement Test in English composition, 700 or better on the CEEB College Placement Test in literature, or 4 or 5 on the CEEB Advanced Placement Examination are eligible to enroll, space permitting, in the following English freshman writing seminars: $270,271,272$.

Advanced placement credits may not be used to fulfill requirements of the English major or distribution requirements of the College of Arts and Sciences.

## GERMAN LITERATURE

The Department of German Studies will grant three credits to students with a score of 3 or better on the Advanced Placement Examination

For information about the College Placement Test, see "Modem Languages," below

## HISTORY

The Department of History will grant four credits to students who score 4 or 5 on the CEEB Advanced Placement Examination in European history and four credits to those with such scores in the American history examination. Such credits are granted automatically, without application to the department.
These credits may not be used to fulfill requirements of the history major or distribution requirements of the College of Arts and Sciences.

## HISTORY OF ART

The Department of History of Art will grant three credits to students who score 4 or 5 on the CEEB Advanced Placement Examination. Such credits are granted automatically, without application to the deparment.
These credits may not be used to fulfill requirements of the history of art major or distribution requirements of the College of Arts and Sciences

## MATHEMATICS

The Cornell calculus sequences discussed below are described under "Basic Sequences" in the Department of Mathematics section of this catalog

The regular freshman calculus courses at Cornell do not differ substantially from calculus courses given in many high schools, and it is best to avoid repeating material that has already been covered at an appropriate level. Secondary school students who have had the equivalent of at least one semester of analytic geometry and calculus should, if possible, take one of the CEEB's two Advanced Placement Examinations (calculus AB or calculus BC ) during their senior year.

The following rules do not apply to students being admitted to the College of Engineering See the college's brochure for a detailed statement

Students with a grade of 4 or 5 on the BC examination may take the appropriate thirdsemester course (Mathematics 213, 221, or 293), but students entering Mathematics 293 may have to make up some material on partial differentiation. Students with a 3 on the $B C$ examination or a 4 or 5 on the AB examination may take the appropriate secondsemester course (Mathematics 112,122 , or 192). Students with a 2 on the BC examination or a 3 on the AB examination may take one of the second-semester courses (Mathematics 112 or 192). Advanced placement credit will be awarded appropriately however, no credit will be granted for a grade of 1 on the BC or 1 or 2 on the AB examination.

A grade of 3 or higher on the BC examination satisfies the distribution requirement in mathematics for students in the College of Arts and Sciences.

Note, however, that the grade of 3 is not sufficient for a full year of advanced placement credit in mathematics

The placement examination in mathematics is offered at Comell only during orientation week and should be taken by students who

1) have had at least a semester of calculus but did not take a CEEB Advanced Placement Examination;
2) have received a 2 on the $B C$ examination or a 3 on the AB examination and want to enter the upper sequence; or
3) believe that the placement assigned on the strength of the CEEB Advanced Placement Examination is not high enough in their case

Students are strongly urged to take the departmental placement test even if they feel that their grasp of the material is uncertain. The grade on this test does not become part
of a student's record. No advance registration for the departmental examination is necessary.

## MODERN LANGUAGES

Students who have studied a language for two or more years and want to continue study in that language at Cornell must present the results of a placement test. In cases where no placement test exists for a particular language, the Department of Modern Languages and Linguistics designates a professor to handle placement for that language. Students who have had a year of formal study or substantial informal study since they last took a placement test should take the examination again during orientation week if they plan to continue course work

Advanced standing credit may be entered on a student's record as follows

1) For students with a score of 4 or 5 on the language Advanced Placement Examination, three credits are granted, and they are eligible to take Comell's Advanced Standing Examination (CASE). Outstanding performance on this examination could provide three additional credits.
1a) Students who achieve a minimum score of 650 on the language placement test are eligible to take Cornell's Advanced Standing Examination (CASE). Oustanding performance on this examination could provide a maximum of six credits.
2) For formal language work at an accredited college, credit is considered by the department on submission of a transcript and may be entered on the student's Comell record.
3) Native speakers of languages other than English may, on examination by the appropriate professor, be granted a maximum of six credits if they can demonstrate proficiency equivalent to course work on the 200 level or above at Cornell. Additional credit will be considered only for those who pursue advanced work in their native language.
Information about times and places to take placement tests is available in the orientation booklet, from Academic and Career Counseling Services, and from the Department of Modern Languages and Linguistics. For more information, see the College of Arts and Sciences section on language course placement, or contact the Department of Modem Languages and Linguistics, Cornell University, 203 Morrill Hall.

## MUSIC

Advanced placement and credit are awarded only in music theory and only on the basis of a comprehensive examination administered by the Department of Music, normally during orientation week. If special arrangements are made, the examination may be administered at other times during the academic year. All students interested in taking this examination should consult Professor E. Murray, 311 Lincoln Hall (telephone: 607/255-4675). Inquiries may be directed to the Department of Music, Comell University, 104 Lincoln Hall (telephone: 607/255-4097).

## NEAR EASTERN STUDIES

For advanced placement and credit in Arabic and Hebrew, students should consult the Department of Near Eastern Studies, 360 Rockefeller Hall. All advanced placement and credit are determined by departmental examination.

## PHYSICS

Advanced placement and credit are awarded on the basis of the CEEB Advanced Placement Examination in physics (physics B or physics C), certain international examinations, or the deparmental examination (which may be taken during orientation week or at other times as arranged). For information about the departmental examination, students should consult Professor R. Cotts, 522 Clark Hall.
Physics B. Students earning a score of 4 or 5 may receive eight credits for Physics 101 and 102. Those earning a score of 5 in physics $B$ with a score of 4 or 5 in calculus BC or a score of 5 in calculus AB may choose to accept four credits in Physics 112 or 207 instead of eight credits in Physics 101 and 102. Those earning a score of 3 will receive four credits in Physics 101.

## Physics C.

1) C-Mechanics Students earning a score of 4 or 5 may receive four credits for Physics 112 or 207 , or for placement into Physics 116 with no AP credit.
2) C-Electricity and Magnetism Students earning a score of 5 may choose four credits for Physics 213, or placement into Physics 217 with no AP credit. A student planning a major in Physics or Applied and Engineering Physics and who is eligible for credit under 1) or 2) above may consult with his/her adviser or the department representative.
Advanced placement into a next-in-sequence course depends on the completion of the appropriate mathematics prerequisites before enrolling. To qualify for advanced placement credit, it is not necessary to continue the study of physics.
General information and advice may be obtained from Professor R. Cotts, 522 Clark
Hall, or from the Department of Physics,
Comell University, 109 Clark Hall.

## PSYCHOLOGY

Students who scored 4 or 5 on the CEEB College-Level Examination Program psychology test may receive three advanced placement credits in psychology. Those interested in taking further courses in psychology should consult a faculty member in the Department of Psychology, Cornell University, 226 Uris Hall.
Advanced placement based on the CEEB test may not be used to satisfy the distribution requirement in the College of Arts and Sciences. Credit toward the requirements of a major in psychology will depend on the recommendation of the student's major adviser.

## ROMANCE STUDIES (FRENCH, ITALIAN, AND SPANISH LITERATURE)

The Department of Romance Studies grants three credits to students with a score of 4 or 5 on the Advanced Placement Examination in French, Italian, or Spanish literature.
For information about the Placement Test in languages, see "Modern Languages," above.

## ADVANCED PLACEMENT AND CREDIT FOR INTERNATIONAL CREDENTIALS

Following are the policies currently in effect for G.C.E. "A" Level Examinations and International Baccalaureate Higher Level Examinations. Accepted students holding any other secondary school credentials are urged to sit for the Advanced Placement examinations of the College Board or for the departmental examinations offered during Orientation week. Students requiring further information concerning advanced standing credit for foreign credentials may contact the Associate Director, Undergraduate International Admissions.

## General Certificate of Education (GCE)

Advanced ("A") Level Examination passes are awarded advanced standing and credit. Students must present the original or a certified copy of their examination certificate to the Associate Director, International Admissions, in order to receive credit. The following overseas examinations are recognized by Cornell as equivalent in standard to GCE "A" Levels:

- Matriculation examination of the University of Hong Kong (Advanced Level)
- Advanced Level examination of the University of Hong Kong
- E. African Advanced Certificate of Education (principal passes only)
- W. African Advanced Level General Certificate of Education
- Joint examination for the Higher School Certificate and Advanced Level General Certificate of Education in Malaysia and Singapore (principal passes only)
Following is a list of subjects and the marks for which credit will be awarded:

| Subject | Marks | Credit |
| :---: | :---: | :---: |
| Biology | A or B | 8 credits |
| Chemistry | A | 8 credits (Chem 207 and 208) |
|  | B | 4 credits (Chem 207) |
| Economics | A | 6 credits (Econ 101 and 102) |
| English |  |  |
| Literature | A | 6 credits |
|  | B | 3 credits |
| Geography |  | subject to departmental review |
| History | $\begin{aligned} & \mathrm{A}, \mathrm{~B}, \\ & \text { or C } \end{aligned}$ | 4 credits |
| Mathematics | A or B | $\begin{aligned} & 8 \text { credits (Math } 111 \\ & \text { and 112) } \end{aligned}$ |
|  | C | 4 credits (Math 111) |
| Music |  | subject to departmental review |

## Philosophy A or B 3 credits

Physics A or B 4 credits for Physics 101,112 , or 207 4 additional credits for Physics 213 are granted for a combination of grades of A or $B$ and a minimum of 8 Advanced Placement (or Advanced Standing) credits in Mathematics. (Students planning to major in physics should consider enrolling in Physics 217.)

International Baccalaureate (IB) Higher
Level Examination passes are awarded advanced standing and credit as follows. The original or a certified copy of the examination results must be shown to the Associate Director, International Admissions.

| Subject <br> Anthropology | Marks | Credit |
| :---: | :---: | :---: |
|  |  | subject to departmental review |
| Biology | $\begin{aligned} & 7 \\ & 6 \end{aligned}$ | 8 credits <br> 6 credits |
| Chemistry | 7 5 or 6 | 8 credits (Chem 207 and 208) <br> 4 credits (Chem 207) |
| Economics | 6 or 7 | 6 credits |
| English |  |  |
| Literature | $\begin{aligned} & 7 \\ & 6 \end{aligned}$ | 6 credits <br> 3 credits |
| Geography |  | subject to departmental review |
| History |  | subject to departmental review |
| Mathematics | 6 or 7 | 8 credits (prospective math, science, and engineering majors must consult with math department to determine prerequisite for placement in thirdsemester math courses) |
| Music |  | subject to departmental review |
| Philosophy | 7 | 3 credits |
| Physical |  |  |
| Science | 6 or 7 | 4 credits (Phys 112 or 207) |
| Physics | 6 or 7 | 4 credits (Phys 112) |

For more information about advanced placement or other academic questions, please contact the Associate Director, International Admissions, Undergraduate Admissions Office, 410 Thurston Avenue, Ithaca, NY 14850-2488.

## University Registration

University registration is the official recognition of a student's relationship with the university and is the basic authorization for a student's access to services and education. Completion of registration is essential to enable the university to plan for and provide
services and education, guided by the highest standards for efficiency and safety. Unauthorized, unregistered persons who use university services and attend classes have the potential to use university resources inappropriately and to displace properly registered students. In addition, the university assumes certain legal responsibilities for persons who participate as students in the university environment. For example, policy states that New York State health requirements must be satisfied. Because these requirements are intended to safeguard the public health of students, the university has a responsibility to enforce the state regulations through registration procedures.
The policy on university registration is intended to describe clearly the meaning of and the procedures for registration so that students can complete the process efficiently and be assured of official recognition as registered students. With the clear communication of the steps for registration, it is hoped that compliance will occur with a minimum of difficulty.
To become a registered student at Cornell University, a person must

- complete course enrollment according to individual college requirements;
- settle all financial accounts, including current semester tuition;
- satisfy New York State health requirements;
- have no holds from the college, the office of the Judicial Administrator, Gannett Clinic, or the Bursar.
Individuals must become registered students by the end of the third week of the semester.
Comell University does not allow persons who are not registered with the university in a timely manner to attend classes. The university reserves the right to require unauthorized, unregistered persons who attend classes or in other ways seek to exercise student privileges to leave the university premises. The university does not permit retroactive registration and does not record courses or grades for unregistered persons.


## COURSE ENROLLMENT

Pre-course enrollment for each semester at Comell takes place partway through the preceding semester. Dates are announced in advance and are usually posted in school and college offices. Each college or school notifies students about special procedures. Students are often expected to meet with their advisers during this period to affirm that the courses they plan to take will ensure satisfactory progress toward a degree. Students complete a course enrollment form, then return the form to their college office. Each student is sent a course confirmation statement listing the courses processed from the enrollment form. Class schedules are distributed later by the college offices, often during the same days as university registration.
New students and transfer students are sent course enrollment instructions by their college offices before they arrive on campus. Procedures vary from college to college.

Students who fail to submit a course enrollment form during the designated period may be charged a penalty fee. The fees are listed in the chart in the following section.

## COURSE ADD/DROP/CHANGE

Students may adjust their schedules during add/drop/change periods. A form is completed by the student and signed by both the student's adviser and an appropriate representative of the department offering the course (an instructor, department staff member or college registrar, depending on the college). The completed and signed form must be returned to the student's college office to be processed. See the chart below for course add/drop/change fees. Professional schools and the physical education department have different add-drop policies.

## Late Course Enrollment and Late Add/ Drop/Change Fees

| Academic Unit E | Late <br> Course Enrollment Fee | Late Course Add/Drop/ Change Fee |
| :---: | :---: | :---: |
| College of Agriculture and Life Sciences | No fee | No fee |
| College of Architecture, Art, and Planning | No fee | No fee |
| College of Arts and Sciences | No fee | No fee |
| School of Continuing Education and Summer Sessions | $\dagger$ | f |
| College of Engineering | No fee | No fee |
| School of Hotel Administration | No fee | No fee |
| College of Human Ecology | No fee | No fee |
| School of Industrial and Labor Relations | No fre | No fee |
| Internal Transfer Division | No fee | No fee |
| Johnson Graduate School of Management | \$100 | \$100 |
| Law School | No fee | No fee |
| Physical education | \$30 | \$20* |
| Veterinary medicine | \$15 | \$15* |

*Consult the college office for special considerations and requirements.
tConsult the Summer Session catalog and the Division of Extramural Study brochure for fees.

## AUDITING COURSES

Summer school and extramural students may officially register as visitors (auditors) in courses and have this entered on their permanent records if their attendance is reported as satisfactory. Graduate students may register for courses as auditors but will not have the courses listed on their transcripts. Undergraduates may not register to audit courses.

## LEAVES AND WITHDRAWALS

A leave of absence must be requested from the college in which the student is enrolled. A leave of absence is granted for a specified time, after which the student is expected to return to resume course work. Students should inform their college of intent to return.
A student may withdraw from the university at the student's discretion. However, a college may withdraw a student who fails to return at the end of a period of authorized leave.
Medical leaves are granted and processed through University Health Services.

## Internal Transfer Division

Students may not always be satisfied with the original Comell school or college into which they've been admitted. They may decide to transfer from one college to another, within the university. This process is called internal transfer, and application procedures and deadlines vary by college. It may be possible to be admitted directly into a new program. Students who are uncertain if they immediately qualify for direct transfer, however, should apply to the Internal Transfer Division (ITI)). To apply, candidates must interview with the division's director and submit an essay to the ITD office outlining their reasons for wanting to transfer. Internal Transfer Division applicants must also fulfill the application requirements (e.g., interviews, essays) of their target college as if they were applying for direct transfer. In many cases, colleges formally sponsor students in ITD and essentially guarantee admission if students successfully complete the requirements (taking particular courses, earning a specified grade point average while enrolled in ITD) that are outlined in their letter of sponsorship. Although sponsorship does not guarantee admission to the Internal Transfer Division, it is the most important factor determining acceptance into ITD. Students can apply simultaneously for direct transfer and to ITD, so that if direct transfer is denied they might be offered the option of being sponsored in the Internal Transfer Division. For more information about transfer requirements, students should contact the admissions office of the college they hope to enter and the office of the Internal Transfer Division, 220 Day Hall (255-4386).

## Bursar Information

## TUITION, FEES, AND EXPENSES

## Tuition for Academic Year 1994-95

## Endowed Dlvislons

Undergraduate
Architecture, Art, and Planning
Arts and Sciences
Engineering
Hotel Administration
$\$ 19,000$

## Graduate

Graduate School (with major chair in an endowed division)

## Professional

Law School
20,080
Management

## Statutory Divisions

Undergraduate
Agriculture and Life Sciences
Human Ecology
Industrial and Labor Relations
New York resident*
7,740
Nonresident*
14,900

## Graduate

Graduate School (with major
chair in agriculture, human
ecology, or industrial and
labor relations)
\$9,050
Graduate School-Veterinary Medicine $\quad 9,800$
Professional
Veterinary Medicine
New York resident ${ }^{*}$
12,100
Nonresident*
15,900

## Summer Session (1995)

Per credit
475 (estimated)

## Other Tuition and Fees

In absentia fees

| Graduate | $\$ 200$ per term |
| :--- | ---: |
| Undergraduate | 15 per term |
| Law and Management | 75 per term |

The amount, time, and manner of payment of tuition, fees, or other cbarges may be changed at any time uithout notice.
*Residency status is determined at the time of admission by the college. Change in residency status is determined by the bursar.

## Fees and Expenses

Undergraduate applicants to Cornell pay a nonrefundable $\$ 60$ application fee when submitting an application for admission. The graduate application fee is $\$ 60$. Application to the Johnson Graduate School of Management costs $\$ 85$ (domestic), $\$ 110$ (international).

## Tuition Refund Policy

Amounts personally paid for tuition may be refunded if the student requests a leave of absence or withdrawal from the office of the dean of his or her college of enrollment. The date of this request will determine the tuition liability for the semester. Previously matriculated students who terminate their registration with the university during a fall or spring semester in this manner will be charged tuition from the university registration day through the date of their request as follows: first six days of the semester (including university registration day), no charge; seventh day of the semester, 10 percent; second week, 20 percent; third week, 30 percent; fourth week, 40 percent; fifth week, 60 percent; sixth week, 80 percent; seventh week to the end of the semester, 100 percent.
First-time matriculants will be charged tuition from the university registration day through the date of their request as follows: first six days of the semester (including university registration day), no charge; seventh day of
the semester, 10 percent; second and third weeks, 20 percent; fourth week, 30 percent; fifth and sixth weeks, 40 percent; seventh week, 50 percent; eighth and ninth weeks, 60 percent; tenth week to the end of the semester, 100 percent.
Repayment policy. Students receiving financial aid from the university who withdraw during a term will have their aid reevaluated, possibly necessitating repayment of a portion of aid received. Repayment to aid accounts depends on the type of aid received, government regulations, and the period of time in attendance. A partial semester will generally count as one of the eight semesters of financial aid eligibility normally allowed a student.

## Refund Schedule for Withdrawals and Leaves of Absence <br> Fall 1994 and Spring 1995

## Previously Matriculated Students

| Percent | Fall 1994 | Spring 1995 |
| :--- | :--- | :--- |
| No charge | $8 / 23-8 / 29$ | $1 / 19-1 / 25$ |
| $10 \%$ charge | $8 / 30$ | $1 / 26$ |
| $20 \%$ charge | $8 / 31-9 / 6$ | $1 / 27-2 / 1$ |
| $30 \%$ charge | $9 / 7-9 / 13$ | $2 / 2-2 / 8$ |
| 40\% charge | $9 / 14-9 / 20$ | $2 / 9-2 / 15$ |
| $60 \%$ charge | $9 / 21-9 / 27$ | $2 / 16-2 / 22$ |
| $80 \%$ charge | $9 / 28-10 / 4$ | $2 / 23-3 / 1$ |
| $100 \%$ charge | $10 / 5 / 94$ | $3 / 2 / 95$ |

## First-Time Matriculated Students

## Percent

No charge Spring 1995

10\% charge 8/23-8/29 1/19-1/25

20\% charge
8/30
8/31-9/13
1/27-2/8
30\% charge
9/14-9/20
2/9-2/15
40\% charge
9/21-10/4
2/16-3/1
50\% charge
10/5-10/11
3/2-3/8
$60 \%$ charge
10/12-10/25
$100 \%$ charge
10/26/94
3/9-3/22
3/23/95

## BILLING AND PAYMENT

## Billing

Tuition and room and board charges will be billed in July and December and must be paid prior to registration. The due date for these semester bills will normally be five to ten working days prior to ID validation day. All other charges, credits, and payments will appear on monthly statements mailed before the twenty-fifth of every month.
It is possible that some charges will not be listed on the first bill and will appear on a subsequent monthly bill. A student must be prepared to pay any charges appearing on a subsequent bill even though the student receives a financial aid stipend before the charges are billed.
All bills are due by the date stated on the bill; all payments must be received by that date to avoid finance charges. Payments are not processed by postmark.

Please inform the Office of the Bursar of any change in billing address. Address changes made at other offices will not change the billing address. The address initially used on billing statements will be the home address as listed on each student's application for admission.

## Payments

An individual who has outstanding indebtedness to the university will not be allowed to register or reregister in the university, receive a transcript of record, have academic credits certified, be granted a leave of absence, or have a degree conferred. University policy precludes the use of any current financial aid for payment of past-due charges.
The Office of the Bursar acts as a clearinghouse for student charges and credits that are placed directly on a student's bill by several departments and offices of the university. Since the Office of the Bursar does not bave detailed records concerning many items that appear on a bill, students should contact the office involved if they have questions.
For further information, students should contact the Office of the Bursar, Cornell University, 260 Day Hall, Ithaca, New York 14853-2801 (telephone: 607/255-2336; fax: 607/255-6442).
*For specific exceptions, see "Bursar and Cornellcard Procedures," published by the Office of the Bursar, 260 Day Hall.

## STUDENT HEALTH INSURANCE

It is a Cornell University policy, by a university board of trustees decision, that all full-time students have health insurance coverage while enrolled at Cornell.
The student health plan offers extensive coverage at a reasonable cost for students and their eligible dependents. Plan benefit information will be mailed to all registered students (including students registered in absentia) in their July bursar bill. If you decide that you have adequate coverage and want to waive the student health plan, a waiver form with proof of other coverage must be submitted to the student insurance office before the September 25 deadline. All full-time registered students, including students registered in absentia, will be automatically billed and enrolled in the student health plan if a completed waiver is not received by the deadline. After the deadline, the plan is nonrefundable, except for dependents who no longer meet eligibility requirements.
Students enrolled in the student health plan may also enroll their eligible dependents for an additional charge. Enrollment deadline is September 25.

A five-month graduate plan is available for those students who finish their degree requirements before the start of the spring semester. The deadline for application is prior to the start of the spring semester.
To obtain additional information about the Cornell University health plan, please contact the student insurance office at the Gannett Health Center, 10 Central Avenue, Ithaca, NY 14853 or (607) 255-6363.

## Class Attendance, Meeting Times, and Examinations

## CLASS ATTENDANCE AND ABSENCES

Students are expected to be present throughout each term at all meetings of courses for which they are registered. The right to excuse a student from class rests at all times with the faculty member in charge of that class.
Absences because of religious beliefs. In accordance with Section 224-a of the New York State Education Law, each student who is absent from school because of his or her religious beliefs must be given an equivalent opportunity to register for classes or make up an examination, study, or work requirements that he or she may have missed because of such absence on any particular day or days. No fees of any kind shall be charged by the university for making available to such student such equivalent opportunity.

## Class Meeting Times

All lectures, recitations, and similar exercises start at 8 a.m., 9:05 a.m., 10:10 a.m., 11:15 a.m., 12:20 p.m., 1:25 p.m., 2:30 p.m., or 3:35 p.m. and last fifty minutes, except that on Tuesday and Thursday the first and second, the third and fourth, the fifth and sixth, and the seventh and eighth periods may be combined to allow for longer meeting times.

All laboratories and similar exercises that continue for 1 hour and 55 minutes, 2 hours and 25 minutes, or 3 hours are scheduled as shown below.

Schedule for Classes Longer than Fifty Minutes 1 bour and 55 minutes
8:00 a.m.-9:55 a.m.
10:10 a.m.-12:05 p.m.
12:20 p.m.-2:15 p.m.
2:30 p.m. $-4: 25$ p.m.
7:30 p.m. $-9: 25$ p.m.
2 bours and 25 minutes
7:30 a.m.-9:55 a.m.
10:10 a.m.-12:35 p.m.
2:00 p.m. $-4: 25$ p.m.
7:30 p.m. $-9: 55$ p.m.
3 bours
8:00 a.m.-11:00 a.m.
10:10 a.m.-1:10 p.m
1:25 p.m. $-4: 25$ p.m.
7:30 p.m.-10:30 p.m.
On Monday, Tuesday, Wednesday, and Thursday the hours of $4: 25$ to $7: 30 \mathrm{p} . \mathrm{m}$.; on Friday the hours after 4:25 p.m; on Saturday the hours after $12: 05 \mathrm{p} \mathrm{m}$.; and all day Sunday are free from all formal undergraduate class or laboratory exercises.
Review sessions cannot be scheduled after 4:30 p.m. on any day unless all students have no university conflict or an alternate session is made available for those with conflicts.
Evening classes are held only on Monday and Wednesday and only when regularly
scheduled and included in written college announcements or when recommended by the Committee on Academic Records and Registration. Evening lectures, recitations, and similar exercises start at 7:30 and 8:35 p.m. evening laboratories and similar exercises start at 7.30 p.m.
Evening academic activities commencing at 7:30 p.m. on Mondays and Wednesdays, other than regularly scheduled courses and prelims previously approved by the office of the university faculty, are not permitted. Violation of these rules interferes with other university activities (athletic, musical, theattrical,
employment, etc.)
Evening preliminary examinations that will be given outside of normal class hours may be scheduled on Tuesday and Thursday evenings only, beginning at 7:30 p.m. All room assignments are scheduled by the Office of the University Registrar. The dates and times of these examinations are listed in the Course and Room Roster for each term.
Any exception to the above regulations, other than those for evening preliminary examinations, will require permission of the dean or director of the college or school offering the course. Exceptions to the regulations on evening preliminary examinations require approval of the dean of the university faculty. All such exceptions must include provision of special arrangements for the students for whom conflicts are generated by such an exception.

## FINAL EXAMINATIONS

Final examinations for undergraduate courses are scheduled by the Office of the University Registrar. Examinations may be one, two, or two and one-half hours in length at the discretion of the department concerned. The schedule of final examinations is available in the Course and Time Roster and the Course and Room Roster, both of which are published through the Office of the University Registrar twice per year. Examinations not listed in the registrar's examination schedule will be arranged by the professor in charge and must fall within the announced examination period, except by permission of the dean of the faculty in accordance with existing faculty legislation.

## General Rules Governing Final Examinations

Legislation of the university faculty governing study periods and examinations is as follows:

1. No final examinations can be given at a time other than the time appearing on the official examination schedule promulgated by the university registrar's office without prior written permission of the dean of the faculty.
2. No permission will be given, for any reason, to schedule final examinations during the last week of classes or the designated study period preceding final examinations.
3. Permission will be given by the dean of the faculty to reschedule examinations during the examination period itself if requested in writing by the faculty member, but only on condition that a comparable examination also be given for those students who wish to take it at the
time the examination was originally scheduled. The faculty member requesting such a change shall be responsible for making appropriate arrangements for rooms or other facilities in which to give the examination. This should be done through the university registrar's office.
4. No tests are allowed during the last week of scheduled classes unless such tests are part of the regular week-by-week course program and are followed by an examination (or the equivalent) in the final examination period.
5. Papers may be required of students during the study period if announced sufficiently far in advance that the student did not have to spend a significant segment of the study period completing them.
6. Faculty can require students to submit papers during the week preceding the study period.
7. Take-home examinations should be given to classes well before the end of the regular term and should not be required to be submitted during study period but rather well into the examination period.

## The university policies governing study period and final examinations are:

a) Each course shoukd require that a final examination or some equivalent exercise (for example, a term paper, project report, final critique, oral presentation or conference) be conducted or due during the period set aside for final examinations.
b) Although not specifically prohibited, it is university policy to discourage more than two examinations for a student in one twenty-four hour time period and especially on any one day. It is urged that members of the faculty consider student requests for a make-up examination, particularly if their course is the largest of the three involved and thus has the strongest likelihood of offering a make-up for other valid reasons, i.e., illness, death in the family, etc.
c) Students have a right to examine their corrected exams, papers, etc., to be able to question their grading. (Note that students have no absolute right to the return thereof.) Exams, papers, etc., as well as grading records, should be retained for a reasonable time after the end of the semester, preferably till the end of the following term, to afford students such right of review.

## EVENING PRELIMINARY EXAMINATIONS

The most convenient times and places for "prelims" are the normal class times and classrooms. In cases where the only alternative is to hold evening preliminary examinations, they may be scheduled only on Tuesday and Thursday evenings and only after 7:30 p.m.
An alternative time to take the examination must be provided for those students who have academic, athletic, or employment conflicts at the time scheduled.
Note that instructors holding evening examinations are strongly urged to indicate this in the course descriptions listed in Courses
of Study and must notify students of the dates of such examinations as early as possible in the semester, preferably when the course outline is distributed. For more information on the policy governing evening examinations, contact the office of the dean of the faculty, 315 Day Hall.

## Grading Guidelines

The official university grading system is composed of letter grades with pluses and minuses. Passing grades range from $\mathrm{A}+$ to $D-F$ is failing. INC denotes a grade of incomplete, and R is the grade given at the end of the first semester of a year-long course The grades of INC and R do not have qualitypoint equivalents attached. These are the quality-point equivalents:

| $\mathrm{A}+=4.3$ | $\mathrm{~B}+=3.3$ | $\mathrm{C}+=2.3$ | $\mathrm{D}+=1.3$ |
| :--- | :--- | :--- | :--- |
| $\mathrm{~A}=4.0$ | $\mathrm{~B}=3.0$ | $\mathrm{C}=2.0$ | $\mathrm{D}=1.0$ |
| $\mathrm{~A}-=3.7$ | $\mathrm{~B}-=2.7$ | $\mathrm{C}-=1.7$ | $\mathrm{D}-=0.7$ |
|  | $\mathrm{~F}=0.0$ |  |  |

This is how a term average is computed: Quality

| Course | Grade | Points | Credits | Product |
| :--- | :---: | :---: | :---: | :---: |
| Chemistry 103 | B+ | 3.3 | 3 | 9.9 |
| English 151 | C- | 1.7 | 3 | 5.1 |
| DEA 145 | B | 3.0 | x | $4=$ |
| CEH 100 | B | 3.0 | 3 | 9.0 |
| DEA 111 | C | 2.0 | 3 | 6.0 |
| Total |  |  | 16 | 42.0 |

To arrive at the term average, add the products (credits $x$ quality points) and divide by the number of credits taken. Here, 42 divided by 16 equals 2.63

The cumulative average (an average of grades from two or more terms) equals the sum of the products of all the grades at Cornell divided by the total number of credits taken.

## S-U GRADES

On September 6, 1972, the Faculty Council of Representatives passed the following legislation

## "Resolved, that

A. the S-U system have symbol equivalents which are uniform within the university: " S " means C - or above; " U " means $\mathrm{D}+, \mathrm{D}$, D-, or failure
B. S-U options be chosen by the student during the first three weeks of the term.
C. the Announcements and/or supplementary course registration materials describing each course include a description of the course grading options, particularly if the course is graded with an exclusive S-U. Any change in grading options must be announced by the instructor within the first two weeks of the term.
D. course requirements (required reading, term paper, etc.) be the same for students electing S-U grades as for those electing letter grades."
The rules for the S-U option are further defined by each of the academic units. They are as follows:

Agriculture and Life Sciences. (a) Must have 100 credit hours with A, B, C, D grades. (b) The S-U option is available only in those courses so designated in the course catalog after approval by the Educational Policy Committee. (c) Freshmen may not exercise the S-U option.
Architecture, Art, and Planning. (a) All courses specifically required for a degree excluded. Various departments may designate specific required courses where S-U will be permitted. (b) In a course designated as $S$ or U , the entire class is so graded. The instructor must announce this decision within the first two weeks of class. (c) Where the option for S or U exists, both student and instructor must agree on the option. This agreement must be made by the end of the third week of classes on the appropriate form in the college office. Once agreed upon, this grade option will be used for the final grade.
Arts and Sciences. (a) Courses that count toward satisfaction of major requirements should not be taken for an S or U grade unless the department grants permission. (b) Permission of instructor. (c) A minimum of 80 of the 120 hrs . required for the A.B. degree must be in courses for which the student has received letter grades

Engineering, (a) May take one Humanities and Social Sciences, Approved, or Free Elective per term after completing first semester. (b) This option may be elected during Pre-Course Enrollment or with the written permission of the instructor and adviser on an add/drop form in the first 3 weeks of classes. (c) Decision is irrevocable after first 3 weeks of term.
Graduate Scbool. (a) Seminars and Thesis Research courses are usually graded $\mathrm{S} / \mathrm{U}$, and should be registered accordingly or a grade error results at semester's end. Other courses may be registered as S-U only if offered as S-U option.
Hotel. (a) Maximum of four free-elective credit hours per term. (b) Exceptions are by petition only.
Human Ecology. (a) Not part of student's major. (b) May be used in the 15 hours required outside the major in Human Ecology courses. (c) Not part of 39 hours required in humanities, natural sciences, and social sciences. (d) A department may approve S-U grading in specific courses if approved by Educational Policies Committee. (e) Only juniors and seniors may take courses in which both letter grades and S-U are options. (f) Sophomores may take courses in which S-U is offered but letter grades are not offered. (g) Freshmen enrolled in English 137 and 138, which are only offered for S-U credit, are permitted to apply these courses to the freshman seminar requirements. (h) Total of four S-U courses during student's college career.
Industrial and Labor Relations. (a) This option may be elected, if available in I\&LR electives, or in out-of-college electives but not including directed studies. (b) Degree requirements include a minimum of 105 lettergrade (A + to D - ) credits. (c) Student must also be in good academic standing. (d) A " U " is considered the equivalent of an " $F$ " in determining a student's academic status (e) Limited to two courses per term, not to exceed four hours in any one course.

Internal Transfer. (a) S-U grades permitted only when it is the only option or (b) when specifically approved by an admissions officer in the school or college to which the student plans to transfer.
Veterinary Medicine. (a) There are four courses in the veterinary core curriculum that are offered on an S-U hasis only. All other required core courses must be taken for a letter grade. (b) Elective courses for veterinary students may be offered on a $\mathrm{S} / \mathrm{U}$ basis at the option of the professor.

## INCOMPLETE

The grade of incomplete is appropriate only when two basic conditions are met:

1) the student has a substantial equity at a passing level in the course with respect to work completed, and
2) the student has been prevented by circumstances beyond the student's control, such as illness or family emergency, from completing all of the course requirements on time.
A grade of incomplete may not be given merely because a student fails to complete all course requirements on time. It is not an option that may be elected at the student's own discretion.
While it is the student's responsibility to initiate a request for a grade of incomplete, reasons for requesting one must be acceptable to the instructor, who establishes specific make-up requirements. The instructor has the option of setting a shorter time limit than that allowed by the student's college for completing the course work. Several colleges require that a statement signed by the instructor be on file indicating the reason for the grade of incomplete and the restriction, if any.
It is the responsibility of the student to see that all grades of incomplete are made up within the deadline and that the grade has been properly recorded with the student's college registrar.

## CHANGES IN GRADES

Changes in a grade may be made only if the instructor made an error in assigning the original grade.

## OFFICIAL TRANSCRIPTS

An official transcript is one that bears the official seal of the university and the signature of the university registrar, sent in a sealed envelope directly from the Office of the University Registrar to another institution or agency as directed by the student. Transcripts can be obtained through the office of the university registrar, 222 Day Hall.

## University Requirements for Graduation

The university has only one requirement (physical education) which must be fulfilled. A student's college determines degree
requirements such as residency, number of credits, distribution of credits, and grade averages. See the individual requirements listed by each college or school or contact the college registrar's office.

## PHYSICAL EDUCATION

All undergraduate students must complete two terms of work in physical education unless exempted from this requirement for medical or other special reasons or by virtue of advanced standing on admission. For transfer students the requirement is reduced by the number of terms satisfactorily completed, not necessarily including physical education, in a college of recognized standing before entering Comell.
Credit in physical education may be earned by participating in courses offered by the Department of Athletics and Physical Education, participating on an intercollegiate athletic team as a competitor or manager, or performing in the marching band.
Physical education is a requirement of the first two terms at Cornell. Students must register for it in each term, except those in which postponements are granted, until the requirement is satisfied.
Temporary postponements may be granted on the basis of physical disability, schedule conflicts, or excessive work load (employment exceeding twenty hours a week). The Gannett Health Center can provide certifications based on health, and the financial aid office can provide certifications of employment. Students should see the director or assistant director of Physical Education to establish postponements or waiver of the requirement. Questionable or unusual cases may be resolved by petition to the Faculty Advisory Committee on Athletics and Physical Education.

## Swim Test

All undergraduate freshmen who do not pass a basic 75 -yard swim test are required to include swimming in their program of physical education unless they are excused by Gannett Health Center. All nonswimmers are required to register in beginning swim classes. Completion of two semesters of beginning swimming will satisfy the swimming requirement.

## STUDENT RESPONSIBILITIES

Students are responsible for meeting all requirements for the courses in which they are enrolled, as defined by the faculty members teaching the courses. It is also the student's responsibility to be aware of the specific major, degree, distribution, college, and graduation requirements for completing his or her chosen program of studies. Students should know how far they have progressed in meeting those requirements at every stage of their academic career.

## Student Records Policy

Under the Family Educational Rights and Privacy Act of 1974 (FERPA), Cornell

University is required to advise students of their rights concerning their education records Education records include records directly related to a student and maintained by an educational institution or party acting on its behalf. The law gives students the right to
a) inspect and review their education records;
b) challenge contents of education records;
c) a hearing if the challenge is unsatisfactory;
d) include an explanatory statement in the education records if the outcome of the hearing is unsatisfactory;
e) prevent disclosure of personally identifiable information*;
f) secure a copy of the institutional policy which includes the location of all education records**; and
g) file complaints with the Department of Education concerning institutional failure to comply with the act.
*Directory information is a category of personally identifiable information that includes name, home address, local address, local telephone listing, dates of attendance at Cornell, major field of study and college attended, previous educational agency or institution attended, participation in officially recognized activities (in athletics, the weight and height of members of athletic teams), degrees earned and awards. Directory information may be released unless the student indicates otherwise at the time of registration. Students who wish no release of their directory information must inform the office of the university registrar in writing within 10 days of the date of official university registration each academic year. Students may rescind their no release request at any time in writing to the office of the university registrar.
**Opies of the "Cornell University Policy on Access to and Release of Student Education Records" are available at the office of the university registrar, 222 Day Hall.

## POLICY ON POSTING OF STUDENT INFORMATION

In compliance with the university's policy on student educational records, and the U.S. Department of Education's Family Educational Rights and Privacy Act of 1974 (FERPA), restricted student information may not be posted.
Accordingly, the following student information is considered restricted and therefore may not be posted:
Student social security number
Student identification number
Course elected
Grades eamed
Grade point average
Class rank
Date of birth
Place of birth
Home telephone listing
Academic and disciplinary actions
Student or administrative committees

The most recent student educational records from previous educational agency or institution
Financial arrangements between the student and the university
Any other education record containing personally identifiable information
For further information, please refer to the revised Policy on Access to and Release of Student Education Records from the office of the university registrar, 222 Day Hall, or from your college registrar.

## Academic Integrity

Absolute integrity is expected of every Comell student in all academic undertakings. Any fraudulent act by a student to advance his or her academic status merits a severe penalty and such cases are governed by the Code of Academic Integrity. A pamphlet entitled the Code of Academic Integrity and Acknowledging the Work of Others is distributed to new and transfer students and is also available from the office of the dean of faculty. The policy is published in the Policy Notebook, available free of charge from the office of the dean of students.

## PROTECTION OF HUMAN SUBJECTS IN RESEARCH

The University Committee on Human Subjects is the official review board of all university projects that use humans as research subjects. Projects affected by this restriction include, but are not limited to, surveys, questionnaires, studies of existing data, documents, records in which there are no identifiers, as well as mental and physical tests of human subjects. Requests for student information must be submitted in writing to the Assistant Vice President for Academic Programs and Campus Affairs, 311 Day Hall. All proposals involving human subjects in any category must be submitted to the committee for review. Inquiries, communications, and requests for guidelines should be directed to the committee's Executive Secretary, 117 Day Hall (255-5014). The guidelines are also available on CUINFO under OSP (Office of Sponsored Programs)

## USE OF ANIMALS FOR COURSES

The Cornell University Institutional Animal Care and Use Committee has made the following statement on the use of animals for courses: "In certain courses the use of vertebrate animals serves as an invaluable aid in instruction. It is recognized, however, that some students have ethical objections to the use of vertebrate animals in this manner Courses that use vertebrate animals are identified as such in course descriptions. Students who have concerns about the use of animals in these courses should consult the course instructor for more information about the precise ways in which the animals are used. A set of university guidelines on the use of vertebrate animals in teaching for faculty and students is available from departments in which the courses are offered.

A student who is reluctant to voice his or her concerns about animal use in a particular course, or who thinks these concerns have not received proper attention, may seek assistance from the director of the Cornell Center for Research Animal Resources (253-3516)."

## Interdisciplinary Centers, Programs, and Studies

## ANDREW D. WHITE PROFESSORS-AT-LARGE

G4 Van Rensselaer Hall (255-0832).
The program has its origins in Comell's early history. Andrew D. White, the first president of Cornell University, inaugurated the position of nonresident professor, to be held by eminent scholars, scientists, and intellectuals who periodically visit the university for the stated purpose of "contributing to the intellectual and cultural life of the university." Toward this end, Professors-at-Large engage in a variety of activities including public lectures, participation in ongoing courses, and collaborative research, as well as holding office hours for undergraduate and graduate students. Professors-at-Large serve for a sixyear term and are full members of the faculty when in residence

## Term Ending in 1995

Doniger, Wendy, historian of religions Kon, Igor S., sociologist and ethnologist Levine, Raphael D., chemical physicist Swaminathan, M. S., natural ecologist President, National Academy of Sciences, India

## Term Ending in 1996

Lloyd, Geoffrey E. R., Professor of Ancient Philosophy and Science and Master of Darwin College, Cambridge University
Myers, Norman, consultant scientist on conservation and management of tropical diversity
Rowlinson, John Shipley, chemical engineer

## Term Ending in 1997

Delano, Jack, artist and film maker
Kuspit, Donald, art critic
Nasr, Seyyed Hossein, Islamist

## Term Ending in 1998

Diaconis, Persi, mathematical statician Levertov, Denise, poet and critical writer

## Term Ending in 1999

Mitchell, Juliet, psychoanalyist and feminist theorist
Mosse, George, historian
Press, Frank, geophysicist, science and technology adviser
Seeger, Anthony, ethnomusicologist

## CENTER FOR APPLIED

 MATHEMATICS504 ETC Building Hall (255-4335)
The Center for Applied Mathematics administers a broadly based interdepartmental graduate program that provides opportunities for study and research over a wide range of
the mathematical sciences. Each student develops a solid foundation in analysis, algebra, and methods of applied mathematics. The remainder of the graduate student's program is designed by the student and his or her Special Committee. For detailed information on opportunities for graduate study in applied mathematics, students should contact the director of the Center for Applied Mathematics, 504 ETC Building.
There is no special undergraduate degree program in applied mathematics. Undergraduate students interested in an application oriented program in mathematics may select an appropriate program in the Department of Mathematics, the Department of Computer Science, or some department of the College of Engineering.
Graduate students in the center take courses related to their program of study that are offered by various departments. Below are listed selected courses in applied mathematics in the main areas of research interest of the center's members. Detailed descriptions of these courses can be found in the listings of the individual departments.

## Selected Applied Mathematics Courses

Basic Graduate Courses in Applled Mathematics (and Analysis)
Math 413-414 Introduction to Analysis
Math 433-434 Introduction to Algebra
Math 511-512 Real and Complex Analysis
Math 521 Measure Theory and Lebesgue Integration
Math 522 Applied Functional Analysis
Math 531-532 Algebra
Math 551 Introductory Algebraic Topology
Math 515-516 Mathematical Methods in Physics
T\&AM 612-613 Methods of Applied Mathematics
T\&AM 614-615 Topics in Applied Mathematics

## Analysis (and Differential Equations)

Math 427 Ordinary Differential Equations
Math 517 Dynamical Systems
Math 518 Smooth Ergodic Theory
Math 519-520 (also Math 428) Partial Differential Equations
Math 552 Differentiable Manifolds
Math 611-612 Seminar in Analysis
Math 613 Functional Analysis
Math 615 Fourier Analysis
Math 622 Riemann Surfaces
Math 623 Several Complex Variables
Math 627-628 Seminar in Partial Differential Equations

## Logic and Theory of Computing

CS 615 Theory of Concurrent Systems
CS 671 Introduction to Automated Reasoning
CS 682 Theory of Computing
CS 715 Seminar in Programming Refinement Logics
Math 486 Applied Logic I
Math 487 Applied Logic II
Math 581 Logic
Math 681-682 Seminar in Logic
Math 683 Model Theory
Math 684 Recursion Theory
Math 685 Metamathematics
Math 687 Set Theory
Math 688 Topics in Applied Logic

## Discrete and Numerical Mathematics

CS 422-522 Parallel Scientific Computing
CS 621 Matrix Computations

CS 622 Numerical Optimization and Nonlinear Algebraic Equations
CS 624 Numerical Methods for Differential Equations
CS 681 Analysis of Algorithms
CS 721-722 Advanced Topics in Numerical Analysis
CS 729 Seminar in Numerical Analysis
EE 543 VLSI Architectures and Algorithms
Math 425 Numerical Solution of Differential Equations
Math 627-628 Seminar in Partial Differential Equations
Math 655 (also CS 655) Mathematical Foundations for Computer Modeling and Simulation
OR\&IE 627 Dynamic Programming
OR\&IE 630-631 Mathematical Programming I and II
OR\&IE 632 Nonlinear Programming
OR\&IE 633 Graph Theory and Network Flows
OR\&IE 634 Combinatorial Optimization
OR\&IE 635 Interior-Point Methods for Mathematical Programming
OR\&IE 636 Integer Programming
OR\&IE 639 Polyhedral Convexity
Information Communication and Control Theory
EE 411 Random Signals in Communications and Signal Processing
EE 425 Digital Signal Processing
EE 468 Communication Theory
EE 521 Theory of Linear Systems
EE 522 Theory of Nonlinear Systems
EE 526 Advanced Signal Processing
EE 528 Multisensor Digital Signal Processing
EE 561 Error Control Codes
EE 562 Fundamental Information Theory
EE 563 Communication Networks
EE 564 Decision Making and Estimation
EE 565 Queueing Networks
EE 567 Digital Communication
EE 573 Optimal Control and Estimation for Continuous Systems
EE 574 Estimation and Control in Discrete Linear Systems
EE 577 Artificial Neural Networks

## Mathematical Biology

Bio S 662 Mathematical Ecology
Stat \& Biom 451 Mathematical Modeling of Populations
Stat \& Biom 651 Mathematical Population Studies and Modeling
Stat 697 \& Biom 760 Special Topics in Theoretical and Computational Biology

## Mathematical Economics

Econ 519 Econometrics I
Econ 520 Econometrics I
Econ 610 Stochastic Economics: Concepts and Techniques
Econ 617-618 Mathematical Economics Econ 619-620 Advanced Topics in Econometrics

## Mechanics and Dynamics

Chem E 731 Advanced Fluid Mechanics and Heat Transfer
Chem E 734 Fluid Mechanics in Suspensions
Chem E 751 Mathematical Methods of Chemical Engineering Analysis
Chem E 753 Analysis of Nonlinear Engineering Systems: Stability, Bifurcation, and Continuation
EE 681 (also A\&EP 761 ) Kinetic Theory
M\&AE 601 Foundations of Fluid Dynamics and Aerodynamics
M\&AE 602 Incompressible Aerodynamics
M\&AE 603 Compressible Aerodynamics

M\&AE 704
M\&AE 733 Stability of Fluid Flow
M\&AE 734 Turbulence and Turbulent Flow
M\&AE 736 Computational Aerodynamics
M\&AE 737 Computational Fluid Mechanics and Heat Transfer
T\&AM 570 Intermediate Dynamics
T\&AM 671 Advanced Dynamics
T\&AM 672 Celestial Mechanics (also Astro 579)

T\&AM 673 Mechanics of the Solar System (also Astro 571)
T\&AM 675 Nonlinear Vibrations
T\&AM 751 Continuum Mechanics and Thermodynamics
T\&AM 752 Nonlinear Elasticity
T\&AM 776 Applied Dynamical Systems

## Probability and Statistics

EE 562 Fundamental Information Theory
EE 563 Communication Networks
EE 564 Decision Making and Estimation
EE 566 Queuing Networks
EE 664 Foundations of Inference and Decision Making
Math 571-572 Probability Theory
Math 573 Experimental Design and Multivariate Analysis
Math 574 Probability and Statistics Math 575 Sequential Analysis, Multiple Decision Problems
Math 577 Nonparametric Statistics
Math 670 Topics in Statistics
Math 674 Multivariate Analysis
Math 675 Statistical Decision Theory
Math 677-678 Stochastic Processes
OR\&IE 561 Queuing Theory and Its Applications
OR\&IE 563 Applied Time-Series Analysis
OR\&IE 650 Applied Stochastic Processes
OR\&IE 651 Applied Probability
OR\&IE 662 Advanced Stochastic Processes
OR\&IE 663 Time-Series Analysis
OR\&IE 665 Advanced Queuing Theory
OR\&IE 670 Statistical Principles
OR\&IE 671 Intermediate Applied Statistics
OR\&IE 674 Design of Experiments
OR\&IE 675 Statistical Analysis of Discrete
Data
OR\&IE 676 Statistical Analysis of Life Data

## Robotics

CS 462 Robotics and Machine Vision
CS 661 Robotics
CS 662 Robotics Laboratory
CS 762 Robot Cafe
Theoretical/Mathematical Physics/Chemistry
Chem 792 Molecular Collision Theory
Chem 793 Quantum Mechanics I
Chem 794 Quantum Mechanics II
Chem 796 Statistical Mechanics
Chem 798 Special Topics in Physical

## Chemistry

EE 407 Quantum Mechanics and Applications
EE 412 Applied Solid State Physics
Phys 553-554 (Astro 509-510) General Relativity
Phys 572 Quantum Mechanics I
Phys 574 Quantum Mechanics II
Phys 561 Classical Electrodynamics
Phys 562 (Chem 796) Statistical Mechanics
Phys 563 Statistical Physics
Phys 651 Advanced Quantum Mechanics
Phys 652 Quantum Field Theory

## CENTER FOR THE ENVIRONMENT

## 200 Rice Hall (255-7535)

The Center for the Environment (CfE) is a campuswide center that promotes and coordinates interdisciplinary research, teaching, and outreach activities on environmental issues. The CfE historically includes several well-established programs, each headed by a program director and typically staffed by research and outreach professionals working with other Cornell faculty and staff in their respective programmatic disciplines. These institutionally based programs of the center include the following: (1) The Comell Laboratory for Environmental Applications of Remote Sensing (CLEARS) promotes, facilitates, and conducts research and extension programs in the areas of remote sensing, geographic information systems (GIS), and resource inventory; (2) the Cornell Waste Management Institute (CWMI) promotes interdisciplinary programs that integrate research and outreach on energy efficient, environmentally sound solid waste management; (3) the Institute for Comparative and Environmental Toxicology (ICET) provides a focus for training, education, and research in environmental toxicology; (4) the Water Resources Institute (WRI) promotes research and educational activities throughout New York State and provides technical and informational assistance to communities and other entities concerned with understanding and managing the state's water resources. The Center works with a variety of faculty and staff members to establish CfE programs that enhance the scope of programming possible from a single academic unit. These facultybased programs of the Center include the following: (1) The Cornell Institute for Research in Chemical Ecology (CIRCE) explores chemical interactions of organisms; (2) the Comell Program in Environmental Sciences for Educators and Youth (ESEY) helps young people and their teachers and leaders develop the ability to critically analyze environmental and resource management issues; (3) the Ocean Resources and Ecosystems Program promotes ocean studies on campus in the most effective ways possible at a university by developing marine research programs of the highest quality; (4) the Earth, Atmosphere, and Aquatic Sciences Program provides coordination for teaching and research activities in the earth, atmospheric, and aquatic sciences across departmental and college boundaries; (5) the Program for Climate Change Research provides a forum for researchers at Cornell through seminars, conferences, and information on sponsored research; (6) the Urban Environment and Poverty Program (UEP) promotes interdisciplinary work on the interaction of poverty and environmental degradation in Third World cities, where the immediate effects of environmental problems are most acutely felt: (7) the Work and Environment Initiative whose goal is to examine new ways to improve environmental performance at work and to increase green employment opportunities.

## Courses

The center is committed to educating the wide variety of undergraduate and graduate students needed to solve today's and tomorrow's environmental problems. CfE helps foster the development of environmentally oriented courses from many departments
and sections. For example, during the last year CfE has helped to sponsor CRP 653Legal Aspects of Land Use Planning ( 3 cr .), R. Booth and H. Carter; CRP 663 -Historic Preservation Law ( 3 cr ), H. Carter, NTRES 101-The Environment ( 2 or 3 cr .),
R. Oglesby; NTRES 494 Land and Culture: Systems of Native American Resource Management (Indians and the Environment) (3 cr.), S. Pennigroth; NTRES/CRP 494Conflict Resolution and Environmental Mediation, B. Wilkins. The center also helps build curricula in environmental sciences that transcend departmental boundaries, such as the Master of Environmental Management (MEM) degree program, which will be admitting students in the fall of 1994. The MEM will offer specialized tracks-biological, physical, or policy aspects of environmental sciences-and cross-disciplinary experiences that are rigorous and scientifically based, attractive to students from diverse disciplines, and relevant to "real-work" environmental problems that demand interdisciplinary approaches to their solutions. Cornell juniors will apply to the program and begin preparation for this one-year Master of Professional Studies degree during their senior year.
Courses related to CfE programs are offered in a number of departments; for example (1) ecosystems science through the Section of Ecology and Systematics and the Department of Natural Resources; (2) remote sensing through the departments of Civil and Environmental Engineering and Soil, Crop, and Aumospheric Sciences; (3) water resources primarily through the department of Agricultural and Biological Engineering; (4) waste management primarily through the departments of Environmental Engineering, Agricultural and Biological Engineering, and Agricultural, Resource, and Managerial Economics; (5) environmental policy through Toxicology, Natural Resources, and City and Regional Planning; (6) and biological resources through the Division of Biological Sciences

Material relevant to global environmental issues is covered by courses in several departments, including Environmental Engineering, Mechanical and Aerospace Engineering, Agricultural Engineering, Geology, Natural Resources, Rural Sociology, Agricultural, Resource, and Managerial Economics, and the Section of Ecology and Systematics

Because courses relating to the environment are not indexed by that title, interested students should check listings under the following sections of the catalog in addition to the departments mentioned above: Communication, Education, Entomology, Food Science, International Agriculture, Biology and Society, Chemistry, Economics, Government, History, Physics, and Science and Technology Studies. A brochure listing undergraduate environmental course offerings is available from the Center

## THE MARIO EINAUDI CENTER FOR INTERNATIONAL STUDIES

170 Uris Hall (255-6370)
The Mario Einaudi Center for International Studies was established in 1961 to encourage, coordinate, and support comparative and interdisciplinary research on international
subjects and was named for its founder in 1991. It is one of the largest and most diverse centers in the United States. Currently it oversees five Title VI National Resource Centers (Africa, Latin American Studies, South Asia, Southeast Asia, and Western Societies), as well as sixteen topical programs and the university study-abroad program. More than 500 faculty members voluntarily collaborate in the center's programs and well over 300 graduate students are involved directly in its international programs. Undergraduate concentrations in International Relations and Modern European Societies serve 285 students.
Cornell is committed to the application and expansion of its resources to study the global community in all its complexity. These resources include a faculty of preeminent scholars and teachers, excellent research facilities, ability to teach forty-five languages, and a library system with more than $2,500,000$ volumes on topics related to international and comparative studies.
As the world changes, Cornell's international programs change to study those developments. In addition to area studies, these programs focus on topics as varied and vital as international marketing, agriculture, nutrition, population, law, planning, politics, rural development economics, and world peace. These areas and topics change as interest, demand, and potential warrant. As one program gains enough momentum and recognition to attract its own resources, the center applies its resources to another pilot activity that brings faculty and students together across customary professional and departmental boundaries.
In addition, the Einaudi Center was recently given responsibility by the university to redesign and expand foreign study options for Cornellians, which has resulted in our Cornell Abroad Program. The center also encourages international research and travel by students through its annual Travel Grant Program.
Although the center has both an endowment and an appropriation from the university to support interdisciplinary international studies, Cornell monies are only a fraction of the total funds involved in international studies at Cornell. Programs seek funding from foundations, the federal government, alumni, and international agencies, a process that the center assists with as necessary. When particular programs are in a low budget cycle, rather than allowing them to lapse, the center continues to support those that show promise to keep the voluntary faculty groups operating together until new outside funding can be acquired. The center is also responsible for the International Students and Scholars Office.
For additional information on current programs, publications, and courses, contact

## Director

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(607)255-6370

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140 Uris Hall
Slavic and East European Studies Program: Valerie Bunce, director
120 Uris Hall
Latin American Studies Program:
Lourdes Benería
190 Uris Hall
South Asia Program:
Dan Gold, director
170 Uris Hall
Southeast Asia Program:
Randy Barker, director
180 Uris Hall
Western Socleties Program:
John Weiss, director
120 Uris Hall
Institute for African Development:
David Lewis, director
203 West Sibley Hall
International Agriculture:
Norman Uphoff
350 Caldwell Hall
International Legal Studies:
John Barcelô, director
309 Myron Taylor Hall
International Political Economy:
Philip McMichael, director
437A Warren Hall
Population and Development Program:
Douglas Gurak, director
200 West Sibley Hall
Peace Studies Program:
Judith Reppy, director

## 130 Uris Hall

## Program in International Nutrition:

Jere Haas, director
Jean Pierre Habicht, co-director
218 Savage Hall
Program on Comparative Economic Development:
Erik Thorbecke, director
458 Uris Hall
Cornell International Institute for Food,
Agriculture, and Development:
Norman Uphoff, chair
350 Caldwell Hall
International Development and Women: Shelley Feldman, director
217 W. Sibley Hall
Cornell Food and Nutrition Policy
Program:
David Sahn, director
308 Savage Hall
Current programs coordinated by the Einaudi Center include the following:
Master of Professional Studies in International Development:
Norman Uphoff, field representative 350 Caldwell Hall
A program intended for midcareer practitioners is sponsored by the center and leads to a Master of Professional Studies in International Development. Interested individuals should apply through the Graduate School.

Program on International Relations:
Peter Katzenstein
Walter S. Carpenter Professor of International Studies
160 Uris Hall
Undergraduates interested in an international relations concentration should see Professor Katzenstein.
Cornell Abroad:
Ben DeWinter, director
474 Uris Hall
International Students and Scholars:
Jerry Wilcox, director
200 Barnes Hall

## COGNITIVE STUDIES

273A Uris Hall (255-6431) (cogstocornell.edu)
Cognitive studies is a new and rapidly growing field of study that focuses on the nature and representation of knowledge. It approaches the study of perception, action, language, and thinking from several perspec-tives-theoretical, experimental, and computational-with the aim of gaining a better understanding of human cognition and the nature of intelligent systems. The comparison between human and artificial intelligence is an important theme, as is the nature of mental representations and their acquisition and use. Cognitive studies has drawn primarily from the disciplines of computer science, linguistics, philosophy, and psychology. In the College of Arts and Sciences the field of cognitive studies is primarily represented by faculty in these departments, as well as in mathematics. It is also represented by faculty in the Department of Human Development and Family Studies (College of Human Ecology), in the Section of Neurobiology and Behavior (Division of Biological Sciences), in the Department of Education (College of Agriculture and Life Sciences), and in the Johnson Graduate School of Management.

## Undergraduate Programs

An undergraduate concentration in cognitive studies in the College of Arts and Sciences provides a framework for the design of structured, individualized programs of study in this growing interdisciplinary field. Such programs of study are intended to serve as complements to intensive course work in a single discipline as represented in an individual department. For further information on the undergraduate program, see "Cognitive Studies Concentration" in the College of Arts and Sciences section. Contact Sue Wurster: 255-6431 or cogsiocomell.edu.

## Graduate Programs

At the graduate level Cornell offers a graduate field minor in cognitive studies. Cornell's unique program of graduate training, which seeks to tailor an optimal program of study and research for each student, fosters interdisciplinary committees. It is the norm for students interested in cognitive studies to combine faculty members from such departments as Philosophy, Computer Science, Modern Languages and Linguistics, or Psychology on common committees. For further information on the graduate Field of Cognitive Studies, contact Barbara Lust, graduate field representative, NG28 Van Rensselaer Hall (telephone: 607/255-0829), or

273A Uris Hall, Office of Cognitive Studies, 255-6431, cogst@cornell.edu.

## Courses

Courses from across the university that are relevant to the Cognitive Studies program are listed in this catalog under Arts and Sciences in the section "Special Programs and Interdisciplinary Studies."

## CORNELL ABROAD

474 Uris Hall 607/255-6224, fax 607/255-8700, e-mail: CUAbroad@cornell.edu
Cornell Abroad offers undergraduates a wide variety of academic programs that are intellectually challenging, academically and socially diverse, and culturally enriching. Study abroad is an integral part of a Cornell undergraduate education, complementing and enhancing study in Ithaca. Qualified students study abroad through programs administered by Cornell and other American institutions, and by enrolling directly in foreign universities. There are hundreds of study abroad programs available; students select programs and apply with the approval of their colleges and faculty advisors. In all cases, students enroll through Cornell Abroad.

## LOCATIONS ABROAD

Cornell undergraduates regularly study in approximately 40 different countries the world over. In addition to a challenging course of study, study abroad offers the experience of immersion in the life and culture of the host country.
Cornell students frequently choose to study at the following universities and programs:
AFRICA
Botswana, Cameroon, Kenya: School for International Training;
Ghana: University of Ghana (through the Council of International Educational Exchange, CIEE);
Kenya: East Africa Program (Friends World Program); Kenya Semester Program (St. Lawrence University);
Nigeria: University of Ibadan (Brown University)
ASIA
China: Peking and Nanjing Universities through CIEE;
Hong Kong: Chinese University of Hong Kong;
Indonesia: Institut Keguruan Dan Ilmu Pendidikan (IKIP) in Malang (CIEE);
Japan: Kyoto Center for Japanese Studies through a Stanford University-led consortium, and various other university programs;
Korea: Yonsei University;
Nepal: Cornell-Nepal Study Program (Samyukta Adhyayan Karikam Nepal) at Tribhuvan University;
Sri Lanka: ISI.E Program (Intercollegiate Sri Lanka Education);
Vietnam: University of Hanoi (CIEE)

## AUSTRALIA

Australia National University, Canberra; Curtin University of Technology, Perth; Griffith University, Brisbane; University of Sydney; University of Adelaide; University of New South Wales, Sydney; University of New England, Armidale; The University of Wollongong; University of Western Australia, Perth; School for International Training.

## EUROPE

Denmark: Denmark's International Study Program (DiS);
France: EDUCO (Comell and Duke in Paris) at Université de Paris VII, Paris I, Institut d'Études Politiques de Paris (Sciences Po); Critical Students Program at the University of Paris (CIEE);
Germany: Cornell program at the University of Hamburg; spring engineering semester at the Technical University of Hamburg, Harburg;
Greece: Cornell program at the Athens Centre;
Hungary: Budapest University of Economic Sciences (CIEE), Technical University of Budapest (Seminars in Mathematics);
Ireland: University of Limerick; Trinity College, Dublin;
Italy: Bologna Cooperative Studies Program; Cornell College of Art, Architecture and Planning Program in Rome; Intercollegiate Center for Classical Studies in Rome;
Russia: Cornell-Colgate Semester in Moscow; St. Petersburg University (CIEE);
Spain: Cornell-Michigan-Penn program at the University of Seville;
Sweden: Agricultural College of Sweden, Uppsala; The Swedish Program at the University of Stockholm;
Switzerland: Cornell program at the University of Geneva and affiliated institutes;
United Kingdom: University of Birmingham; University of Bristol; Cambridge University; University of Edinburgh; University of Manchester; Oxford University; University of Reading; University of Sussex; Lniversity of Warwick; University of London: King's College, University College, Imperial College of Science and Technology, and the London School of Economics and Political Science, Queen Mary Westfield College, School of Oriental and African Studies, School of Slavonic and East European Studies.

## LATIN AMERICA, CENTRAL AMERICA, AND

 THE CARIBBEANCosta Rica: School for Field Study;
Ecuador and Jamaica: Partnership for Service Learning;
Honduras: Escuela Agricola Panamericana (Zamorano);
Mexico: Instituto Tecnológico y de Estudios Superiores de Monterrey; Universidad de las Americas-Puebla (UDLA); Universidad Iberoamericana;

## MIDDLE EAST

Egypt: American University in Cairo;
Israel: Bar Ilan University; Ben-Gurion University; Development Study Center, Rehovot; Haifa University; Hebrew University of Jerusalem; Technion (Israel Institute of Technology); Tel Aviv University;
Morocco: School for International Training

## Other Locations

Cornell students are not limited to the locations listed above. In recent years, they have also studied in Argentina, Austria, Brazil, Colombia, Czech Republic, Dominican Republic, India, New Zealand, the Philippines, Poland, Puerto Rico, Turkey, Venezuela, and elsewhere.

## Who Studies Abroad

Students from all seven undergraduate colleges and from all major fields are eligible to study abroad; a cumulative grade point average of 30 or above is required. Approximately 500 undergraduates study abroad each year. Because the colleges usually require that students complete at least sixty hours of undergraduate credit on the Ithaca campus, students who transfer to Comell as juniors generally cannot count student abroad credit toward their Comell degree.

## When Students Study Abroad and for How Long

Students may study abroad their sophomore, junior, or senior year. Junior year is the traditional choice, but second semester sophomore year or first semester senior year is increasingly popular. To ensure preparation, it is important to begin planning for study abroad in the freshman year. Although semester-long programs are usually available, academic year programs are highly recommended, especially for students enrolling in non-English speaking universities.

## Application Process

Applications for all study abroad programsCornell programs, as well as those administered externally by other institutions in this country and abroad-are available in the Cornell Abroad Office, 474 Uris Hall, where students are encouraged to consult the library of study abroad materials and to ask preliminary questions of the staff. Students meet with the study abroad advisers in their colleges to choose programs that fit the needs of their degree programs. Each applicant completes a one-page written statement of purpose outlining goals for study abroad and the academic program that will be followed. Applications are signed by both college study abroad and faculty advisers and are returned to the Comell Abroad office, with the exception of Human Ecology and Industrial and Labor Relations students whose applications are submitted to their college for forwarding to Cornell Abroad. Cornell Abroad reviews all applications and forwards them to external programs as necessary. All students who wish to receive academic credit for study abroad must apply through Cornell Abroad.
The deadline for all applications to study abroad in the spring 1995 semester is October 15, 1994; to study abroad in the fall 1995 semester and/or the 1995-96 academic year, the deadline is February 15,1995 . Note that to
study at Oxford and Cambridge for the full 1995-96 academic year, the deadline is November 1, 1994 and that for all other British universities, students should inquire at Cornell Abroad.
Externally sponsored programs announce application deadlines at varying dates; students are advised to apply as early as possible. Some programs admit students on a rolling basis from very early in the semester.

## Registration, Credit Transfer, and Grades

Students who apply through Cornell Abroad to programs approved by their colleges, as outlined above, remain registered at Cornell while they study abroad. They remain eligible for financial aid and receive full academic credit for pre-approved courses of study completed with satisfactory grades. Students enroll for a full load of courses abroad, according to the standards of the foreign institution and normally receive 30 credits per year or $12-20$ credits per semester. The colleges review coursework taken abroad and make the final decisions concerning credit transfer and distribution. When study abroad credit has been transferred, the transcript will indicate the names of the courses taken, the credits earned, and the grades received. The foreign grades are not translated into the Cornell/American grading system, nor are they averaged into the Cornell grade point average.

## Foreign Language Requirements

Study abroad programs in non-English speaking countries that offer direct enrollment in universities generally require at least two years or the equivalent of college-level language study. Students should make firm plans for any requisite language courses early in their freshman year. English-language programs are increasingly available in non-English-speaking countries-for example, Belgium, Denmark, Egypt, France, Hong Kong, Indonesia, Israel, Italy, Japan, Korea, Netherlands, People's Republic of China, and Sweden. Whenever Cornell students study in a non-English-speaking country in an Englishlanguage program, they are required to take at least one language course as part of their course of study.

## Housing Arranagements

Study abroad programs generally provide housing in the homes of local residents, in university halls of residence, or in apartments Comell Abroad will advise students of the arrangements that are available and most appropriate to their individual needs.

## Costs

Students pay the tuition of the study abroad program and a fee to Comell, which will be $\$ 1,890$ in 1994-95. Students studying in the United Kingdom pay an additional semester fee of $\$ 300$ for services of the Cornell Centre, unless they are attending a program sponsored in the U.K. by another American university. Detailed information on costs is available at the Comell Abroad office.

## Financial Aid

All students going abroad, whether through a Cornell program or a program sponsored by another institution, are eligible for financial aid as consistent with general university policy.

## Security Abroad and Related Issues

The decision to study in a particular region of the world must be made by each student and his or her family in light of their own interpretation of current events. The director and staff stay in regular contact with representatives abroad and receive information regarding rapidly changing political situations through the U.S. Department of State Office of Citizens Emergency Services and other agencies. As long as the State Department does not restrict travel by U.S. citizens, Cornell Abroad does not recommend limitations on student plans for study abroad. Comell Abroad will do everything possible to notify students immediately that they should defer plans when official travel restrictions are issued. Nothing is as important as student security and well-being.

Responsibility for a decision to withdraw from a program or return home early rests with the individual and his or her family. There can be no guarantee of credit for students who withdraw from programs sponsored by colleges and universities other than Cornell; they are advised to inquire about those institutions' policies regarding the completion of academic work and the potential financial implications of a premature departure. In the event of a disrupted semester, refunds of tuition and fees, and the appropriate number of credits to be awarded will be reviewed by Comell and affiliated institutions on a case-by-case basis. Most institutions sponsoring study abroad programs strive to facilitate student completion of academic programs even under unusual circumstance and have tuition refund policies that contain a prorated formula.

## Sources of Information and Advice Concerning Study Abroad

Cornell Abroad (474 Uris Hall):
Urbain J. DeWinter, adjunct associate professor of romance languages, director; Beatrice B. Szekely Ph.D., associate director; Elizabeth R. Okihiro, Student Services; Kathy Lynch, accounts coordinator; Rae Ann Peterson-Mathewson, secretary/receptionist. The Comell Abroad library contains an extensive collection of university catalogs, study abroad program brochures, course syllabi and evaluations, books, videotapes, and some information on travel, summer study, and work abroad. In the early weeks of every semester, faculty, students, and staff discuss programs in a series of information meetings that is announced in the Comel! Daily Sun.

## College Study Abroad Advisers

Agriculture and Life Sciences: Dr. Donald Burgett, director, Student Services, 140 Roberts Hall; Architecture, Art, and Planning: Phyllis Thibodeau, executive assistant (Rome Program), 129 Sibley; Arts and Sciences: Dr. Barbara Jo Lantz, assistant dean, International Programs, 55 Goldwin Smith Hall; Engineering: Professor Richard Lance, 322 Thurston Hall; Hotel Administration: Professor Russell Bell, 545C Statler Hall; Human Ecology: Dr. Mary Rhodes, registrar, N101 Martha Van Rensselaer; Industrial and Labor Relations: Laura Lewis, student development specialist, 101 Ives Hall.

## CORNELL-IN-WASHINGTON PROGRAM

## 131 Sage Hall (255-4090)

Cornell-in-Washington is a university-wide program that offers students from all colleges within the university an opportunity to earn full academic credit for a semester of study in Washington, D.C. The aim of the program is to give students a chance to take advantage of the rich resources of the national capital. Washington, as the center of much of the nation's political energy, is an ideal place to study American public policy and the institutions and processes through which it is formulated and implemented. At the same time, Washington's rich collection of libraries, museums, theaters, and art galleries, offers an opportunity to explore American history, literature, art, and the full range of the American humanistic tradition. The Comell-in-Washington Program offers two study options: 1) studies in public policy; and 2) studies in the American experience. Students take courses from Cornell faculty, conduct individual research projects, and work as externs in the Washington community.
The program is housed at the Comell Center, 2148 O Street, NW, Washington, D.C. 20037. The academic and adminstrative space is located on the first floor; twenty-seven residential units for students and faculty are on the upper floors.
The Comell-in-Washington program is open to qualified juniors and seniors from all colleges, schools, and divisions of the university Students enroll in one core course, which involves a major research project often carried out in conjunction with an externship. Students also select one or two other seminars from such fields as government, history, economics, history of art, literature, natural resources, and social policy. All seminars are taught by Cornell faculty and carry appropriate credit toward fulfillment of major, distribution, and other academic requirements. In addition, students work as externs with congressional committee offices, executive-branch agencies, interest groups, arts and research institutions, and other organizations involved in the political process and public policy.

## Tuition

Students are registered as full-time students, earn Cornell credit, pay full tuition, and remain eligible for financial aid.

## Housing

Apartments are rented at the Cornell Center during the academic year and during the summer. All are fully furnished (except for dishes, cookware, towels and bedding) and reasonably priced by both Washington and Cornell standards. Two students are assigned to each efficiency and three to each onebedroom apartment. Because of the limited number of spaces and the need for accurate planning, a non-refundable deposit of $\$ 150$ is required to reserve a space. Students are discouraged from bringing automobiles. The public transportation system, consisting of both bus and subway service, is extensive and convenient to the Center and street parking is not available.

## Applications

Application forms are available from the Cornell-in-Washington office at 131 Sage Hall. Applications should be submitted the semester prior to participation.

## Information

Regular information meetings are held on campus in early October and March. These meetings are advertised in the Cormell Daily Sun and on campus bulletin boards. Additional information concerning externships, courses, housing and other features of the program may be obtained at either the Cornell-in-Washington office at 131 Sage Hall (607) 255-4090, or in Washington at the Cornell Center, 2148 O Street, NW, Washington, DC 20037, (202) 466-2184.

## CORNELL INSTITUTE FOR PUBLIC AFFAIRS

132 Sage Hall, Ithaca, NY 14853-6201; telephone: 607 255-8018
Cornell's Institute for Public Affairs (CIPA) seeks to provide stuclents with an understanding of the political processes through which issues, problems, and policies are formulated; the economic bases for government action in a market economy, including both micro- and macroeconomic techniques and problems; and the historical context and development of government programs. The program intends to provide familiarity with public budgets, finance, and the regulatory process, as well as a thorough knowledge of the behavior of both public and private organizations and their management. It also aims to develop competence in the quantitative methods needed to analyze and evaluate programs and policies and sensitivity to the moral and ethical dimensions of policy questions.
The two-year Master of Public Administration program consists of sixteen courses; students are required to take four courses per term for two years. Students with unusually strong backgrounds in required course areas may be granted advanced standing. Special arrangements will be made for students who require additional preparation in required areas.
In consultation with a faculty adviser, each student uses electives to develop an area of concentration. Elective courses and research opportunities may be taken within the program or in any department or college in the university. Students have considerable freedom to design specializations that suit their interests and career goals. Potential areas of concentration include environmental policy, health and human services, international development, labor/management relations, public policy analysis and planning, and science and technology studies.
All students are required to develop and complete a CIPA thesis project. This project, under the supervision of two faculty members in the student's area, should define and analyze a specific policy problem and offer recommendations for furure programs and policies in this area. The CIPA thesis project should allow students to refine and integrate analytical and intellectual skills they have acquired as well as to demonstrate their capacity to understand and deal with real problems facing public agencies.

Application. Applicants are required to submit GRE general test scores.
Financial Support. The budgetary resources of the program are extremely limited, and financial aid will be awarded only on the basis of unusual merit and clearly documented need. Requests should be made directly in writing to Cornell Institute for Public Affairs, 132 Sage Hall, Ithaca, N.Y. 14853-6201.

## CORNELL PLANTATIONS

One Plantations Road (255-3020)
A place of exceptional diversity and opportunities, Comell Plantations comprises the university's botanical garden, arboretum, and natural areas. Its nearly 3,000 acres include the woodlands and gorges bordering campus, as well as 11 specialized gardens and the 150 acre arboretum that features a field flower meadow and trees and shrubs native to New York State. Comell Plantations provides unique outdoor laboratories and plant collections for Cornell's academic programs and research in disciplines that include agronomy, biology, ecology and systematics, entomology, floriculture and omamental horticulture, fruit and vegetable science, geology, landscape architecture, natural resources, plant breeding, and plant pathology. While much of Cornell Plantations' resources are on or near campus, several thousand acres in and around Tompkins County preserve quality examples of native vegetation and rare plants and animals. The lands include bogs, fens, glens, swamps, wet and dry forests, vernal ponds, and meadows. Arrangements to use these areas for classes and research can be made by calling Comell Plantations.

For those seeking less-strenuous experiences, Cornell Plantations offers relaxation, rejuvenation, and inspiration. The vast open spaces provide room to breathe; the intimate gardens shelter you. Visitors always discover surprises and learn something new in the gardens, which feature herbs, flowers, heritage and modern vegetables, international crops, weeds, alpine and rock garden plants, peonies, poisonous plants, groundcovers, rhododendrons, and plants native to the Cayuga Lake Basin.
Students are encouraged to volunteer as photographers, authors, tour guides, and gardeners. Maps, information, publications, and class brochures (for noncredit classes and workshops) are available in the Garden Gift Shop in the Lewis Headquarters Building at the botanical garden. Non-credit courses in horticulture, plant science, geology, free-hand drawing, and other natural history topics are offered throughout the year

## PROGRAM ON ETHICS AND PUBLIC LIFE

117 Stimson Hall (255-8515)
The critical issues of public life are inescapably ethical issues. In the economy, we face questions of equity and justice and questions about the relation between prosperity, the environment, and the quality of individual lives. In constitutional law, we confront dilemmas about civil rights, freedom of speech, privacy, and abortion. In politics and government, we wrestle with questions about
campaigning, character, and compromise. And in international affairs, we encounter the complexities of war and peace, human rights, multilateral aid, and climate change.
The university-wide Program on Ethics and Public Life (EPL) is Comell's initiative in the systematic study of the ethical dimension of specific public issues. EPL grew out of a conviction that these questions need something more than abstract philosophical discussion. In addition to the general study of values and principles that goes on in theoretical ethics, universities need to foster ways of thinking about the complex, uncertain, and urgent problems of the real world, ways of thinking that are realistic without sacrificing anything of their ethical character.
EPL does not intend to create either an undergraduate major or a graduate field in Ethics and Public Life. On the contrary, we seek to enhance and facilitate the discussion of ethical issues by students whose central educational interests lie elsewhere, but whose work and lives will nevertheless confront them with dilemmas and responsibilities for which a university education should prepare them. EPL aims, not to create yet another specialized department, but to enrich existing departments with courses that are intellectually serious and practically fruitful at the same time.

## EPL Core Courses

PHIL 247 Ethics and Public Life
PHIL 342 Law, Society, and Morality PHIL 343 Political Obligation and Civil Disobedience
GOVT 469/Phil 369 Limiting War: The Morality of Modern State Violence
GOVT 412 Voting and Political Participation GOVT 466/Womns 466/Law 648 Feminism and Gender Discrimination
GOVT 468/Phil 368 Global Climate and Global Justice
GOVT 491/691 Conflict, Cooperation, and Norm: Ethical Issues in International Affairs

## Related Courses

CEH 356 Economics of Welfare Policy CRP 642 Critical Theory and the Foundations of Planning Analysis
ENGR 360/S\&TS 360 Engineering Ethics ILR 482 Ethics at Work
ILR 488 Liberty and Justice for All LAW 668 Lawyers and Clients LAW 744 Lawyers and the Legal Profession
Henry Shue, director, 117 Stimson Hall, 255-8515; Henry Shue, Wyn and William Y. Hutchinson Professor of Ethics and Public Life; Kathryn Abrams, Associate Professor of Ethics and Public Life and Professor of Law.

## HISPANIC AMERICAN STUDIES PROGRAM

## 211 Sage Hall (255-3197)

The Hispanic American Studies Program is an interdisciplinary academic program that focuses on the contributions, concerns, and welfare of those persons of Hispanic origin who reside in the United States. It includes support for historical, linguistic, literary, social, economic, and political studies of this diverse group of Americans. To this end the program objectives are (1) to expand the available course curriculum by providing both undergraduate and graduate courses pertain-
ing to Hispanic American subject matters; (2) to enlarge the size of the Hispanic American faculty at Cornell through permanent appointments and visiting appointments; and (3) to enhance the Hispanic American academic environment on campus through support of such activities as lectures, conferences, seminars, exhibits, and research activities.

## 1994-95 Course Offerings

Because courses relating to Hispanic American Studies are not indexed by that title, courses of particular relevance are listed below. Please refer to the appropriate department for details.
HSS 280/ASR 280: Racism in American Society
HSS 370: Social Welfare as a Social Institution
ILR 469: Immigration and the American Labor Force
SOC 265: Hispanic Americans
SPAND 204: Intermediate Composition and Conversation
SPAND 366/LING 366: Spanish in the United States
SPANL 311-312: Advanced Composition and Conversation
SPANL 332: The Modern Drama in Spanish America
SPANL 346: Hispanic Caribbean Culture and Literature
SPANL 390: Fiction of Modern Hispanic Women
SPANL 396: Modern US-Hispanic Prose Fiction
SPANL 397: Colombian Literature
SPANL 492: Latin American Women Writers HASP/SPANL 105 FWS: Paradise Lost: Biculturalism in America
HASP/SPANL 106 FWS: Searching for Self in Hispanic fiction
HASP/SPANL 107 FWS: The Literature of U.S. Hispanic/Ethnic Women Writers
LING 113 FWS: Two Worlds-Dos Mundos HASP/SPANL 119 FWS; Letters from el Barrio: A Sense of Place in Hispanic American Fiction
HASP/SPANL 125 FWS: The City in Hispanic Novels
HASP/SPANL 126 FWS: The Complex Fate: Self-Identity and Conflict in the United States Hispanic Literature
HASP/SPANL 210: Introduction to Hispanic American Studies
HASP 304/SPANL 304: Hispanic American Poetry
HASP/ARTH 312/SPANL 314: Hispanic Aesthetics: Visual Vernacular
HASP 311/GOVT 357: Transnational Communities: Latin Americans in the United States
HASP 402/SPANL 402/THETR 402: Latin American and Latino Video

## PROGRAM IN COMPARATIVE AND ENVIRONMENTAL TOXICOLOGY

213 Rice Hall (255-8008 or 255-2808)
The Cornell Program in Comparative and Environmental Toxicology is coordinated and facilitated by the Institute for Comparative and Environmental Toxicology (ICET). ICET serves as a focal point for all research, teaching, and cooperative extension activities in the broad interdisciplinary area of environmental toxicology at Cornell and
encourages the development of collaborative programs between faculty members in many university departments.

## Graduate Studies

The major in the graduate Field of Environmental Toxicology promotes training leading to the M.S. or Ph.D. degrees and provides both breadth and depth in environmental toxicology and related disciplines. The program offers a combination of research and didactic training that is designed to prepare students for solving the problems of modern toxicology. Specialization tracks include cellular and biochemical toxicology; nutritional and food toxicology; ecotoxicology and environmental chemistry; and risk assessment, management, and public policy. Research of the faculty associated with the program is focused on the interactions of drugs, pesticides, and other potentially hazardous environmental agents with a wide variety of living organisms (including humans) and with the ecosystems with which these organisms are associated.

## Courses

Courses in environmental toxicology are cosponsored by the university academic departments and are open to all graduate students and to those undergraduates who have permission of the instructor. The titles and numbers of these courses are listed below, and details of course content are provided elsewhere in the catalog under the listings of the cosponsoring department. Further information concerning the program and the development of new courses may be obtained through the graduate faculty representative, 213 Rice Hall (telephone: 255-8008).
Tox 370 Pesticides and the Environment (Entomology 370)
Tox 437 Oncogenic Cancer Viruses (Biological Sciences 437 )
Tox 528 Pharmacology (Veterinary Medicine 528)

Tox 607 Ecotoxicology (Natural Resources 607)

Tox 610 Introductory Chemical and Environmental Toxicology (Food Science 610)

Tox 611 Molecular Toxicology (Nutritional Sciences 611)
Tox 621 Clinical Veterinary Toxicology (Veterinary Medicine 621)
Tox 640 Principles of Toxicological Pathology (Veterinary Medicine 640)
Tox 660 Safety Evaluation in Public Health (VetPR 660)
Tox 680 Hazardous Waste Toxicology
Tox 690 Insect Toxicology and Insecticidal Chemistry (Entomology 690)
Tox 698 Current Topics in Environmental Toxicology (Nutritional Sciences 700, NatRes 698, Ag \& Bio Eng 698)
Tox 702 Seminar in Toxicology
Tox 751 Professional Responsibilities of Toxicologists (Biological Sciences 751)
Tox 899 Master's Thesis and Research
Tox 999 Doctoral Thesis and Research

## STATISTICS CENTER

## 482 Caldwell Hall (255-8066)

The Cornell Statistics Center coordinates university-wide activities in statistics and probability at the graduate and research level.

Students interested in graduate study in statistics and probability can apply to the field of statistics or to one of the other graduate fields of study that offer related course work.
Students in the field of statistics plan their graduate program with the assistance of their Special Committee. For detailed information on opportunities for graduate study in statistics and probability, students should contact the director of the Statistics Center, 482 Caldwell Hall.
The many different programs available to graduate students within the field of statistics can be broadly grouped as follows: biometry, biostatistics, economic and social statistics, operations research, probability theory, sampling theory, statistical computing, statistical design, statistical theory, and stochastic processes and their applications.
The following list contains selected courses in statistics and probability of interest to graduate students in the field of statistics.

## Economics

519 Econometrics I
520 Econometrics II
619 Advanced Topics in Econometrics 1
620 Advanced Topics in Econometrics II

## Electrical Engineering

411 Random Signals
468 Communication Systems I
561 Error Control Codes
562 Fundamental Information Theory
563 Communication Networks
564 Decision Making and Estimation
567 Communication Systems II
577 Artificial Neural Networks
663 Advanced Topics in Information Theory
664 Foundations of Probability
Industrial and Labor Relations
310 Design of Sample Surveys
312 Applied Regression Methods
410 Techniques of Multivariate Analysis
411 Statistical Analysis of Qualitative Data
510-511 Introductory Statistics for the Social
Sciences
610 Seminar in Modern Data Analysis
611 Statistical Computing
612 Statistical Classification Methods
613 Bayesian and Conditional Inference
614 Structural Equations with Latent Variables
711 Sensitivity Analysis in Linear Regression
712 Theory of Sampling
713 Empirical Processes with a Statistical Application
714 Modern Distribution Theory

## Mathematics

471 Basic Probability
472 Statistics
571-572 Probability Theory
573 Multivariate Analysis
574 Mathematical Statistics
670 Topics in Statistics
Operations Research
561 Queuing Theory and Its Application
562 Inventory Theory
563 Applied Time Series Analysis
575 Experimental Design II
577 Quality Control
580 Design and Analysis of Simulated
Systems
630-631 Mathematical Programming I and II
650 Applied Stochastic Processes
651 Applied Probability
662 Advanced Stochastic Processes
663 Time-Series Analysis
665 Advanced Queuing Theory
670 Applied Statistics

671 Intermediate Applied Statistics
674 Design of Experiments
676 Statistical Analysis of Life Data
678 Asymptotic Methods in Statistics
680 Simulation
769 Selected Topics in Applied Probability

## Statistics and Biometry

408 Theory of Probability
409 Theory of Statistics
417 Matrix Algebra
451 Mathematical Modeling of Populations
601-604 Statistical Methods I, II, III, and IV
605 Applied Regression Analysis
606 Sampling Biological Populations
607 Nonparametric and Distribution-Free
Statistical Methods
642 Advanced Mathematical Population Studies and Modeling
651 Mathematical Population Studies and Modeling
662 Mathematical Ecology
681 Topics in Environmental Statistics
697 Special Problems in Statistics and Biometry
717 Linear Models
718 Variance Components
795 Statistical Consulting

## VISUAL STUDIES

Studio G, 726 University Ave. (255-6770) or Sb20A Center for Theatre Arts (254-2782)
Visual Studies as a distinct area of intellectual activity comprehends the analysis of visual forms, especially symbolic visual forms, from a range of historical, scientific, sociological, and aesthetic points of view. Images can be analyzed within a variety of contexts and by means of a variety of methods, and their study is therefore ideally conceived of in transdisciplinary terms. And since the creation of images has an important bearing on their analysis, visual studies concerns itself with practice as well as theory.
In addition to the courses listed below, which represent only a sampling of formal curricular offerings pertinent to visual studies, interested students should be aware of the programs and facilities available in the Herbert F. Johnson Museum of Art and the ETV Center of the College of Human Ecology, as well as the frequent showings by Cornell Cinema and Pentangle II. For additional information, contact Robert Ascher (Anthropology) or Marilyn Rivchin (Theatre Arts)

## Courses

Some of these courses may not be taught in 1993-94. For information about availability consult the appropriate departmental listings.
An Introduction to Architecture (Architecture 132)

Art and Visual Thinking (Textiles and Apparel 125)

Asian American Images on Film (Asian American Studies 435)
Blacks in Communication Media (Africana Studies 303)
Cinema to Literature (Italian 399)
Color, Form, Space (Art 110)
Computer Art (Art 171)
Computer Graphics (Architecture 374 and Computer Science 417)
Computer Vision (Electrical Engineering 547)
Design I and II (Design and Environmental Analysis 101-102)

Documenting the Depression: Film, Literature, and Memory (History 476)
Fiction and Film in France (French 499)
Film and Performance (Theatre Arts 413 )
Filming Other Cultures (Anthropology 290 and Theatre Arts 290)
Fundamentals of $16-\mathrm{mm}$ Filmmaking (Theatre Arts 377)
The Geometry of Tilings, Polyhedra and Structural Engineering (Mathematics 151)
German Film (German Studies 396 and Theatre Arts 396)
Graphic Design (Design and Environmental Analysis 349)
History and Theory of Commercial Narrative Film (Theatre Arts 375)
History of Art Criticism (History of Art 421)
Human Perception (Psychology 342)
The History of the Book (English 450)
Image Analysis I (Civil and Environmental Engineering 613-614)
Impact of Communication Technologies (Communication 626)
The Indian Example and the Visual Tradition in Culture (Architecture 448)
Introduction to Film Analysis: Meaning and Value (Theatre Arts 274)
Introduction to Mass Media (Communication 120)

Introductory Photo I (Art 161 and Architecture 251)

The Japanese Film (Asian Studies 313 and Theatre Ars 313)
Literature to Cinema (Italian 390)
Machine Vision (Computer Science 664)
The Medieval Illuminated Book (History of Art 337)

Modern Experimental Optics (Physics 330)
Myth onto Film (Anthropology 653 and Theatre Arts 653)
Optical Methods of Biologists (Biological Sciences 450)
Perception (Psychology 205)
Photo Communication (Communication 234)
Political Theory and Cinema (German Studies 330 and Theatre Arts 330)
Psychology of Television (Human Development and Family Studies 461)
Psychology of Visual Communications (Psychology 347)
Russian Film of the 1920s and French Film of the 1960s (Theatre Arts 378)
Scientific Illustration (Freehand Drawing 417)
Seminar in Museum Issues (History of Art 407) Spanish Film (Spanish 399)
Studies in Modern Art (Art History 463)
Video Communication (Communication 348)
Visual Anthropology (Anthropology 453)
Visual Communication (Communication 230)
Visual Ideology (German 660 and Theatre Arts 660)

Visual Perception (Psychology 305)
The Visual System (Neurobiology and Behavior 326)

## Business and Preprofessional Study

## UNDERGRADUATE BUSINESS STUDY

Undergraduate preparation for business is found in many schools and colleges at Cornell. Students most frequently take courses in more than one area, as well as in related fields, to construct a program to suit their interests and career objectives. Each of
the following areas provides a different focus for application and use of business study and training, and students should consider carefully the implications of each program when making a choice. (Graduate study is available in the Johnson Graduate School of Management as well as in graduate fields following each of the undergraduate options.)
The areas most often pursued include applied economics and business management (College of Agriculture and Life Sciences), economics (College of Ars and Sciences), engineering, hotel administration, consumer economics and housing (College of Human Ecology), and industrial and labor relations.
Applied economics and business management. This program is designed to prepare students for a career in business or in public service. Emphasis is placed on the application of economic theory and management principles. Graduates of this program typically choose careers in investment banking or finance or with firms offering opportunities in sales and marketing. Areas of specialization include business management and marketing, farm business management and finance, and food industry management.
Economics. This program provides a broad view of that social science concerned with the description and analysis of the production, distribution, and consumption of goods and services, the understanding of monetary systems, and the comprehension of economic theories and models. It is viewed more often as preprofessional than as training for immediate practice in business or economics.
Engineering. This area provides much of the management personnel of modern industry. Engineers frequently climb the ladders of technological management that lead to more general management responsibilities; more than half of the management-level personnel of major corporations such as General Electric, Xerox, IBM, and Du Pont have engineering degrees. In addition to becoming managers by being effective technical supervisors, many students enter engineering explicitly anticipating graduate business education, judging that an engineering background is particularly appropriate for management in a technologyoriented society.
Hotel administration. The undergraduate program in hotel administration prepares individuals to be mid- to upper-level managers and entrepreneurs for the hospitality industry (lodging, food service, and travel) and allied fields. Instruction is provided in the areas of administration and general management, human-resources management, accounting and financial management, food and beverage management, law, properties management, communication, science and technology, economics, and marketing.
Consumer economics and housing. Study in the department develops an understanding of the market economy from both buyers' and sellers' perspectives. The focus is on the economic behavior and welfare of consumers in the private, public, and mixed sectors of the economy. An understanding of economics, sociology, and government policy provides the basis for an analysis of consumers' rights and responsibilities.
Industrial and labor relations focuses on the interactions among human beings, organizations, and institutions. It encompasses not only the relationships between
employer and employee but the political, economic, social, and psychological factors that affect those relationships. It includes the study of the hiring, training, and motivating of individual workers; negotiation and conflict resolution; and the economic and technological changes that affect the jobs that people perform. Finally, it embraces the many regulations and regulatory agencies created by our society to protect and help both employer and employed.

## Related Areas

Courses in areas directly related to these business programs are found in many of the university departments. For example, quantitative methods may be studied in the departments of Mathematics and Computer Science, and courses in public administration are found in the departments of Government, and City and Regional Planning. There are additional programs that allow students with an interest in business to focus on a particular geographic area. Examples are the Latin American Srudies Program, the South Asia Program, and the Africana Studies and Research Center. Such interdisciplinary programs as the Program on Science,
Technology, and Society and the various programs in international agriculture provide additional opportunities for study of interest to business students.

## Combined Degree Programs

Because Cornell has the Samuel Curtis Johnson Graduate School of Management, special opportunities exist for highly qualified undergraduates to combine their undergraduate programs with graduate study in that school. Students in the double-registrant program generally receive a bachelor's degree after four years of study and a Master of Business Administration (M.B.A.) degree after the fifth year of study, rather than the usual sixth year. Students in all Cornell undergraduate colleges and schools are eligible to explore this option. There is also a program with the College of Engineering that allows qualified students to earn a B.S., M.B.A., and Master of Engineering degree in six years. Admission to these combined degree programs is limited to particularly promising applicants. Careful planning is required for successful integration of the work in the two schools.

## SELECTED BUSINESS AND <br> MANAGEMENT COURSES

## Accounting

Ag Ec 221 Financial Accounting
Ag Ec 323 Managerial Accounting
H Adm 120 Survey of Financial Management H Adm 226 Financial Management
JGSM NBA 500 Intermediate Accounting
JGSM NBA 501 Advanced Accounting
JGSM NBA 505 Auditing
OR\&IE 350 Cost Accounting Analysis and Control

## Communications

Comm 201 Oral Communication
Comm 204 Effective Listening
Comm 272 Principles of Public Relations and Advertising
Comm 301 Business and Professional Speaking
Comm 372 Advanced Advertising

H Adm 165 Managerial Communication: Writing Principles and Procedures
H Adm 364 Advanced Business Writing

## Computing

Ag Ec 412 Introduction to Mathematical Programming
Ag Ec 413 Information Systems and Decision Analysis
ABEN 204 Introduction to Computer Uses
COMS 100 Introduction to Computer Programming
COMS 101 The Computer Age
COMS 102 Introduction to Microcomputer Applications
Educ 247 Instructional Applications of the Microcomputer
H Adm 174 Microcomputing
H Adm 374 End-User Business Computing Tools
H Adm 375 Hotel Computing Applications

## Economics

Ag Ec 415 Price Analysis
Ag Ec 431 Food and Agricultural Policies
Ag Ec 450 Resource Economics
CEE 321 Microeconomic Analysis
CEH 355 Wealth and Income
Econ 101 Introductory Microeconomics
Econ 102 Introductory Macroeconomics
Econ 314 Intermediate Microeconomic Theory
Econ 317 Intermediate Mathematical Economics I
Econ 318 Intermediate Mathematical Economics II
Econ 351 Industrial Organization
ILRIC 240 Economics of Wages and Employment
ILRIC 340 Economic Security

## Entrepreneurship

Ag Ec 325 Personal Enterprise and Small Business Management
Ag Ec 425 Small Business Counseling
Ag Ec 427 Advanced Personal Enterprise Systems
Ag Ec 429 Small Business Advisory Group JGSM NBA 300 Entrepreneurship and Enterprise

## Finance

Ag Ec 324 Financial Management
Ag Ec 404 Advanced Agricultural Finance Seminar
Ag Ec 405 Farm Finance
Ag Ec 407 Financial Management in Farming
CEH 315 Personal Financial Management
Econ 331 Money and Credit
Econ 333 Theory and Practice of Asset Markets
Econ 336 Public Finance: Resource Allocation
H Adm 125 Finance
H Adm 322 Investment Management
H Adm 326 Corporate Finance
OR\&IE 451 Economic Analysis of Engineering Systems

## International Business

Ag Ec 100 Introduction to Global Economic Issues
Ag Ec 430 International Trade Policy
Ag Ec 449 Global Marketing Strategy
Econ 102 Introductory Macroeconomics
Econ 313 Intermediate Macroeconomics
Theory
Econ 325 Economic History of Latin America
Econ 366 The Economy of the Soviet Union

Econ 369 Selected Topics in Socialist Economies: China
Econ 661 International Trade Theory and Policy
Econ 362 International Monetary Theory and Policy

## Law, Regulation, and Ethics

Ag Ec 250 Natural Resource and Environmental Economics
Ag Ec 320 Business Law I
Ag Ec 321 Business Law II
Ag Ec 422 Estate Planning
Comm 428 Communication Law
Econ 302 The Impact and Control of Technological Change
Econ 304 Economics and the Law
Econ 308 Economic Analysis of Government (also Civil and Environmental Engineering 322)

Econ 354 Economics of Regulation
Econ 552 Public Regulation of Business
Educ 477 Law and Educational Policy
Govt 389 International Law
H Adm 422 Taxation and Management Decisions
I\&LR 201 Labor Relations Law and Legislation
ILRIC 330 Comparative Industrial Relations Systems: Western Europe
ILRIC 331 Comparative Industrial Relations Systems: Non-Western Countries

## Management

Ag Ec 220 Introduction to Business Management
Ag Ec 302 Farm Business Management
Ag Ec 402 Advanced Farm Business Management
Ag Ec 424 Business Policy
Ag Ec 426 Cooperative Management and Strategies
Ag Ec 443 Food Industry Management
Econ 326 History of American Business Enterprise
H Adm 103 Principles of Management

## Manufacturing

Econ 302 The Impact and Control of Technological Change
OR\&IE 410 Industrial Systems Analysis
OR\&IE 421 Production Planning and Control

## Marketing

Ag Ec 240 Marketing
Ag Ec 342 Marketing Management
Ag Ec 346 Dairy Markets and Policy
Ag Ec 347 Marketing Fruits, Vegetables, and Ornamental Products
Ag Ec 448 Food Merchandising
CEH 233 Marketing and the Consumer
H Adm 243 Principles of Marketing
Personnel and Human Resource Management
Econ 381 Economics of Participation and Workers' Management
Econ 382 The Practice and Implementation of Self-Management
H Adm 211 The Management of Human Resources
H Adm 212 Human Relations Skills
H Adm 414 Organizational Behavior and Small-Group Processes
ILROB 120 Introduction to Macro Organizational Behavior and Analysis
ILROB 121 Introduction to Micro Organizational Behavior and Analysis
ILRPR 260 Personnel Management
ILRPR 360 Human Resource Economics and Public Policy

ILROB 370 The Study of Work Motivation
ILROB 373 Organizational Behavior Simulations
ILROB 374 Technology and the Worker ILROB 420 Group Processes
ILROB 425 Sociology of Industrial Conflict
II.RPR 461 Human Resource Managment
(I\&LR 200 Collective Bargaining)

## Quantitative Decisions and Decision Science

Ag Ec 310 Introductory Statistics
Ag Ec 340 Futures and Options Trading
Ag Ec 408 Seminar in Farm Business
Decision Making
Ag Ec 410 Business Statistics
Ag Ec 411 Introduction to Econometrics Ag Ec 413 Information Systems and Decision Analysis
Ag Ec 419 Expert Systems Workshop
Ag Ec 428 Technology: Management and Economic Issues
CEE 304 Uncertainty Analysis in Engineering
CEE 323 Engineering Economics and
Management
Econ 320 Introduction to Econometrics
Econ 520 Econometrics II
CEH 330 Economics of Consumer Policy
ENG 270 Basic Engineering Probability and
Statistics

## Real Estate

Ag Ec 406 Farm and Rural Real Estate Appraisal
CRP 664 Economics and Financing of Neighborhood Conservation and Preservation
H Adm 323 Hospitality Real Estate Finance
H Adm 350 Real Estate Management

## Transportation

CEE 361 Introduction to Transportation Engineering
CEE 660 Transportation Planning and Policy

## PRELAW STUDY

Law schools do not prescribe any panticular prelaw program, nor do they require any specific undergraduate courses as do medical schools. Law touches nearly every phase of human activity, and there is practically no sulject that cannot be considered of value to the lawyer. Therefore, no undergraduate course of study is totally inappropriate. Students contemplating legal careers should be guided by certain principles, however, when selecting college courses.

1. Interest encourages scholarship, and students will derive the greatest benefit from those studies that stimulate their interest.
2. Of first importance to the lawyer is the ability to express thoughts clearly and cogently in both speech and writing. Freshman writing seminars, required of nearly all Cornell freshmen, are designed to develop these skills. English literature and composition, and communication courses, also serve this purpose. Logic and mathematics develop exactness of thought. Also of value are economics, history, government. and sociology, because of their close relation to law and their influence on its development and ethics, and philosophy, because of the influence of philosophic reasoning on legal reasoning and jurisprudence. Psychology leads to an understanding of human nature and mental behavior. Some
knowledge of the principles of accounting and of the sciences such as chemistry, physics, biology, and engineering is recommended and will prove of practical value to the lawyer in general practice in the modern world.
3. Cultural subjects, though they may have no direct bearing on law or a legal career, will expand students' interests; help cultivate a wider appreciation of literature, art, and music; and make better-educated and well-rounded persons.
4. Certain subjects are especially useful in specialized legal careers. For some, a broad scientific background-for example, in agriculture, chemistry, physics, or engineering-when coupled with training in law, may furnish qualifications necessary for specialized work with the government, for counseling certain types of businesses, or for a career as a patent lawyer. A business background may be helpful for those planning to specialize in corporate or tax practice. Students who anticipate practice involving labor law and legislation might consider undergraduate study in the School of Industrial and Labor Relations. Whatever course of study is chosen, the important goals are to acquire perspective, social awareness, and a critical cast of mind; to develop the ability to think logically and analytically; and to express thoughts clearly and forcefully. These are the crucial tools for a sound legal education and a successful career.
The presence of the Cornell Law School on campus provides the opportunity for a limited number of highly qualified undergraduates registered in the College of Arts and Sciences at the university to be admitted to the Law School. At the time of entry they must have completed 105 of the 120 credits required for the Bachelor of Arts degree, including 92 credits of course work in the College of Arts and Sciences.
It may be possible for exceptionally wellqualified students in other Comell undergraduate colleges to arrange to enter the Law School after three years. The College of Human Ecology offers a program in which students spend their fourth year at the Law School. In addition, members of the Cornell Law School faculty sometimes offer undergraduate courses such as Nature, Functions, and Limits of Law, which are open to all undergraduates.

## PREMEDICAL STUDY

Medical and dental schools, while not requiring or recommending any particular major course of study, do require that a particular selection of undergraduate courses be completed. These courses usually include general chemistry and organic chemistry, biology, physics, and a year of English composition (or a freshman writing seminar). In addition, many medical schools require or recommend mathematics and at least one advanced biological science course, such as genetics, embryology, histology, or physiology.
There is no major program that is the best for those considering medical or dental school, and students are therefore encouraged to pursue their own intellectual interests. Students are more likely to succeed at, and
benefit from, subjects that interest and stimulate them, and there is no evidence that medical colleges give special consideration to any particular undergraduate training beyond completion of the required courses. In the past, successful Cornell applicants to medical and dental schools have come from the Colleges of Arts and Sciences, Agriculture and Life Sciences, Human Ecology, and Engineering. The appropriate choice depends to a great extent on the student's other interests.
Qualified students in the Colleges of Agriculture and Life Sciences, Arts and Sciences, and Human Ecology may apply for acceptance into a double registration program arranged between Comell University and Cornell University Medical College in New York City. This program allows registered students to save one year in pursuit of the bachelor's and M.D. degrees. Further information about this program is available from the Health Careers Program office at the Career Center, Cornell University, 103 Barnes Hall, Ithaca, New York, 14853-1601.

## PREVETERINARY STUDY

There is no specific preveterinary program at Cornell, and students interested in veterinary medicine as a career should select a major area for study that fits their interests while at the same time meeting the entrance requirements for veterinary college as listed below. Most preveterinary students at Comell are enrolled in the College of Agriculture and Life Sciences, which offers several applied science majors, including animal science, that can lead to related careers if the student does not go to veterinary college. Some enter other divisions of the university, especially the College of Arts and Sciences, because of secondary interests or the desire for a broad liberal arts curriculum.
The college-level prerequisite courses for admission to the College of Veterinary Medicine at Cornell are English composition, biology or zoology, physics, inorganic chemistry, organic chemistry, biochemistry, and microbiology. All science courses must include a laboratory. These requirements, necessary for admission to the College of Veterinary Medicine at Comell, may vary at other veterinary colleges.
For information on additional preparation, including work experience and necessary examinations, students should consult the brochure, Admission to the College of Veterinary Medicine at Comell, obtained by writing to the Office of Student Services, College of Veterinary Medicine, Cornell University, C-106 Schurman Hall, Ithaca, New York 14853-6401. Information on the Guaranteed Admissions Program is available from the same address.
Qualified students in the College of Agriculture and Life Sciences may apply for acceptance in a double-registration program arranged between Comell University and the College of Veterinary Medicine at Cornell. This program allows registered students to save one year in pursuit of the bachelor's and D.V.M. degrees. Further information about this program is available from the Health Careers Program office at the Career Center, Cornell University, 103 Barnes Hall, Ithaca, New York 14853-1601.

## COLLEGE OF AGRICULTURE AND LIFE SCIENCES

## ADMINISTRATION

David L. Call, dean
Brian F. Chabot, associate dean
William G. Boldt, assistant dean for public affairs
George J. Conneman, associate dean and director of academic programs
Elizabeth A. Oltenacu, associate director of academic programs
W. Ronnie Coffman, associate dean and director of research
Anthony M. Shelton, associate director of research
Lucinda A. Noble, associate dean and director of cooperative extension
R. David Smith, associate director of cooperative extension

Norman T. Uphoff, director of international agriculture
Larry W. Zuidema, associate director of international agriculture

## Office of Academic Programs Staff

Student services: Donald Burgett, Lisa Ryan, Catherine Thompson
Registrar: Mary Milks
Admissions: Bonnie Comella, Laurie Gillespie, Randy Stewart
Career development: William Alberta, Amy Benedict-Martin

## Department Chairs

Agricultural and biological engineering: R. B. Furry, Riley-Robb Hall

Agricultural, resource, and managerial economics: A. Novakovic, Warren Hall
Animal science: H. F. Hintz, Morrison Hall Communication: R. D. Colle, Kennedy Hall Education: H. D. Stuphin, Kennedy Hall Entomology: G. Eickwort, Comstock Hall Floriculture and ornamental horticulture: G. L. Good, Plant Science Building

Food science: R. A. Ledford, Stocking Hall
Fruit and vegetable science: E. E. Ewing, Plant Science Building
Natural resources: D. J. Decker, Fernow Hall
Plant breeding and biometry: E. D. Earle, Emerson Hall
Plant pathology: W. E. Fry, Plant Science Building
Rural sociology: D. L. Brown, Warren Hall
Soil, crop and atmospheric sciences:
R. J. Wagenet, Emerson Hall

## College Focus

The College of Agriculture and Life Sciences provides educational programs that prepare young men and women with technical, management, and leadership skills. The college's programs fall into three major areas:

- Science and technology
- Management
- Communication and education

The college focuses on a broad-based education for its students, and on a problemsolving and basic research program. The program is geared to the discovery and dissemination of knowledge for the purpose of advancing the food system, agriculture, nutrition, biological sciences, environmental quality, and community and rural development throughout New York State, the nation, and the world.
There are six primary areas of focus, developed in response to the needs of society, and representing agriculture and life sciences
in their broadest and most dynamic meaning:

- Agriculture (production and marketing)
- Community and Rural Development
- The Environment
- Food Systems, Nutrition, and Health
- International Dimensions
- Life Sciences


## Facilities

The College of Agriculture and Life Sciences is located on the upper campus, up the hill from the central area of Cornell University, on land that was once part of the Ezra Comell family farm.
Buildings around the area commonly known as the Ag Quad house classrooms, offices, and laboratories. Flanking them are the greenhouses, gardens, and research facilities. Nearby orchards, barns, field plots, forests, and streams extend as far as the Animal Science Teaching Research Center at Harford and the Agricultural Experiment Station at Geneva.

Roberts Hall serves as headquarters for the administrative units, including offices of the deans and directors of academic programs, research, and cooperative extension. Included in the Office of Academic Programs are the director and associate director, the Admissions Office, the Career Development Office, the Office of Student Services and the Registrar.
Mann Library, with its extensive collections of materials in the agricultural and biological sciences, is at the east end of the Ag Quad. The student lounge and service center, known as the Alfalfa Room, and many of the college classrooms are in Warren Hall. Public computer facilities are available in Warren Hall, in Riley-Robb Hall, and in Mann Library.

## DEGREE PROGRAMS

The College of Agriculture and Life Sciences offers programs leading to the degrees of Bachelor of Science, Master of Science, and Doctor of Philosophy. Professional degrees include the Master of Professional Studies and the Master of Arts in Teaching. Some registered professional licensing and certification programs are also available.
Each curriculum in the college creditable toward a degree is registered with the New York State Education Board and is linked with the national Higher Education General Information Survey (HEGIS) codes for federal and state reporting.

## Graduate Degrees

Graduate study is organized by fields that generally coincide with the academic departments but may draw faculty from several disciplines in the various colleges of the university. The following gracluate fields have primary affiliation in Agriculture and Life Sciences. Current graduate field representatives are also listed.
Agriculture [M.P.S. (Agr.)], G. Conneman, Roberts Hall
Agricultural and Biological Engineering. M. Walter, Riley-Robb Hall

Agricultural Economics, R. Boisvert, Warren Hall
Animal Breeding, E. J. Pollak, Morrison Hall Animal Science, R. Quaas, Morrison Hall
-Biochemistry, Molecular and Cell Biology;
J. Calvo, Biotechnology Building

Biometry, S. Searle, Warren Hall
Communication, C. Glynn, Kennedy Hall
Development Sociology, T. Lyson, Warren Hall
${ }^{\bullet}$ Ecology and Evolutionary Biology, R. Root, Corson Hall
Education [also M.A.T.], A. Berkey, Kennedy Hall
Entomology, J. Liebherr, Comstock Hall
Environmental Toxicology, A. Yen, Veterinary Research Tower
Floriculture and Omamental Horticulture, N. Bassuk, Plant Science Building

Food Science and Technology, J. Hotchkiss, Stocking Hall
*Genetics and Development, M. Goldberg, Biotechnology Building
International Agriculture and Rural Development [M.P.S. (Agr.)], R. Blake, Morrison Hall
International Development, N. Uphoff, Caldwell Hall
Landscape Architecture [M.L.A.], L. Mirin, W. Sibley Hall
*Microbiology, S. Zinder, Wing Hall

Natural Resources, R. Oglesby, Fernow Hall
*Neurobiology and Behavior, A. Bass, Seeley Mudd Hall

Nutritional Sciences, K. Rasmussen, Martha Van Rensselaer Hall
*Physiology, J. Wootton, Vet Research Tower
*Plant Biology, J. Doyle, Mann Library Building
Plant Breeding, D. Viands, Bradfield Hall
Plant Pathology, J. Lorbeer, Plant Science Building
Plant Protection [M.P.S. (Agr.)], G. Bergstrom, Plant Science Building
Pomology, M. Pritts, Plant Science Building
Soil, Crop and Atmospheric Sciences, S. Riha, Emerson Hall

Statistics, M. Wells. Caldwell Hall
Vegetable Crops, P. Ludford, Plant Science Building
*Zoology, D. Noden, Veterinary Research Tower

## -Division of Biological Sciences

## Bachelor of Science Degree

Deparments in the College of Agriculture and Life Sciences sponsor study for the B.S. degree in sixteen major fields. To qualify for the degree, students must fulfill requirements established by the faculty of the college and administered through the Office of Academic Programs. The following units offer major fields of study for undergraduates. A faculty advising coordinator is listed for each unit Students should consult with the faculty coordinator regarding requirements and opportunities for concentrations within the major field

Agricultural and Biological Engineering:
K. Gebremedhin, 320 Riley-Robb) Hall

Animal Sciences: E. J. Pollak, B-22 Morrison Hall
Applied Economics and Business Management: D. Streeter, 354 Warren Hall
Biological Sciences, Division of: H. Stinson, 200 Stimson Hall
Biometry and Statistics: S. Schwager, 339 Warren Hall

Communication: B. Earle, 332 Kennedy Hall
Education: D. Hedlund, 403 Kennedy Hall
Entomology: R. Roush, 6130 Comstock Hall Food Science: J. Sherbon, 207 Stocking Hall
Landscape Architecture: P. Trowbridge, 442 Kennedy Hall
Natural Resources: T. Fahey, 8F Fernow Hall Nutrition, Food, and Agriculture: C. Bisogni, 334 MVR Hall
Plant Science Units (Plant Biology, Breeding, Pathology/Protection, Floriculture, Pomology. Vegetable Crops): D. Viands, 523 Bradfield Hall
Rural Sociology: D. Brown, 133 Warren Hall
Soil, Crop and Atmospheric Sciences: G. Fick, 505 Bradfield Hall
Special Programs in Agriculture and Life Sciences: D. Burgett, 140 Roberts Hall

## Summary of Basic College Requirements for Graduation

1. Credit Hours
a. Minimum: 120
b. Minimum with letter grade: 100 (number with S-U grades pro-rated for transfer students)
c. Maximum independent study, teaching experience, internships: 15 (pro-rated for transfer students)
d. Minimum from College of Agriculture and Life Sciences: 55
e. Maximum from endowed colleges without additional charge: 55. Payment must be made for each credit taken in excess of the 55 allowed, whether or not the courses are passed. For the precise fee per credit, students should call the Office of the Bursar.
f. Maximum transferred in: 60 ; minimum at Comell: 60
Transfer credit will not be accepted for the Project Advance Programs. If a student is enrolled in a college/university course, during his/her high school years, transfer credit will be given only if certain criteria are met, i.e., taught by a university/college instructor, in the college/university environment, along with other college/university students and graded as the college/university students are graded. If one of these is not met no transfer credit will be given. Written verification may be necessary
Note: Credits received for physical education and for certain other courses, such as Mathematics 109, Education 005 and LSC courses, do not count toward the 120 hours but are included on the transcript and in the grade-point average.
2. Residence
a. Normally, eight full-time semesters
b. Seven semesters, if all other degree requirements are met, with a grade-point average of 2.0
c. Minimum of 12 credits per semester
d. Minimum of two semesters, including the final semester prior to graduation, in the College of Agriculture and Life Sciences (residency in the Internal Transfer Division [ITD] does not count toward residency in the college)
e. Students who have completed 8 semesters in residence at Cornell, including two in the college, and who have 8 or fewer credits remaining for graduation may petition for approval to complete this work elsewhere.
3. Physical Education (see note at 1 f )
a. Completion of university requirement for two terms of work
b. Transfer students may be exempt from part or all of the requirement.
Note: Requests for exemption should be made in writing to the University Faculty Committee on Physical Education. Requests for postponement should be referred to Alan Gantert, Teagle Hall (255-4286). Medical postponement requests must go through Gannett Clinic.
4. Grade-Point Average (GPA)
a. Cumulative GPA: 1.7 or above must be maintained
b. Final semester GPA: 1.7 on a minimum of 12 credits in final term before graduation.
Note: Only grades earned at Comell and while registered in the college are included.

## 5. Distribution

The purpose of the distribution requirement is to provide a broad educational background and acquaint students with a broad range of subject matter. Through study of the physical sciences, students develop quantitative and analytic skills based on an understanding of the physical laws governing the universe; through study of the biological sciences, they gain an appreciation of the variability of living organisms. The social sciences and humanities give students perspective on the structure and values of the society in which we live, and prepare them to make decisions on ethical issues that will impact their work and role in society. Through development of written and oral expression skills, students master the essentials of effective communication.
Credits received for independent study, field, teaching, or work experience, and internships cannot be used to fulfill the distribution requirement. Courses judged to be remedial in the discipline such as Education 005, will not be counted.
Group A: Physical Sciences. 9 credits of 100or 200 - level courses, in at least two disciplines, including at least one course in chemistry or physics.

## Chemistry

Physics
-Mathematics (excluding Education 005 and Mathematics 109)
Education 115
Soil, Crop and Atmospheric Sciences 131
Biometry
Astronomy
Geology
*The college mathematics requirement is described below
Group B: Biological Sciences. 9 credits, including 6 of introductory biological science.

Biological Sciences (except 152, 160, 200
[unless permission of associate director of the division of Biological Sciences is obtained], 202, 205, 206, 208, 209, 301 or 367)

Animal Sciences $100,221,300,301$
Entomology 212
Nutritional Sciences 262
Plant Breeding 225
Plant Pathology 301, 309
Group C: Social Sciences and Humanities. 12 credits ( 6 in each of the following two categories):

Social Sciences. 100 -through 400 -level courses in the following departments (excluding Freshman Seminars):

## Anthropology

Archaeology
CEH 110/CEH 111 (cannot receive credit for these courses and Econ 101/Econ 102)

Communication 418, 422
Economics (except Agricultural Economics)

Education 271, 311, 317, 370, 378
Government (including Africana Studies 190)

HDFS 150 (cannot receive credit for this course and Soc 243)
LA/CRP 261, 360, 363
LA/ARKEO 365
Psychology
Sociology (including Rural Sociology except RS $100,175,318,442$ )
Humanities. 100 - through 400 -level courses in the following departments (excluding
Freshman Seminars and language courses):
Africana Studies (literature and history)
Asian American Studies
Asian and Near Eastern Studies (history and literature)
Classics
Comparative Literature
English (literature only)
French, German, Italian, Russian, and Spanish (literature only)
History
History of Art/History of Architecture LA 382
Music and Theatre Arts (theory, literature, and history only)
Philosophy (also Natural Resources 407) Religious Studies
Rural Sociology 100, 175, 318, 442
S \& TS 233
Group D: Written and Oral Expression. 9 credits, of which at least 6 must be in written expression, selected from the following:

## Freshman Seminars

Communication 201, 350, 352, 360, 363, 365
English 280-281, 288-289, 382-385, 388-389

## 6. Mathematics

The faculty requires minimum competency in mathematics as a requisite to satisfactory completion of a degree. As a measure of their competency in mathematics, all entering undergraduates, including those presenting advanced placement or transfer credit in college calculus, must take the test. The test is administered free of charge just prior to registration each semester. No student may repeat the placement test. It consists of fiffy sample questions from arithmetic, algebra, geometry, trigonometry, and basic calculus.
The score on the math test has two components and will place each student in one of three groups, defined by the score of each component of the math test.
Mathematics requirements for each group
Group I Students in this group are exempt from the math requirement. If further math is needed for the major area of study, they should consider taking calculus (MATH 111 or MATH 191).
Group II Students in this group MUST complete one math course at Cornell usable in Group A. The recommended math course is EDUC 115 or MATH 105. BTRY (formerly STATS) 102 is also acceptable.
Group III Students in this group are automatically registered in EDUC 005 and must also complete one math course at Cornell usable in Group A.

## Transfer credit for mathematics

Most college-level math courses in a transfer student's record will be transferred (limit 6 hours into Group A of the college distribution), and the student will be held for the results of the math test and must satisfy the college's math requirement.

Students entering with A-P calculus credit will also be held for the results of the math test, and must satisfy the college's math requirement.
7. Faculty Adviser
a. Each student is assigned to a faculty adviser soon after being admitted to the college. The faculty adviser will help the student plan a program of study and enroll in courses appropriate to the degree programs offered by the college.
b. Course enrollment each semester should be planned in consultation with the faculty adviser. The signature of the faculty adviser indicates approval of, or at least consent to, the choice of courses made and is required before the course enrollment can be processed.
c. All academic plans, such as acceleration and graduate study, should be made in consultation with the student's faculty adviser. Support of the adviser is essential if a student petitions for an exception to any of the requirements of the college.
8. Progress toward the Degree
a. The progress of each student toward meeting the degree requirements is recorded each term in the college registrar's office on a summary of record form.
b. Students who have been in residence for eight semesters and who have met the graduation requirements will be graduated. Students are entitled to attend for the full eight semesters even if they have completed the graduation requirements in fewer semesters, but must notify the College Registrar of their intent prior to the graduation date. A student who wishes to continue study after graduation must apply for admission as a special student.
c. Graduation with distinction: Students who rank in the top 10 percent of the college's graduates on the basis of the GPA for the last 60 credits completed at Cornell will be graduated with distinction.
d. Application to graduate. Students who are planning to graduate must complete an "Application to Graduate" by the 15th day of the first month of the semester in which they will complete their graduation requirements. This form must be signed by the student, the adviser, and the registrar, confirming that all requirements for graduation have been met.

## STUDENTS

Undergraduate enrollment is approximately 3,000, with about 56 percent in the upper division. Each year about 850 students are graduated, while 650 freshmen and 250 transfer students are enrolled. Members of the faculty of the college serve as chairs of the

Special Committees of about 1,000 graduate students.

## Admission

The College Admissions Committee selects applicants who are academically well prepared and appear most likely to profit from the college's various curricula.
Most students come from New York State, but around 30 percent come from other parts of the United States or abroad. About half of the undergraduates are women. Approximately 14 percent are identified as members of minority ethnic groups.

## Transfer Students

Approximately 18 to 20 percent of the ALS undergraduate students are transfers who have taken part of their collegiate work at community colleges, agricultural and technical colleges, or other four-year institutions. Many of them hold an associate degree.
A Cornell student in good standing may apply for intra-university transfer to pursue a course of study unavailable in his or her current college. Guidelines are available in the Admissions Office of the College of Agriculture and Life Sciences, 177 Roberts Hall. The procedure includes filing a transfer request and submitting a letter explaining reasons for making the transfer.
Consideration is given to students who have demonstrated an interest in their intended field of study, by taking appropriate prerequisite courses and courses within this area of study. Academic achievement is also considered. Students are seldom allowed to transfer during their freshman year.
In some cases a student may be referred to the Internal Transfer Division to study for one semester before entering the college. A second semester is considered under unusual circumstances. During this trial semester the student must achieve a predetermined average (usually 2.7 ) and take approved courses to assure acceptance.

## Special Students

A limited number of non-degree candidates who want to take selected courses in the college are admitted each year. Applicants should submit the standard Cornell application, a resume of their work experience and a list of the courses they want to take. For more information, students should contact the Admissions Office, 177 Roberts Hall.

## Part-time Students

All students in the College of Agriculture and Life Sciences are expected to be enrolled as full-time students in a registered program of study. Part-time students must register in the Division of Summer Session, Extramural Courses, and Related Programs. The Continuing Education Information Service, B20 Day Hall. provides information, counseling, and special programs for mature students throughout the university.

## Off-Campus Students

Programs in which students study off campus but enroll for Cornell credit include SEA semester, field study in human ecology or industrial and labor relations, Albany programs, Cornell-in-Washington, student teaching, IPM internship, and clinical
microbiology internship. Students intending to receive Comell credit for work done off campus should inform the college registrar at the time of enrolling for courses to ensure that proper registration will occur.

## Off-Campus Courses

Students in CALS are to be registered for at least twelve (12) hours of course work each semester. It is expected that students will not be enrolled in course work at another institution while they are enrolled at CALS
Two exceptions would be the joint enrollment agreements between Cornell and Ithaca College and Wells college. Other exceptions would be reviewed by the Committee on Academic Achievement and Petitions. Students must petition before enrolling for a course elsewhere. The committee would approve such petitions only when there are compelling circumstances such as severe scheduling problems or no equivalent course available at Cornell. Enrolling in a course at another college to avoid taking it at Comell is discouraged.

## Leave of Absence

A student considering taking a leave of absence from the university should contact the Office of Student Services. A petition must be filed when requesting a leave of a semester or more. Students returning from a leave of absence do not need to reapply for admission; they should contact Student Services.

## Withdrawal

A student who finds it necessary to leave the university permanently should file a petition for withdrawal. Such petitions are approved if the student is in good standing. Students who have withdrawn and who later decide to return must apply to the Admissions Office.

## Graduation

Diplomas are ordered from the Office of the University Registrar, and distributed to those who have completed the degree requirements and have been approved by the college faculty.

## ADVISING AND COUNSELING SERVICES

Faculty members in the College of Agriculture and Life Sciences recognize that students need information and advice to make intelligent decisions while they are in college. They believe that personal contact on a one-to-one basis is an important way to identify individual differences and needs of students. Faculty members believe that they can and should be an important source of information and advice on both academic and personal matters. Thus they consider advising to be an important and integral part of the undergraduate program.
The Office of Student Services has overall responsibility for coordinating the college advising and academic counseling program. Each student enrolled in the college is assigned to a faculty adviser in the major field of study for aid in developing a program of study and peer advisers are available to help with problems of a general nature relating to personal matters and campus life.

Student Services provides a variety of services for undergraduates in the College of Agriculture and Life Sciences. The staff is available to help students with academic, social, and personal concerns. In addition, learning skills information and tutoring is offered, at no charge, by the college's honor society, Ho-Nun-De-Kah. Assistance is also available for students considering submitting petitions for waiver of college regulations.
The office is located on the first floor of Roberts Hall (room 140). Appointments are not necessary and questions regarding services and procedures should be directed to Donald Burgett and the Student Services staff.
Minority students in the College of Agriculture and Life Sciences receive counseling, tutoring, advising, and referral to agencies that will meet their special needs. The Educational Opportunity Program (EOP) is a statesupported program intended to assist New York State students who meet specific economic and academic criteria set by the State Programs Office and the NYS Board of Regents. Eligible students are accepted during the admissions process.
For further information, please contact Catherine Thompson in 140 Roberts Hall.
The Office of Career Development offers a variety of services to all students and alumni of the college. Career development includes self-awareness and assessment, career exploration, decision making, and job search. Services are designed to assist students and alumni with those activities and to help them develop the career planning and job search skills they will find useful as their career paths progress and change.
An active on-campus recruitment program is integrated with the other services provided by the office. Extensive job vacancy files are updated daily and a bulletin of select job listings is published each month. The Career Library contains an extensive collection of current and useful material. The Sigi Plus system is a computer-assisted guidance system that can help in career and educational planning, providing useful information and ideas about work-related interests, skills and values, and occupations and careers. Internships, summer jobs, job search presentations, and assistance with resume writing are other activities of interest.
The office, in conjunction with a network of college faculty members, assists students throughout their undergraduate years. For further information students should contact William Alberta and the staff in 177 Roberts Hall.
Financial aid is administered through the university office in Day Hall. Endowment funds and annual donations provide supplemental aid for students in the college who are eligible for aid. Information about these college grants is available from the Office of Academic Programs in Roberts Hall, after students have a financial aid package established through the university office in Day Hall. Grants recommended by the college Financial Aid and Scholarship Committee are processed through the university's Office of Financial Aid
A small loan fund is administered by the college through the Office of Academic Programs to assist students facing short-term emergencies. The loans are interest-free and
are usually made for no more than ninety days. For information and an application form students should contact the Office of Academic Programs, Roberts Hall.

## Academic Integrity Policy

The College of Agriculture and Life Sciences faculty, students. and administration support and abide by the university Code of Academic Integrity. Its principle is that absolute integrity is expected of every student in all academic undertakings: students must in no way misrepresent their work, fraudulently or unfairly advance their academic status, or bee a party to another student's failure to maintain academic integrity.
The maintenance of an atmosphere of academic honor and the fulfillment of the provisions of the code are the responsibility of the students and the faculty. Therefore, all students and faculty members shall refrain from any action that would violate the basic principles of this code

1) Students assume responsibility for the content and integrity of the work they submit, such as papers, examinations, or reports.
2) Students are guilty of violating the code if they

- knowingly represent the work of others as their own
- use or obtain unauthorized assistance in any academic work
- give fraudulent assistance to another student
- fabricate data in support of laboratory or field work
- forge a signature to certify completion or approval
- knowingly deprive other students of library resources, laboratory equipment, computer programs, and similar aids
- in any other manner violate the principle of absolute integrity

3) Faculty members assume responsibility to make clear to students and teaching assistants specific regulations that apply to scholarly work in a discipline.
4) Faculty members fulfill their responsibility to

- maintain in all class, laboratory, and examination activities an atmosphere conducive to academic integrity and honor
- make clear the conditions under which examinations are to be given
- make clear the consequences of violating any aspects of the code
- provide opportunities for students to discuss the content of courses with each other and help each other to master that content and distinguish those activities from course assignments that are meant to test what students can do on their own without help from others
- state explicitly the procedures for use of materials taken from published sources and the methods appropriate to a discipline by which students must cite the source of such materials
- approve in advance, in consultation with other faculty members, which work submitted by a student and used by a faculty member to determine a grade in a course may be submitted by that student in a different course
- monitor the work and maintain such records as will support the crucial underpinning of all guidelines; the students' submitted work must be their own and no one else's

Cornell's Code of Academic Integrity spells out how individuals who have allegedly violated Cornell standards for academic integrity are to be confronted and, if found to be in violation of those standards, sanctioned. The code provides for informal resolution of most perceived violations through a primary hearing between the faculty member and the student involved. If necessary, a hearing before a hearing board follows.
The Academic Integrity Hearing Board for the College of Agriculture and Life Sciences consists of three elected faculty members, three elected student members, a chair appointed by the dean, and the coordinator of student services, who serves as a nonvoting record keeper. Professor D. Grossman is the current chair.
Individuals who observe or are aware of an alleged violation of the code should report the incident to the faculty member in charge of a course or to the chair of the hearing board. General information and details on procedures for suspected violations or hearings are available from the Office of Student Services, 140 Roberts Hall.

## ACADEMIC POLICIES AND PROCEDURES

## Records

The college registrar maintains for each student a complete record of academic achievement. A permanent record card is on file for each matriculated student and is updated whenever new information becomes available. Staff members are available in Roberts Hall to consult with students regarding the assignment of credit toward meeting distribution and elective requirements and to verify the official summary of record.
The Committee on Academic Achievement and Petitions is a standing committee of six college faculty members and two students. On behalf of the faculty and subject to its review, the committee

- reviews, at the end of each semester and at other times as shall seem appropriate to the committee, the progress of all students not meeting academic requirements
- receives and acts upon petitions from individual students asking for exceptions from particular academic regulations or requirements of the college, or for reconsideration of action previously taken by the committee
- acts upon readmission requests from persons whose previous enrollment was terminated by the committee
- notifies the petitioner in writing of the action taken by the committee

Good academic standing means a student is eligible for, or has been allowed to register and enroll in, academic course work for the current semester. Whether an individual student is in good academic standing is determined by the college registrar and the Committee on Academic Achievement and Petitions.

A petition to be exempt from a college academic requirement or regulation may be filed by any student who has grounds for exemption. Forms are available in the Office of Student Services, 140 Roberts Hall

A petition is usually prepared with the assistance of a student's faculty adviser, whose signature is required; it indicates the adviser's awareness of the petition. The adviser's recommendation is helpful to the committee. The committee determines whether there is evidence of mitigating and unforeseen circumstances beyond the control of the student that would warrant an exemption or other action.

## Registration Procedures

All students must register with the university and "check-in" with this college at the beginning of each semester. Registration materials are available at a time and place announced each term by the Office of the College Registrar.

## Course Enrollment Procedures

To enroll in courses, students pick up materials from the college Registrar's Office, 140 Roberts Hall; plan a schedule in consultation with their adviser; and return the completed forms to the Registrar's Office for verification and processing. Class lists are generated on the basis of the properly filed course enrollment forms.
To enroll in courses that involve independent study, teaching, or research, a student must file an independent study form, available in the college Registrar's Office, 140 Roberts Hall. Students who will be studying off campus or abroad should file the intent to study off campus form to ensure that proper registration will occur. These forms are available in the Program office (Comell Abroad, 474 Uris Hall).

Students may enroll again for a course in which they received a grade of $F$ in a previous semester. The grade received the second time will be recorded and both grades calculated as part of their GPA.
Students must not enroll again for a course in which they received an incomplete. Instead, work for that course should be completed, and the instructor files an incomplete make-up form to assign the grade. An incomplete not made up by the end of two successive semesters of registration reverts to a failure. In the case of a graduating senior, incompletes revert to failures at the time of graduation.
Students enrolled in a two-semester course will receive an R at the end of the first semester and should enroll again for the same course the second semester. The letter grade will be recorded for the second semester when all work for the course is completed. A note on the transcript will explain the two grades for the same course.

A student is held responsible for and receives a grade for those courses in which he or she
enrolls unless the student officially changes such enrollment. All changes in courses or credit, grading options, or sections must be made by the student at the Registrar's Office, 140 Roberts Hall, on an official form provided for that purpose.
Add/Drop/Changes are made by filing properly signed forms in the Registrar's Office, 140 Roberts Hall. Approval and signature of the faculty adviser and course instructor are required to add or to drop a course.
Students may add courses and change grading options or credit hours where applicable during the first three weeks of the term and may drop courses until the end of the seventh week.
Students wishing to withdraw from a course after the end of the seventh week must petition to the college Committee on Academic Achievement and Petitions. A form is available in Student Services, 140 Roberts Hall. Requests for course changes are approved only when the members of the committee are convinced that unusual circumstances are clearly beyond the control of the student. The committee assumes that students should have been able to make decisions about course content, total work load, and scheduling prior to the end of the seventh week of the semester.

If the petition to drop a course is approved after the end of the seventh week of classes, the course remains on the student's record and a W (for "withdrawal") is recorded on the transcript.

## Grade Reports

Grade reports for the fall term are included in spring term registration materials; grade reports for the spring term are mailed by the office of the university registrar to students at their home addresses unless alternative addresses are reported to the college or university registrar by mid-May

## Academic Deficlency Policies

At the end of each semester, the Committee on Academic Achievement and Petitions reviews the records of those students who in any respect are failing to meet the academic requirements of the college or who persistently fail to attend classes. In case of students not making satisfactory progress, the committee takes appropriate action, including, but not limited to, issuing warnings to students, placing them on probation, suspending them, decreeing that they may not reregister, granting them leaves of absence, and advising them to withdraw.
Specifically, the committee considers as possible cause for action failure to attend and participate in courses on a regular basis or, at the end of any semester, failure to attain one or more of the following:

- semester GPA of at least 1.7
- cumulative GPA of at least 1.7
- satisfactory completion of 12 or more credits per semester
- reasonable progress toward completion of distribution requirements
- appropriate completion of college and university requirements

In general terms, regular participation in course work with academic loads at a level
sufficient to assure graduation within eight semesters and grades averaging $C-$ (1.7) or higher are prima facie evidence of satisfactory progress.

## HONORS PROGRAM

The Bachelor of Science degree with honors will be conferred upon those students who, in addition to having completed the requirements for the degree of Bachelor of Science, have satisfactorily completed the honors program in their area of major interest and have been recommended for the degree by the honors committee of that area.
An undergraduate wishing to enroll in the honors program must have completed at least 55 credits, at least 30 of the 55 at Cornell. Also, the student must have attained a cumulative grade-point average of at least 3.0 at the time of entry.
Interested students must make written application no later than the end of the third week of the first semester of their senior year, but are encouraged to make arrangements with a faculty member during the second semester of their junior year. An application form is available from the college registrar, 140 Roberts Hall, or from the area committee chair. (Biological sciences students should get applications at 200 Stimson Hall.)
Written approval of the faculty member who will direct the research and of the honors committee in the area is required. After the college registrar verifies the student's gradepoint average, the student will be officially enrolled in the honors program.
Academic credit may also be earned by enrolling in an appropriate independent study course. When applying for admission to the program, the student may, if appropriate, submit a budget and a modest request for funds to cover some of the costs the student incurs in doing the research.
The honors committee for each area recommends to the college registrar those students who qualify for honors. Only those who maintain a GPA of at least 30 will be graduated with honors.
Students in the College of Agriculture and Life Sciences wishing to participate in the honors program must be accepted in one of the program areas approved by the faculty. Students are not eligible for honors by participating in a program offered by another college or administrative unit.

## Animal Sciences

Faculty committee: W. B. Currie, chair; D. E. Bauman, P. A. Johnson
The objective of the animal sciences honors program is to provide outstanding undergraduates with the opportunity to pursue supervised independent research and to develop an awareness of the scientific process. It is expected that the research will require significant effort and creative input by the student in its design and execution and in the reporting of the results.
Those students with majors in animal sciences who are interested in doing an honors project should consult with their faculty advisers early in their junior year. All students are expected to meet the college requirements in qualifying
for the program and to complete the following:

- Identify a potential honors project sponsor (i.e., a faculty member working in the animal sciences) and secure that faculty member's commitment to sponsor the student in the honors project. That should be accomplished early in the second semester of the junior year.
- Preregister during the spring semester for AS 496, Animal Sciences Honors Seminar, which is offered in the fall semester.
- Register for AS 499, Undergraduate Research.
- Participate in AS 402, Seminar in Animal Sciences, during the spring semester and report on and discuss the project and results.
- Submit a written thesis to the honors committee and to a selected external reviewer by the scheduled deadline. Specific information regarding deadlines, format, and organization for the thesis will be provided.
- Meet with the honors committee for a short oral defense of the thesis following a review of the thesis by the student's sponsor, the external reviewer, and the honors committee.
Details pertaining to the specific requirements of the program can be obtained from the office of the committee chair. 434 Morrison Hall.


## Biological Sciences

Students interested in the honors program in the biological sciences should consult with their faculty advisers and with potential faculty research sponsors early in their junior year. See "Independent Research and Honors Program" in the Biological Sciences section of this catalog for complete details. Applications and details pertaining to the program requirements may be obtained from the division's Office for Academic Affairs, 200 Stimson Hall. Information on faculty research activities is available in the Behrman Biology Center, 216 Stimson Hall.

## Entomology

Faculty committee: B. L. Peckarsky, chair An honors program in the area of entomology may be pursued by any qualified student in the College of Agriculture and Life Sciences (see the requirements at the beginning of this section). The student need not be specializing in entomology. Insects, because of their variety, small size, and easy availability, are convenient subjects for study in a wide array of problems dealing with living systems. Short life cycles, unique physiologies and developmental patterns, and species with easily managed colony requirements and a wide range of behavioral traits provide the raw material for honors study. Comell's diverse faculty interests and extensive collections and library in entomology are also major assets if a student selects entomology as the area for honors study.
The honors committee requires that an undergraduate who is interested in embarking upon an honors project proceed with the following steps:

- Discuss the matter with his or her academic adviser, preferably in the junior year, so that a research project can be carefully planned. The possibility of conducting some research during the junior year and/or summer should be discussed.
- Discuss the project with an appropriate faculty member in the Department of Entomology who can serve as a supervisor to oversee the honors research. (The faculty adviser will be of assistance in determining which faculty entomologist might be the best supervisor, the decision being based primarily on available faculty members' areas of expertise.)
- Prepare a brief, tentative plan for the project for discussion and approval of the honors project supervisor. The plan should include a statement of objects or hypotheses, proposed methods for testing hypotheses, needs for laboratory space or shared equipment, and a budget outlining financial support needed for travel and supplies.
- Present a completed application to the chair of the entomology honors committee no later than the end of the third week of the first semester of the senior year. Earlier submission is encouraged.
- Submit a brief progress report, approved by the project supervisor, to the entomology honors committee by midterm of the semester in which the student will complete his or her graduation requirements.
- Present a formal seminar reporting the significant findings of the research to the Department of Entomology (preferably as a Jugatae seminar) in the last semester of the senior year.
- Submit two copies of the final project report (honors thesis) to the chair of the entomology area honors committee no later than two weeks before the last day of classes in the semester in which the student anticipates graduation. The thesis will be reviewed by the faculty honors project supervisor and one other referee from the department honors committee. The committee will return the thesis to the student one week before the last day of classes. If reviewers indicate that changes must be made, the revised thesis should be submitted to the chair no later than the last day of classes.


## Natural Resources

Faculty committee: M. E. Richmond, chair; J. W. Kelley, R. J. McNeil

The honors program in natural resources provides an opportunity for undergraduates to participate in independent research in the areas of fisheries and aquatic science, forest science, wildlife science, ecotoxicology, and conservation. The subject matter and nature of the research experience may be quite varied in this program but require the guidance and supervision of a faculty member with substantial interest and expertise in the problem area chosen.
In addition to meeting requirements of the college, the student is expected to do the following:

- Register for the honors program in the junior year or earlier.
- Select a faculty adviser who will help identify and formulate a research problem.
- Carry out an independent research effort that is original and separate from the work of others who may be investigating similar subjects.
- Describe and summarize the work in the format of a conventional master's thesis or in the form of a scientific paper ready for journal submission. About half of the theses have been published.
- Work closely with at least two faculty or staff members who will agree to serve as readers for the thesis. Provide readers with a copy of the guidelines for evaluation of honors theses, available from the department's honors program committee.


## Nutritional Sciences

Faculty committee: M. N. Kazarinoff, R. S. Parker, B. A. Lewis

The honors program offers students a research experience structured to give them the opportunity to choose a research project, search the literature relevant to it, plan and execute the research, and write it up in the form of a thesis. As in other types of research available to undergraduates, each student is guided by a faculty mentor. The honors project is designed to be spread over both semesters of the junior and senior years.
Students who consider this option should be aware that it involves a number of deadlines and considerable time commitment. Before signing on for honors they need to consult with their academic advisers to make sure that honors will not interfere with other academic objectives, such as preparation for admission to medical school or making the dean's list. Although honors credits for spring semester junior year and both semesters senior year are designed LET, individual mentors may choose the R grade for work in progress until the project has been fully completed. An outline of activities for both years is given below.

## Junior Year

Fall Semester Course No: NS 398 (No credit, S-U): Students are oriented to the program at a group meeting and provided material that summarizes the range of research activities in DNS. The honors chair/committee will have solicited and received responses from faculty members who have openings and willingness to work with an honors student each year. These responses will be given to the students and they will be asked to indicate their tentative choice(s) to the honors chair, who will be available to help getting them placed. When these arrangements have been completed, students will begin a literature search that focuses on their research problems. After fall break, the group will meet alternate weeks to present and discuss literature reviews with each other and the honors chair.
Spring Semester ( $1-3$ credits, LET*) Each student registers under the number NS 498 for a convenient number of credits, to be determined in consultation with the chosen adviser. Work carried out will have two objectives:

1. to become familiar with literature and/or research methods appropriate to the problem for the honors research,
2. to develop a research proposal.

The semester outcome will be written reports/ discussions of the method(s) or literature searches and a short research proposal, evaluated by the research adviser. Three to four group sessions will be scheduled after spring break in which the students will present their reports informally. The final written and graded literature reviews and proposals will be submitted to the honors committee by the last day of exams.

## Senior Year

Fall Semester Students will register under the number NS 499 ( $2-4$ credits, LET, by arrangement with their mentors). They may begin their research earlier than fall, e.g., during the summer, or even earlier, but should be prepared to begin research early in the fall semester at the latest. The objective for the semester will be to conclude most of the hands-on research/data acquisition. The honors committee or its chair will hold four group meetings with the students during the latter part of fall semester for informal progress reports and discussion.
Spring Semester Students will again register under course number NS 499 for $2-4$ credits LET, by arrangement with their research mentors. Much of the allotted time will be spent on data analysis and on writing the honors thesis.

## Several important deadlines should be noted.

1. Last week in March: The names of thesis readers** are to be in the hands of the honors committee.
2. Third to fourth week of April: A final draft of the thesis is handed to the readers
3. First to second week of May: Scheduled seminars for oral presentations of each students research.
4. Last day of oral presentations: Final form of the thesis is handed to the honors chairman.
To help students meet these deadlines, 2-3 class sessions will be held before spring break for informal reporting of preliminary data. After spring break the group will meet once or twice (depending on number of students) to practice oral presentations of completed research.

* Grade is determined by each student's mentor.
*Two readers knowledgeable in the area of the student's research topic to be chosen by the honors committee and faculty advisers.


## Physical Sciences

Faculty committee: J. W. Sherbon, chair; G. W. Fick, C. E. McCulloch, J.-Y. Parlange

The honors program in physical sciences provides outstanding students with an opportunity to do independent research under the supervision of a faculty member in the Departments of Agricultural and Biological Engineering; Soil, Crop, and Atmospheric Sciences; Food Science; or in the Biometrics Unit.
Students must be enrolled in the program for a minimum of two semesters and must also enroll in the appropriate departmental independent study course for a total of at least 6 credits. They must submit a report of their research to the honors committee by the end
of classes of the semester in which they expect to graduate.
Details of the program can be obtained from the chair of the physical sciences honors committee.

## Plant Sciences

Faculty committee: R. L. Obendorf, chair; L. L. Creasy, A. M. Petrovic, W. A. Sinclair

Before acceptance into the program, students must submit to the chair of the plant sciences honors committee a completed application and a one-page tentative project proposal by the end of the second week of classes in the first semester of their senior year. The project proposal should include a clear statement of the objective(s) of the research, methodology, and needs for space, equipment, and supplies (attached budget required). The proposal must be accompanied by a letter from the faculty supervisor stating that he or she has seen and approved the project plan. Full committee approval is needed for acceptance into the program.
Completion of the honors program in plant sciences requires two copies of a report of independent research in the honors program to be submitted to the chair of the honors committee before the last day of classes of the semester in which the degree is sought. The report should be written in the format for research publication required by that discipline of plant science in which the student is enrolled. The report must be accompanied by a letter of recommendation from the supervisor of the research, that letter reflecting the supervisor's familiarity with the research and providing an evaluation of the performance and a recommendation for graduation with honors.
The honors committee will review the report, and, if a majority of the committee votes favorably, the chair will recommend graduation with honors for that student in a letter to the director of academic programs. One copy of the report will be returned to the student.

## Social Sciences

Faculty committee: B. V. Lewenstein, chair; E. J. Haller, M. J. Pfeffer, L. S. Willett

Acceptance into the behavioral and social sciences honors program of the College of Agriculture and Life Sciences is contingent on meeting all the criteria described above, on information in the student's written application, and on a detailed thesis proposal. The application and proposal are due no later than the third week of the first semester of the senior year. Each student is encouraged to begin working on this proposal with a prospective faculty thesis adviser during the first semester of the junior year. The purpose of the proposal is twofold. First, it formalizes a plan of study and establishes a set of expectations between the student and his or her faculty adviser. Second, the Honors Committee reviews the proposal to determine whether it is consistent with honors thesis requirements, and to make suggestions for improvement.
The proposal must be 5-10 typed, doublespaced pages in length and include the following sections:

- Research Topic: This section should contain a statement of the problem to be studied or the topic of interest. The
relevant literature should be briefly reviewed and the background of the problem or topic discussed; a more extensive bibliography should be included.
- Research Questions/Empirical Hypotheses: This section should contain specific questions to be answered or hypotheses to be empirically tested via collection of data and some mode of analysis accepted in the social sciences.
- Research Methods: This section should contain a discussion of models to be constructed, data collection procedures (including survey instruments or experiments, if appropriate), and methods of analysis.
- Expected Significance: What new knowledge or information is likely to be forthcoming and why is it important?
Faculty advisers must be members of the graduate faculty. Exceptions to this rule will he granted for persons with special expertise who are deemed capable of thesis supervision; exceptions will be granted pending petition to the social science honors committee. Students may register for independent study directed by the faculty adviser in conjunction with an honors project.
Honors degrees are awarded upon approval of the honors thesis by the social science honors committee. The research should deal with a substantive issue within one of the fields in the social sciences. Both the results of the research and the methodology (or the argument by which the results were achieved) must be reported. Reviews of the literature, practical conclusions or applications, or broad characterizations of an area of inquiry may constitute part of the research report but are not themselves sufficient to count as research.

Honors theses should be written according to the form of any standard journal within the appropriate fields. Four copies of the thesis must be submitted to the chair of the social science committee no later than three weeks before the last day of classes of the semester for which the degree is sought. A supporting letter from the faculty member supervising the work also must be submitted. Approval of the thesis requires a majority vote of the honors committee.

## INTERCOLLEGE PROGRAMS

The College of Agriculture and Life Sciences does not participate in any dual-degree programs. Study for the Bachelor of Science is the only undergraduate degree program offered.
The College of Veterinary Medicine may accept students who are then permitted to double-register in their seventh or eighth semester and complete requirements for the Bachelor of Science degree in the College of Agriculture and Life Sciences. Students should consult with the college registrar, 140 Roberts Hall, to ensure that degree requirements have been fulfilled.
Students who have been offered admission to the S. C. Johnson Graduate School of Management upon completion of the B.S degree in Agriculture and Life Sciences may take a program of management courses in their senior year if it is approved by their
college faculty adviser as part of their undergraduate program. In certain cases an "upset" tuition charge, equal to the endowed undergraduate tuition rate, will be applied for undergraduate statutory college students taking excess credit hours from endowed colleges and schools. Inquiries should be directed to the university bursar.
Students in the Field Program in Agricultural and Biological Engineering are usually enrolled in the College of Agriculture and Life Sciences during the freshman and sophomore years and jointly enrolled in this college and the College of Engineering in the junior and senior years. Students pay the engineering college tuition in the junior year. The curriculum is accredited by the Accreditation Board for Engineering and Technology. The B.S. degree is awarded in cooperation with the College of Engineering.

The Program in Landscape Architecture is cosponsored by the Department of Floriculture and Ornamental Horticulture in the College of Agriculture and Life Sciences and by the College of Architecture, Art, and Planning. The program offers a first professional degree curriculum in landscape architecture at both undergraduate and graduate levels, as well as a graduate second professional degree program.
The Division of Nutritional Sciences is an intercollege unit affiliated with the College of Human Ecology and the College of Agriculture and Life Sciences. The undergraduate nutrition major is based in the College of Human Ecology. Students in Agriculture and Life Sciences may study nutrition in areas such as animal sciences; food-industry management; food science; microbiology; nutrition, food, and agriculture; and fruit or vegetable science. Students may also plan a concentration in biological sciences or a concentration in general studies in agriculture to include a human nutrition component.
The Program on Science, Technology, and Soclety is an academic unit that engages in teaching and research involving the interactions of science and technology with social and political institutions. The program draws its students, faculty, and research staff from the various divisions of the university, including the College of Agriculture and Life Sciences. It offers an interdisciplinary undergraduate curriculum in Biology and Society. A concentration in general studies in the agriculture major may be planned in consultation with a faculty adviser to include a biology and society component. Further information, including a list of courses, may be obtained from the program office, 632 Clark Hall.
The American Indian Program (AIP) is a multidisciplinary intercollege program with instructional, research, and extension components. The instructional core consists of courses focusing on American Indian life with emphasis on the Iroquois and other Indians of the Northeast. A description of the program and general information is available from the director of the American Indian Program, Caldwell Hall.
The Comparative and Environmental Toxicology Program is an interdisciplinary intercollege program with research, teaching, and cooperative extension components coordinated by the Institute for Comparative and Environmental Toxicology (ICET).

Courses are cosponsored by academic departments in several colleges of the university. A description of the program and general information is available from the director of the program through the ICET office, 16 Fernow Hall.
The Cornell Laboratory of Environmental Applications of Remote Sensing (CLEARS) is an interdisciplinary intercollege center with teaching, research, and extension components affiliated with the College of Agriculture and Life Sciences and the School of Civil and Environmental Engineering. A description of the program and general information is available from the director through the CLEARS office in Hollister Hall.

## OFF-CAMPUS STUDY PROGRAMS

Study off campus is of two types: (1) credit may be earned at another institution and transferred to Comell, or (2) credit may be earned in Comell courses that require offcampus activity.
An Intent to Study Off Campus form should be filed with the college registrar before leaving campus. Tuition may be reduced. In some cases stipends or cost of living allowances are provided. Students should consult with the Office of Financial Aid if receiving financial aid and clear all accounts with the bursar prior to departure.
Students who plan to enroll in courses at another institution in the United States must petition for a leave of absence. Courses should be selected in consultation with the faculty adviser.

## Albany Programs

Study off campus in Albany, the New York State capital, provides a unique opportunity to combine career interests with academic and legislative concerns. Students receive an intensive orientation to state government and attend a lecture-seminar program composed of three two-credit components and offered by professors-in-residence. An internship experience, supervised by an internship committee, provides up to six academic credits. Independent study and research courses offered by the various departments in ALS and/or courses offered by academic institutions in the Albany areas may be elected.
Three opportunities are available. The Assembly Intern Program provides a placement with a member of staff of the New York State Assembly. The Senate Assistants Program has placements with New York State senators and selected staff. The Albany Semester Program provides experience with a state agency such as the Departments of Environmental Conservation, Education, or Labor.
Applicants are screened by the ALS Internship Committee in the term prior to assignments. Those accepted should plan a program of study in consultation with their faculty adviser. At least twelve credits must be carried to meet the residence requirement. Seniors should note that the last term average must be 1.7 or above.
All interns will audit the orientation sessions and meet participation requirements in at least two of the lecture-seminar sections. The
paper required in each section constitutes an independent study project to be directed and evaluated by a Comell faculty member in an appropriate discipline. Normally a faculty member will not sponsor more than one of the independent study courses for any one student. To receive academic credit for the internship, students enroll in ALS 400, for an S-U grade only.
Information and applications are available in the Career Development Office, 177 Roberts Hall.

## Cornell-in-Washington

The Cornell-in-Washington Program offers students from all colleges within the university an opportunity to earn full academic credit for a semester in Washington, D.C. Students take courses from Comell faculty, conduct individual research projects, and work as externs. The Cornell-in-Washington Program offers two study options: 1) studies in public policy; and, 2) studies in the American experience. The program also offers a unique externship opportunity: students serve as externs in a federal agency, congressional office, or nongovernmental organization and take part in a public policy or humanities seminar. They define and carry out individual research projects under the supervision of Cornell faculty. Potential externships are arranged through, and approved by, the Cornell-in-Washington program. Students in the College of Agriculture and Life Sciences must register for ALS 500. For further information, see p. 19 or inquire at 131 Sage Hall, 255-4090.

## SEA Semester

The Sea Education Association is a nonprofit educational institution offering ocean-focused academic programs and the opportunity to live, work, and study at sea. Science, the humanities, and practical seamanship are integrated in small, personal classes. The 17credit program is twelve weeks in length. Six weeks are spent in Woods Hole, the following six weeks are spent on either one of SEA's two sailing vessels: the R/V Westward, or the R/V Corwith Cramer. For more information, students should contact the Comell Marine Programs office, G14 Stimson Hall. ALS students should file the intent to study off campus form with the college registrar as early as possible to ensure proper registration and enrollment in courses.

## Shoals Marine Laboratory

The Shoals Marine Laboratory, run cooperatively by Cornell University and the University of New Hampshire, is a seasonal field station located on 95-acre Appledore Island off the coast of Portsmouth, New Hampshire, in the Gulf of Maine. SML offers undergraduate, beginning graduate students, and other interested adults a unique opportunity to study marine science in a setting noted for its biota, geology, and history. Please refer to "Courses in Marine Science," under the section on the Division of Biological Sciences, for a list of courses offered.

For more information, contact the Shoals Marine Laboratory office, G14 Stimson Hall, 607-255-3717.

## Internships

Several departments in the college offer supervised internships for academic credit. Arrangements should be made with the offering department for assignment of a faculty member who will be responsible for placement, for planning the program of work, and for evaluation of student performance.
For internships not governed by an established internship course, the student must enroll in a 497 course for the number of credits to be assigned. If the work is done during the summer, the student must enroll in the Cornell summer session for the agreedupon credits.

In cases where the work is not done at Cornell, the awarding of credits depends upon a prior contractual arrangement between a Cornell professor and the student. Specific terms for receiving credit and a grade should be recorded, using the Independent Study, Research, Teaching, or Internship form, available in the Registrar's Office, Roberts Hall.
A maximum of 15 (pro-rated for transfer students) of the 120 credits required for the degree may be taken in internships, independent study courses, and undergraduate teaching or research. No more than 6 of the 15 credits allowed for independent study may be awarded for internships consisting of offcampus work experiences that do not have the continued presence of a Cornell faculty member. The 6 -credit allotment includes transfer credit and credit for internships in other colleges at Comell. The 6 -credit limit does not apply to secondary, postsecondary, and cooperative extension teaching internships in the Department of Education.
The College of Agriculture and Life Sciences does not offer a field study option. In general, a rather narrow view is taken toward awarding academic credit for work experience, "life" experience, or apprenticeships. Credit will only be assigned or accepted in cases where a professor is directly involved in determining both the course content and in evaluating a student's work. The awarding of credit will not be allowed in cases where a student brings to the college or to a professor a description of a past experience and requests credit nor in cases where the student has received financial remuneration.
All students enrolling for an internship must file an independent study, research, teaching, or internship form with the Office of the College Registrar. If the study is to take place off campus, the Intent to Study Off Campus form should also be filed with the college registrar.

## Overseas Academic Programs

The Comell Abroad program is open to students in all colleges of the university. Students in the College of Agriculture and Life Sciences should consult with their faculty adviser and the college registrar to ensure that credit received for academic work abroad will meet requirements for graduation. The Office of Student Services, 140 Roberts Hall, has information and application forms.
Cooperative arrangements with the University of Reading, in England, and the University of Dublin, in Ireland, enable the college to endorse several students for a year of study under a tutor in those schools. The Swedish exchange program is operated in cooperation with the Agricultural College of Sweden at

Uppsala. The ALs student selected to participate in the Swedish exchange spends the junior year at Uppsala. All essential expenses in Sweden, including a living allowance, are provided by a student group there. Round-trip air transportation must be paid by the student. An exchange student from Uppsala spends a year at Cornell, supported by the college and the Cornell student in Sweden. A similar program is operated in cooperation with ITESM in Monterrey, Mexico.

## MAJOR FIELDS OF STUDY

The college curriculum emphasizes the biological and physical sciences and the technology basic to the study of agriculture and life sciences. The sixteen major program areas reflect the departmental academic effort in the college. Faculty curriculum committees in each area identify a sequence of courses appropriate to all students studying in that field. Courses of study are designed to provide systematic development of basic skills and concepts. Opportunity for concentration in an area of particular interest is usually available.
Programs are planned with considerable flexibility, allowing students to prepare for careers, graduate work, professional opportunities, and the responsibilities of educated citizens. Course requirements in each program area are different, but all students must meet minimum distribution requirements of the college.

## Agricultural and Biological Engineering

Agricultural and biological engineering is a field of engineering application wherein the engineering, biological, environmental, agricultural, and social sciences are applied to design and manage processes and systems to solve technical problems related to agriculture and biology, while at the same time conserving our natural resources and the quality of our environment. Increasingly important aspects of the field are engineering applications related to biotechnology, environmental quality engineering, and international engineering. As a field of engineering application, agricultural and biological engineering is rapidly evolving to encompass new uses of electronics, sensors, and computers, advances in the biological sciences, and engineering analysis applied to systems ranging from microcosms, such as carbon dioxide diffusing into leaf stomatal cavities, to entire ecosystems surrounding rivers and lakes, to growing food in space colonies.
Because agricultural and biological engineers work at the interface between the biological and physical sciences, they must be knowledgeable in each. They are educated in mathematics, physics, chemistry, and the engineering sciences; and in biology and the agricultural and social sciences. It is the mix of engineering and biology that makes Agricultural and Biological Engineering unique.
The undergraduate program area offered by the Department of Agricultural and Biological Engineering includes three distinct academic programs: Agricultural and Biological Engineering, Environmental Systems Technology, and Agricultural Systems Technology.

The department is located in Riley-Robb Hall and operates specialized facilities that are among the largest and most complete of their kind in the world.
The Agricultural and Biological Engineering program has three concentrations-Agricultural Engineering, Biological Engineering, and Environmental Systems Engineering-and is intended for students who are particularly interested in the theoretical and fundamental aspects of engineering required for analysis, design, and research. Students in this program must be highly motivated and have strong aptitudes for mathematics and the sciences. Biological, social, and agricultural sciences are integrated into this program, but mathematics and the physical sciences dominate. The program is accredited by the Accreditation Board for Engineering and Technology (ABET) and the Egineering Accreditation Commission (EAC) and is jointly sponsored by the New York State College of Agriculture and Life Sciences and the College of Engineering. Students register in both colleges during their junior and senior years, with the primary college being the College of Engineering during the junior year, then the College of Agriculture and Life Sciences during the senior year. Because the Agricultural and Biological Engineering program is a nationally accredited engineering program, it is more structured than the two technology programs.
The Agricultural and Biological Engineering program provides excellent preparation for a variety of positions in industry and public agencies, and qualified graduates often continue study in a Master of Engineering. Master of Science, or doctoral degree program; or in veterinary science or medicine. For specific course requirements and other information for the Agricultural and Biological Engineering program, see the section on the College of Engineering in this same publication.
The two technology programs emphasize applied and technical aspects of agricultural, biological, and environmental sciences. These programs incorporate courses in basic biological and physical sciences and mathematics as well as engineering and technology, agriculture, business, social sciences, and liberal studies. The student develops his or her own program of advanced and elective courses in consultation with a faculty adviser, and may have an informal minor in an area such as communication, business, education, or international agriculture.
Specific course distribution requirements for the academic programs in Environmental Systems Technology and Agricultural Systems Technology include:
A. Basic Subjects

Credits

1. Calculus
2. Chemistry
3. Physics
4. Introductory biological science
5. Computer applications 4
6. Statistics or probability 3
7. Economics 3
8. Oral communication 3
B. Advanced and Applied Subjects
9. Five courses in the agricultural, biological, or environmental sciences
10. Five engineering courses at the 300 level or above; at least 9 credits in agricultural and biological engineering

> C. Electives
> Additional courses to complete college requirements
D. Total (minimum) 120
For further details on the Agricultural and Biological Engineering and Technology programs, see the deparment's undergraduate programs publication, available at 320 RileyRobb Hall, or telephone the Coordinator of Instruction for the programs, at 255-2499

## Animal Sciences

The animal sciences program area offers a coordinated group of courses dealing with the principles of animal breeding, nutrition, physiology, management, and growth biology. Emphasis in subject matter is directed toward domestic animal species, dairy and beef cattle, horses, poultry, pigs, and sheep, while laboratory, companion, and exotic animal species are also included in research and teaching programs. The Animal Science department has extensive facilities for animal production and well-equipped laboratories and classrooms, including a teaching barn, in which students can gain practical experience in the care and management of large animals at a convenient location on campus.
The program focuses on the application of science to the efficient production of animals for food, fiber, and pleasure and easily accommodates a variety. of interests and goals. Beyond a core of basic courses (suggested minimum, 12 credits) students select production and advanced courses to fulfill an individually tailored program worked out in consultation with their advisers. In this way it is possible to concentrate by species as well as by subject matter (nutrition, physiology, growth biology, breeding, management). For each subject area, supporting courses in other departments are readily available and strongly encouraged. Many science-oriented students elect a program emphasizing supportive preparation in the physical and biological sciences appropriate to graduate, veterinary, or professional study following graduation. Dairy management is a popular program among students who may be preparing to manage a dairy farm or enter a related career. Other students may elect a program oriented toward economics and business in preparation for a career in the poultry, dairy, meat-animal. horse, feed, or meats industry. These are examples of the flexibility of programs that can be developed to meet a student's career interest related to animals.
It is recommended that students obtain appropriate fieldwork or animal experience during summers. Several special training opportunities exist for highly motivated students. Upperclass students whose academic records warrant it may, by arrangement with individual faculty members, engage in research (either for credit or for Honors) or assist with teaching (for credit). The Dairy Management Fellows program and the Livestock Fellows program offer an equally
challenging but different type of experience for a highly select group of students.

## Applied Economics and Business Management

The undergraduate program in applied economics and business management is based in the Department of Agricultural. Resource, and Managerial Economics. Courses in agricultural, resource, and managerial economics are supplemented with others in related areas such as computer science, economics, sociology, history, government, industrial and labor relations, hotel administration, consumer economics, animal sciences, plant sciences, natural resources, mathematics. and statistics.
Six areas of specialization are offered:
Agribusiness management is designed for students who have a special interest in the economics and management of businesses that provide services for the agricultural sector of the economy.

## Agricultural and applied economics

provides a general program in the economics of the agricultural sector and of resource use. It is an appropriate major for those students who (1) are interested in applied economics; (2) want to survey offerings in agricultural, resource, and managerial economics, such as management, marketing, economic development, policy, and environmental and resource economics; and (3) want to prepare for graduate work in agricultural economics. It is an appropriate option for those interested in the application of the principles of economics to problems in both the public and private sector.

## Business management and marketing

applies the principles of economics and the tools of management to prepare students for careers in business. Special emphasis is given to developing decision-making skills and to the study of the structure and practices of business institutions. Market analysis, sales, banking, merchandising, production management, and general business management are careers for which students may prepare.
Environmental and resource economics provides training for students interested in applying economic concepts to problems of the environment and resource use. A good option for those wishing to take positions as analysts with agencies that have environmental responsibility or facing environmental regulations.
Farm business management and finance is intended for students with farm experience who are interested in farming or in preparing for work in farm management or farm finance, in such positions as Agricultural Lenders,
Extensions Specialists, or Consultants.
Food-industry management is designed for students interested in management or sales positions with the processing, manufacturing, or distribution segments of the food industry. All of these areas of specialization can provide a strong foundation for graduate work. In planning a course schedule, students must work closely with their faculty adviser. Each area of specialization has its own unique set of required and recommended courses, yet all the areas have enough flexibility to satisfy the interests and abilities of each individual student.

## Biological Sciences

Biology is a popular subject at many universities for a variety of reasons: It is a science that is in an exciting phase of development; it prepares students for careers in challenging and appealing fields such as human and veterinary medicine, environmental sciences, and biotechnology; and it deals with the inherently interesting questions that arise when we try to understand ourselves and the living world around us. Many of the decisions we face today deal with the opportunities and problems that biology has put before us.
The major in biological sciences at Cornell is offered by the Division of Biological Sciences to students enrolled in either the College of Agriculture and Life Sciences or the College of Arts and Sciences. Student services in the division's Office for Academic Affairs and the Behrman Biology Center are available to students from either college.

The biology major is designed to enable students to acquire the foundations in physical and life sciences necessary to understand modern biology and to pursue advanced studies in a specific area of biology. Programs of study include animal physiology; biochemistry; cell biology; ecology and evolutionary biology; general biology; genetics and development; microbiology; neurobiology and behavior; and plant biology. A special program of study is available for qualified students with an interest in nutrition. Students interested in the marine sciences may consult the Cornell Marine Programs Office (G14 Stimson Hall, 255-3717) for academic advice and career counseling. For more details about the biology curriculum see the section in this catalog on the Division of Biological Sciences.

## Biometry and Statistics

Statistics is concerned with quantitative aspects of scientific investigation: design, measurement, summarization, and drawing conclusions based on probability statements Biometry is the application of mathematical and statistical techniques to the life sciences. Students with ability in mathematics and an interest in its applications will find this a challenging specialization.

The work of a statistician or biometrician can encompass research, teaching, consulting, and computing in almost any mix and in a wide variety of applications. Opportunities for employment are abundant in universities, government, and businesses ranging from large corporations to small consulting firms; salaries are usually excellent

While satisfying course requirements for a specialization in statistics and biometry, students can also take a wide variety of courses in other disciplines. In fact, students are encouraged to take courses in applied disciplines such as agriculture, biology, economics, and the social sciences that involve numerical data and their interpretation.
Students specializing in this area are required to take at least two computer science courses (e.g., Computer Science 100 and 211 ), mathematics courses (at least three semesters of calculus), and statistics courses (Biometry and Statistics 102, 200, 215, 408-409, 417, 601602 , and 607 , and Industrial and Labor Relations 310). Work experience gained through summer employment or undergradu-
ate teaching is highly recommended. Students should contact Steven J. Schwager for information

## Communication

Everyone relates to others through the process of communication. Whether these human linkages are personal or through the mass media, there is an increasing need for individuals who can help establish communication relationships and make them more efficient and effective. Individuals who are able to do this must have good communication skills themselves and must comprehend the social psychology of human communication. Students in the Department of Commu nication have the opportunity to learn both the social science underlying human communication and the most effective means of adapting written, interpersonal, audio, and visual communication to audiences. The curriculum emphasizes learning communication theory along with communication skills. With this preparation, students will be ready to meet the needs of communicating in the twenty-first century
Required courses for majors include courses in the theory of communication, understanding mass communication, public speaking, visual communication, research methods in communication, and an upper level professional writing course. Beyond these requirements students choose 18 credit hours of course work within the Department of Communication. Specific choices of courses are determined by a student's interests and guided by faculty advice.
The major prepares students for careers as communication, information, and public relations specialists in a wide variety of organizations, and for careers in information agencies in which they must work with a wide range of publics and media. Students can prepare for work in publication where they might be editors or writers in virtually any organization, perhaps preparing annual reports, editing an employee newspaper, writing sales or marketing literature, or writing news stories. Other careers open to communication majors are in human service professions, such as personnel administration, training, or sales and consulting; the major also prepares students for graduate study in communication and other social sciences.

The superior resources of Cornell's natural and social science courses may be combined with communication principles and skills to offer students the background needed for presenting scientific and technical information to the general public or communicating with scientific and technical constituencies.

In addition to the basic course requirements a concentration of at least 12 credits outside the department is required. The concentration helps orient students to a communication career in either a business, government, education, or public service organization or to a very specific profession such as agribusiness public relations or science communication Those interested in international communication or environmental communication may combine courses outside the department to provide a solid background for communciation careers in these areas.

Students are strongly encouraged to seek practical communication experience through part-time or summer employment, the
department's internship course, or the campus media. Work experience contributes to a portfolio of professional materials that is invaluable in obtaining a position in communication.

Students may apply for the department's program in Speech and Debate. Further information is available from the Department of Communication, Kennedy Hall.

## Education

The focus in the Deparment of Education is on how teaching and learning take place in school and nonschool settings, as well as on the role of education in our society. Students study concepts and develop competencies necessary to analyze educational situations critically and to plan, implement, and evaluate educational programs. Students in the program area take a core curriculum:

- A course in general psychology (e.g., Psychology 101)
- A course in educational psychology (e.g., Education 311, 317)
- A course in the social and philosophical foundations of education (e.g., Education $271,370,378,472$ )
- A field experience (e.g., Education 420, 430,498 )
Three specializations and two teacher certification programs are available at the undergraduate level.
Agricultural extension and adult educa-
tion. Agricultural extension and adult education is a program that combines preparation in both the agricultural and social sciences. The program prepares students for teaching careers in agriculture/biotechnology in public schools, Cooperative Extension and extension and adult programs of agricultural businesses, government agencies, and a variety of private and not-for-profit organizations. Students take a college program that includes a balance of courses in education as well as courses on a technical area of agriculture/biotechnology, community/ economic development, natural resources, human ecology, or communication. Education courses in issues in education, teaching and learning, methodology, and instructional applications of microcomputers prepare students to succeed as educators in a broad range of careers. Courses are selected to develop professional leadership and teaching competence. Students may elect to focus their study on one or more of these areas: agricultural education, extension education, or adult education. As an alternative, students may elect to major in one of the college's technical departments and co-advise to prepare in one or more of the three areas of agricultural, extension, and adult education. Further information is available from the agricultural extension and adult education coordinator, Kennedy Hall (Tel: 607-2552197).

Educational psychology. Studies in educational psychology have traditionally focused on teaching and learning in schools. Yet schools are only one location in which learning and teaching take place. An undergraduate emphasis in educational psychology at Cornell applies principles of teaching and learning to educational enterprises, broadly defined.

While graduate study is still required for many careers in psychology, an undergraduate emphasis in educational psychology provides excellent preparation for graduate work or for many post-baccalaureate positions. Educational psychologists develop and/or supervise training programs in business, industry, the military, and government; design and evaluate curriculum and instructional materials for publishers; develop tests for educational and professional associations; evaluate social programs; work in human resource management; and conduct applied research for educational research organizations.

Students interested in concentrating their studies in educational psychology complete a total of 21 hours in educational psychology and related courses. Working with a faculty adviser a student may design a program in one of a variety of applied areas: Instructional Systems Design and Development; Human Relations; Measurement and Fvaluation; Individual and Social Development; or the Educational Psychology of Human Development.
Students interested in careers in educational psychology should apply for admission to the Education Department. For more information regarding a concentration in educational psychology, contact: Coordinator, Educational Psychology Program, Education Department, Kennedy Hall.
General education. By selecting courses in the Department of Education, students can prepare for positions in areas such as counseling, youth group leadership, and the Peace Corps. Students can also prepare themselves for graduate programs in: environmental education; research methods; extension, adult and continuing education; and the social/economic/legal/philosophical foundations of education. Further information is available from the undergraduate coordinator, Kennedy Hall.

## Teacher Certification

Teacher education in agriculture. Students completing the Cornell registered program earn grade 9-12 certification to teach agricultural subjects (animal science, plant science, agricultural mechanization, and business management), introduction to occupations, occupational science, and occupational mathematics; and the introduction to technology course required for all 7-8th grade students.
A passing grade on the National Teacher Examinations (NTE) and one year of agricultural work experience are required. Provisional (initial) certification is valid for five years. The master's degree required for permanent certification is offered through graduate study at Comell.
Students may also be certified to teach selected science subjects (e.g., biology, earth science, and general science) and work as a diversified cooperative education work experience coordinator through direct application to the State Education Department. For more information contact the program coordinator, A. Berkey, at (607) 255-2197.

## Teacher Education in science and

 mathematics. Students at Comell may pursue teaching credentials in biology, chemistry, earth science, general science, mathematics, and physics. Teacher Education in Science and Mathematics (TESM) is auniversity program jointly conducted by the departments of Education and Mathematics. Although TESM offers options for undergraduate and graduate study, most students enroll in a five-year program, which combines an undergraduate major in mathematics or one of the sciences with a one-year Master of Arts in Teaching (MAT). Students from any college at Cornell are eligible to apply to the program as undergraduates. Undergraduate students in TESM do not normally major in education.
Students who complete their studies as undergraduates and their student teaching are normally eligible for provisional teaching certification from the State Education Department, effective for five years. Students completing the graduate program can earn the master's degree required for permanent certification.
For more information, contact the TESM
Student Support Specialist at (607) 255-9255 or the program coordinator, D. Trumbull (607) 255-3108.

## Entomology

The entomology curriculum provides students with a basic background in biological and environmental sciences, with a special emphasis in the study of insects. Majors may pursue graduate studies in entomology or related sciences upon completion of the B.S. degree. Alternatively, students may immediately begin careers in various aspects of integrated pest management. Because of this diversity of career options, the major includes a common core of requirements allowing flexibility in electives selected by the student in consultation with their adviser.

## Specific Requirements

## Basic Sciences

College mathematics, including a course in calculus
A year of physics
Chemistry 103-104 or 207-208
Chemistry 253 (organic)

## General Biology

Introductory Biology
Biological Sciences 281, Genetics, or Plant Breeding 225, Plant Genetics
A choice of one: Biological Sciences 261, Principles of Ecology or
Biological Sciences 330 or 331 , Principles of Biochemistry or
Biological Sciences 378, Evolutionary Biology
Entomology
Entomology 212, Insect Biology
Entomology 322, Insect Morphology
Entomology 331, Introductory Insect Systematics
Entomology 483, Insect Physiology
It is strongly recommended that students who wish to undertake graduate training in entomology include course work beyond the minimum in their program, including enrollment in more than one of the general biology courses; i.e., ecology, biochemistry, and evolutionary biology. Students interested in pest management may include courses such as Entomology 241, Applied Entomology, Entomology/Plant Pathology 444, Integrated Pest Management, or other appropriate specialized courses.

## Food Science

The Food Science Program is designed to provide students with the knowledge, perspective, and rechnical skills necessary to ensure an adequate food supply for individuals, countries, and the world. Students choose one of five specializations and select courses that are appropriate for the elected specialization. The five specializations are: basic food science, food engineering, food processing, food industry operations and management, and intemational food development. The first three are designed to meet minimum guidelines of the Institute of Food Technologists, the professional society of U.S. food scientists. The flexibility of the food science program allows students to prepare for a variety of positions in industry, government, or education. Some of the positions and areas of work require graduate training. Opportunities for graduate study exist at a number of universities, including Cornell.
During the first two years, students are required to take the two-semester introductory courses in biology, chemistry, and physics plus introductory courses in microbiology, calculus, food science, and nutrition. During the last two years, students take courses dealing with the application of science and technology to the processing, preservation, distribution, and utilization of foods. These include the following required courses: Food Analysis, Food Engineering I, Food Safety Assurance, Food Processing, Food Chemistry, Sensory Evaluations of Foods, Food Microbiology, Food Chemistry Laboratory, and introductory statistics. Students also take courses in the social sciences and humanities to meet college distribution requirements.
Students may choose additional courses in chemistry. microbiology, or nutrition in preparation for careers in research and development; in mathematics and engineering, for careers in processing and engineering; in marketing and business management; in international agriculture; or in a variety of production courses related to specific commodities. In addition, a wide variety of courses in food science and related disciplines may be taken as electives.
Students are strongly encouraged to enhance their competence through participation in research supervised by a faculty member and or through summer internship programs sponsored by food companies. Most faculty in the department have active research programs and welcome participation by undergraduate students. Students may receive academic credit or pay for their research work. Many food companies recruit on campus for their summer internship programs. These internships are excellent opportunities for students to gain experience and establish contacts for future employment. A state-of-the-art food processing and development laboratory, a full-scale dairy plant, and extensive laboratory facilities are available for training, research, and employment.

## Landscape Architecture Program

The Landscape Architecture Program focuses on the art of landscape design as an expression of cultural values combined with natural processes of the ambient environment. The program's unique place within the university promotes interaction among the areas of horticulture, architecture, and city and regional planning. The program is co-
sponsored by the colleges of Agriculture and Life Sciences and Architecture, Art, and Planning.
The program offers a course of study that prepares students intellectually, technically, artistically, and ethically for the practice of landscape architecture. The curriculum focuses upon graphic communication, basic and advanced design methods, landscape history, plant materials, construction technology, theory, and professional practice. Design studios focus upon the integration of site requirements as applied to specific sites at a variety of scales. Projects range from urban design and housing to parks and garden design.
The Landscape Architecture Program offers three professional degree alternatives: a twoyear graduate curriculum for those who have undergraduate degrees in landscape architecture or architecture, a three-year graduate curriculum for those who have a four-year undergraduate degree in another field and a four-year Bachelor of Science degree. Graduate studies in landscape architecture are administered through the Graduate School and lead to a Master of Landscape Architecture degree. Undergraduate studies in landscape architecture are administered through the College of Agriculture and Life Sciences. In addition, a concentration in the cultural landscape is available for non-majors.

## Dual Degree Options

Graduate students can earn a Master of Landscape Architecture and a Master of Science or a Master of City and Regional Planning simultaneously. Students need to be accepted into both fields of study to engage in a dual degree program and must fulfill requirements of both fields of study. Thesis requirements are generally integrated for dual degrees

## Study Abroad

The faculty encourages study abroad and has two formally structured programs. The Denmark International Study (DIS) program is available primarily to senior undergraduates in their fall semester and is administered through Comell Abroad. The Rome Program is made available to undergraduates and graduate students through the College of Architecture, Art, and Planning.

## First Year

Fall Term
Credits
LA 141, Freehand Drawing
$\dagger$ Biological sciences elective
$\dagger$ Physical sciences elective
tSocial sciences or humanities elective
$\dagger$ Written or oral expression elective
fWriten or oral expression elecive
15
Spring Term
*LA 142, Introduction to Landscape
Architecture
$\dagger$ Biological sciences elective
$\dagger$ Social sciences or humanities elective
$\dagger$ Written or oral expression elective
$\ddagger$ Free elective

## Second Year

## Fall Term

*LA 480, Principles of Spatial Design
3
*LA 201, Design, Theory, and Composition
6
†Free elective
3
*HORT 335, Woody Plant Materials for Landscape Use

Spring Term
*LA 202, Design, Composition and Theory 6
LANAR 524, History of European Landscape Architecture
+Writren or oral expression elective 3
$\dagger$ Physical sciences elective

## Third Year

Fall Term
*LA 301, Site Design and Detailing
6
*LA 310, site Engineering 4
${ }^{\bullet}$ LaNAR 525, History of American Landscape Architecture
${ }^{*}$ LA 491, Design and Plant Establishment $\qquad$ 16

## Spring Term

*LANAR 302, Site Design and Detailing
6
$\dagger$ Biological Sciences Elective
$\dagger$ Physical sciences elective
-LA 312, Site Construction

## Fourth Year

Fall Term
*LA 401, Urban Design and Planning
$\ddagger$ LANAR 520, Contemporary Issues in Landscape Architecture
tSocial sciences or humanities elective
$\ddagger$ Free elective
4
(Optional landscape architecture study 15
abroad semester in Denmark or Rome)
Spring Term
*LA 402, Advanced Project Studio
6
tSocial sciences or humanities elective 3
*LA 412, Professional Practice 1
*LA 483, Design Criticism 2

12
Summary of credit requirements
-Specialization requirements
$\dagger$ Distribution electives 39
$\ddagger$ Free electives

## Master of Landscape Architecture (M.L.A.)

 DegreeRequirements of the three-year M.L.A.
curriculum include 90 credits, satisfactory completion of the core curriculum courses, and a thesis.

## First Year

Fall Term
Credits
*LA 505, Graphic Communication I 3
*LA 480, Principles of Spatial Design and Aesthetics
*LA 501, Theory, Composition and Design 6
*HORT 335, Woody Plant Materials for
Landscape Use
*LA 520, Contemporary Issues
17
Spring Term
-LA 502, Design Composition and Theory 6
"LANAR 524, History of European Landscape
Architecture
3
*LA 506, Graphic Communications II 3
$\ddagger$ Free elective
3
$\qquad$

## Second Year

## Fall Term

${ }^{*}$ LA 601, Proejct Design and Application 6
*LA 610, Site Engineering 4
*LANAR 525, American History of Landscape Architecture
*LA 491, Design and Plant Establishment $\qquad$

Spring Term
*LA 602, Urban Design and Planning 6
*LA 590, Graduate Seminar 3
*LA 612, Site Construction 4
$\ddagger$ Free elective(s)
4

17

## Third Year

Fall Term
*LA 701, Natural Systems and Site Design
Studio 6
$\ddagger$ Free elective $\quad 6$
Spring Term
-LA 800, Master's Thesis in Landscape Architecture
"LA 412, Professional Practice 1
$\ddagger$ Free elective(s)

Summary of credit requirements
-Specialization requirements 74
$\ddagger$ Free electives

Second professional degree curriculum.
The two-year Master of Landscape Architecture (M.L.A.) curriculum serves to broaden and enrich undergraduate education in design by providing an expanded educational experience to those who are technically skilled. Applicants are therefore expected to hold a bachelor's degree in landscape architecture or architecture from an accredited program.

The objectives of the two-year M.L.A. curriculum are to permit students to conduct research relating to landscape architecture and to provide advanced education and training to individuals who may wish to teach, practice, or conduct applied research in landscape architecture. Students are permitted considerable flexibility in establishing programs that take full advantage of the teaching and research resources of the university.
Students admitted to the two-year M.L.A curriculum are required to complete 60 credits of course work as approved by the members of their graduate committee. This must include at least two advanced studios, a graduate seminar, and a thesis or final master's project.

## Undergraduate Concentration for NonMajors

Students outside the professional program may choose the undergraduate concentration in the American Cultural Landscape to complement their major. The courses center on the landscape as an object, something to be studied for its own sake, and as a subject, as a means to understand society and its relationship to natural systems and diverse cultures. The cultural landscape includes its visible elements as well as perceptions and cultural ideas and values. The concentration consists of five courses, two required and three elective.

## Required.

## Visual Studies (choose one):

Arch 11 Introduction to Architectural Design ( 4 cr )
Art 121 Introduction to Painting (3 cr)
Art 141 Introduction to Sculpture ( 3 cr )
Art 151 Introduction to Drawing ( 3 cr )
Art 158 Conceptual Drawing ( 3 cr )
Art 159 Life and Still-Life ( 3 cr )
Art 161 Photography I (3 cr)
DEA 101 Design I: Fundamentals ( 3 cr )
DEA 114 Drawing ( 3 cr )
LA 141 Freehand Drawing ( 3 cr )

## The Landscape

+LA 382 The American Landscape ( 3 cr )
Electives (choose three):
ANTH 211 Nature and Culture ( 3 cr )
+LA 262 Urban Archeology ( 3 cr )
+LA 360 Pre-Industrial Cities and Towns of North America ( 3 cr )
+LA 398 Archeology Fieldwork: New York State ( 5 cr , summer only)
LA *** American Indian Landscape, Architecture and Planning ( 3 cr )
LA 521 History of American Landscape Architecture ( 3 cr )
LA 569 Archeology in Site Design and Planning ( 3 cr )
+Distribution Elective

## Natural Resources

The undergraduate curriculum is designed to provide an enduring and broadly applicable education. The focus of study is on the systems that yield our renewable natural resources (water, forests, fish, and wildlife) and includes emphasis on both natural
sciences and human organizations involved with resource management. Students are provided with an opportunity to understand the scientific, ethical, and societal basis for the protection and management of renewable resources through the application of ecological principles and knowledge of social needs.

## Required Core Curriculum

Students who desire to graduate with a specialization in Natural Resources are expected to complete, as a minimum, the courses specified in the following two-part Core Curriculum. First is a broad group of courses taken primarily outside the department, which, as their presentation suggests (Groups A-D), also fulfill this college's course distribution requirements described on page 30.

## Group A - Physical Sciences Total Hours

Mathematics - 2 courses $\quad 6-8$
Chemistry - 2 courses 7-8

## Group B - Biological Sciences

Introductory biology - 8 cr . hours
General ecology - 1 course

## Group C - Social Sciences

3 credits in addition to
3 credits in economics

## Humanities

6 credits in addition to a course in "normative" ethics (e.g., NTRES 407, or PHIL 241, 246, or 247)

## Group D - Written and Oral Expression

Freshmen Writing Seminars - 2 courses
Oral communications - 1 course

## Courses outside the Distribution Groups

Statistics - 1 course
Computer applications or programming - 1 course
The Core Curriculum's second portion is composed entirely of courses offered by the Department of Natural Resources; a minimum of 19 hours in department courses is required.

## YEAR 1

Total Hours
One of 2 introductory courses:
NTRES 100 Principles of Conservation (Fall, 3 cr.)
NTRES 201 Environmental Conservation (Spr., 3 cr .)

## YEAR 2

both courses listed:
NTRES 210 Introductory Field Biology (Fall, 4 cr .)
NTRES 253 Integrated Resource and Environmental Management (Spr., 3 cr.) 3

## YEARS 3 AND 4

At least 3 of the following courses, with one from each group

## Ecology

 3-8NTRES 301 Forest Ecology (Fall, 3 cr.)
NTRES 304 Wildlife Ecology (Spr., 3 cr.)
NTRES 418 Wetland Ecology and
Management (Fall, 3 cr.)
NTRES 440 Fishery Science
(Fall, alt. yrs., 3 cr .)

NTRES 442 Techniques in Fishery Science (Fall, 5 cr .)

## Management

3-6
NTRES 303 Woodlot Management (Fall, 3 cr .)
NTRES 308 Natural Resources Management (Fall, 3 cr .)
NTRES 401 Envir. and Nat. Res. Policies (Fall or spring, 3 or 4 cr..)
NTRES 402 Nat. Res. Policy, Planning \& Politics (Spr., 3 cr.)
NTRES 410 Principles of Wildlife Management (Spr., 3 cr.)
NTRES 438 Fishery Management (Spr., alt. yrs., 3 cr.)
Students pursuing this specialization have remaining approximately 40 credit hours available to develop one or more concentrations of their choice within or outside this field.
Students who wish to do so may specialize further in wildlife science, forest science, fishery and aquatic science, or natural resource policy and management.
Opportunities for field-oriented studies are available at Comell's nearby Arnot Teaching and Research Forest, the Cornell Biological Field Station on Oneida Lake near Syracuse, as well as at numerous natural areas near campus.
Students should seek relevant work experi-
ence to complement their academic studies.

## Nutrition, Food, and Agriculture

Nutritional sciences draws upon chemistry, biology, and the social sciences to understand complex relationships among human health and well-being, food and lifestyle patterns, food and agricultural systems, and social and institutional environments.
The program in nutrition, food, and agriculture was established in 1990 to provide students with strong training in human nutrition in the context of an understanding and appreciation of the agricultural and life sciences. The program responds to the growing and important interrelationships between human nutrition and the agricultural and life sciences. Growing public interest in health and nutrition has placed new demands upon food producers, processors, and retailers. The problems of hunger and malnutrition in the United States and abroad require that nutritionists work together with specialists in areas such as agricultural economics, food production, and rural sociology. Advances in biotechnology provide researchers with new ways to understand human nutritional requirements and the regulation of human metabolism.
Nutrition, food, and agriculture majors complete a core set of requirements and choose elective courses in the areas of their particular interest. The core curriculum includes introductory chemistry and biology, organic chemistry, biochemistry, physiology, and mathematics. Students complete five courses in nutritional sciences: NS 115 Nutrition and Health Concepts and Controversies, NS 245 Social Science Perspectives on Food and Nutrition, NS 345 Nutritional and Physicochemical Aspects of Foods, NS 331 Physiological and Biochemical Bases of Nutrition, and NS 332 Methods in Nutritional

Sciences. In addition, students select a minimum of three advanced courses in nutritional sciences as well as elective courses in the broad areas of food production and processing, food and agricultural policy, and the life sciences.
All majors have faculty advisers in the Division of Nutritional Sciences with whom they meet regularly. Advisers help students plan course schedules and help find opportunities for special study or experiences outside the classroom.
Many students engage in laboratory or field research with a faculty member for academic credit or, in some cases, as employment. The honors program is designed for academically talented students who are interested in research. Honors students conduct independent research projects under the guidance of a faculty member and prepare an honors thesis. Many students participate in field experiences for credit during the academic year or summer. Placements in laboratories, inclustries, or community agencies are possible.
The major in nutrition, food, and agriculture can lead to many different career paths. By supplementing the core requirements with courses in different areas, students can prepare for jobs in industry, government, or community agencies in the United States or abroad. The major is excellent preparation for graduate study in a variety of fields.

The Division of Nutritional Sciences is affiliated with both the College of Agriculture and Life Sciences and the College of Human Ecology. Most of the Division faculty members work in Savage Hall and Martha Van Rensselaer Hall. In addition to housing offices, classrooms, and seminar rooms, these buildings contain research facilities, specialized laboratories, a human metabolic research unit, and computer facilities. The nutritional sciences Learning Resource Center in Martha Van Rensselaer Hall is used by students for study and small group discussion. The center contains class materials, audiovisual aids and supplementary books and periodicals for independent study and special projects.
For additional information about the nutrition, food, and agriculture program, contact the Division of Nutritional Sciences Academic Affairs Office, 335 MVR, 607-255-2628.

## Plant Sciences

Plant sciences students can specialize in plant biology, plant breeding, plant pathology, plant protection, or horticultural sciences, including floriculture and ornamental horticulture, and fruit and vegetable science. Students with well-defined interests upon arrival at Cornell can specialize in one of these programs beginning as freshmen when they enter college. Others may prefer to start in the general plant sciences curriculum and specialize after they have had a chance to explore the program offerings in the plant sciences.
Plant sciences is a multidepartmental program area, sponsored by the Department of Plant Breeding in Emerson Hall, and the departments of Floriculture and Ornamental Horticulture, Fruit and Vegetable Science, and Plant Pathology, all located in the Plant Science Building.

General plant science is intended for students whose interest in studying plants has not yet centered on any one of the specializations within the area. Students may continue with this option throughout their undergraduate years. particularly if they are likely to be interested in and qualified for advanced studies beyond the bachelor's degree Students who plan to seek employment upon graduation may prefer to specialize. There are, however, excellent opportunities for general plant science graduates at the bachelor's degree level in the service and supply industries, as extension agents, as teachers, and as research technicians.

More than one hundred courses are offered that deal directly with some area of plant science. Other courses relating to plant science are offered in agronomy and biological sciences. In addition, an interest in plant science may be combined with another specialization, such as agricultural and biological engineering, education, extension, statistics, international agriculture, food science, or agricultural economics.

Undergraduates are encouraged to obtain practical experience, which may involve research under the direction of a faculty member or work in a commercial industry, or research institute, a botanical garden or arboretum, or nursery, greenhouse, or farm operation. Departments will assist students in finding positions that will provide useful experience.

Floriculture and ornamental horticulture applies principles of plant science and business management to the production and marketing of florist, nursery, and turfgrass crops, as well as to the selection and management of plants for both indoor and outdoor landscapes. Programs prepare students for careers at the professional and managerial levels in horticultural business, botanical gardens and arboreta, research, teaching, communications, and extension and public education.

The core curriculum consists of the following courses:
HORT 101, Introduction to Horticultural Science
HORT 102, General Horticulture
HORT 230, Woody Plant Materials
HORT 300 or 301, Garden and Interior Plants I and II
HORT 400, Principles of Plant Propagation BIOPL 241, Plant Biology (Introductory Botany)
BIOPL 242, Plant Physiology (lecture) BIOPL 244, Plant Physiology (laboratory) SCAS 260, Introduction to Soil Science ENTOM 241, Applied Entomology PL PA 301, Introductory Plant Pathology
Although mastery of these subject areas is considered essential for students planning to enter a floriculture or landscape horticulture career, justifiable exceptions to the core curriculum may be granted by the student's adviser.
With permission of the adviser, a transfer student may receive core curriculum credit for similar courses taken at other institutions provided that transfer credit is granted by the College of Agriculture and Life Sciences. In addition, all transfer students must complete a minimum of 12 credits in floriculture and ornamental horticulture courses at Cornell. No more than two of the following landscape
architecture courses may be included in this 12 -credit requirement: LA $142,311,312,480$, 490, 491. No other landscape architecture or freehand drawing courses may be applied to the requirement because they do not contain horticultural subject matter.

Students may select an area of emphasis in either floriculture or landscape horticulture, or they may study generally across the specialization concentration in floriculture prepares students for careers in management of the production of florist and greenhouse crop production, crops in controlled environment agriculture, and wholesale- and retail-florist marketing, whereas specialization in landscape horticulture trains students for careers in nursery-crop production, turfgrass management, landscape contracting and service, retail- and wholesale-marketing of nursery products and services, botanical garden and arboretum management, urban horticulture, and related areas. Some students choose to pursue a general program in floriculture and landscape horticulture including courses in both areas. Similarly, programs in horticultural business management, research, teaching, extension and public education, and communications/journalism may be arranged across two specialization areas. Students wishing to prepare for graduate study in horticultural science may develop a program in basic sciences and their application in horticultural science. Lists of recommended courses for the areas of specialization are available from student advisers and from the undergraduate program coordinator.

Working with his or her faculty adviser, each student will tailor a program to achieve individual educational objectives in floriculture, landscape horticulture, horticultural business management, or general horticultural science. A core of management courses also is recommended for students planning horticultural business careers. Students are also encouraged to take courses in these areas: agricultural and biological engineering, soil science, computer science, ecology. entomology, geology, plant breeding, plant pathology, plant physiology, oral and written expression, plant taxonomy, and weed sciences. Use of electives to pursue study in the humanities and in other areas of special interest to the student is encouraged. Numerous opportunities to become familiar with the horticultural industries and professions are provided through field trips, guest lectures, undergraduate seminars, independent or small-group study, optional internships, and work-experience programs.
Questions concerning the undergraduate curriculum, advising, and related manners should be addressed to Professor Carl F. Gortzig, Unclergraduate Program Coordinator, Department of Floriculture and Ornamental Horticulture, 23 Plant Science Building, Ithaca, New York 14853-5908 (telephone: 607-2551787).

The department's office is 20 Plant Science Building. Departmental facilities include classrooms and laboratories in the Plant Science Building, greenhouse and laboratory facilities at the Kenneth Post Laboratory, the Test Garden, the Turfgrass Research Field and Laboratory, landscape architecture studios on the fourth floor of Roberts Hall (entrance Kennedy Hall), and freehand drawing studios in Mann Library.

## AGRICULTURE AND LIFE SCIENCES - 1994-1995

Plant biology provides undergraduates with preparation for graduate study in the plant sciences that stresses basic, rather than applied, research. In cooperation with an adviser, each student plans a curriculum with a concentration in basic sciences supplemented by courses in applied areas that seem appropriate. Options include molecular biology, plant physiology, plant biology, genetics, cytology, organic chemistry, biochemistry, anatomy, taxonomy, ecology and evolution, and statistics. A core of courses, including mathematics, plant biology and physiology, and cytology, is strongly suggested. However, different specialties within plant biology afford a flexible curriculum.
Plant breeding provides undergraduates with (1) preparation for graduate study leading to advanced degrees in plant breeding and plant genetics and (2) preparation for work in producing and marketing plant varieties and making varietal recommendations, for positions in seed analysis, regulation, and quality control, and for work in biotechnology laboratories

In cooperation with an adviser, each student plans a curriculum with a concentration in basic sciences supplemented by courses in applied fields best suited to his or her individual goals. Options include plant breeding and plant genetics; genetics, cytology, and cytogenetics; mathematics (calculus) and statistics; organic chemistry and biochemistry: plant anatomy, ecology,
taxonomy, and physiology; crop production; plant pathology, and entomology
Plant pathology is the study of the causes of plant diseases, the mechanisms of the interactions of disease-causing agents and plants, and the methods of preventing or controlling plant diseases. For most students a concentration in plant pathology as an undergraduate is preparation for graduate study in plant pathology or another field of plant science. However, this concentration also prepares students for careers as technical representatives for agribusiness, as cooperative extension agents, as state or federal regulatory agents, or as research technicians in laboratories of plant pathology, mycology, microbiology, and biotechnology
Course courses include chemistry, mathematics, introductory biology. botany, plant physiology, and introductory plant pathology Additional plant pathology courses and other relevant courses from other fields are selected according to the particular interests of the student. Options include entomology, plant breeding, pomology, vegetable crops,
floriculture and ornamental horticulture, and soil, crop, and atmospheric sciences.

Plant protection is offered for students who are interested in the management of plant pests. It includes the study of insects, diseases, weeds, vertebrate pests, and other factors that prevent maximum crop production. This concentration can prepare students for careers in agribusiness, the agrichemical industry, cooperative extension, pest management consulting, state and federal regulatory work, and a variety of other technical positions. Although designed as a terminal program for students desiring a practical preparation in general plant protection, this specialization can also provide an adequate background for graduate work in
entomology, plant pathology, or weed science.
The following subjects are considered essential to the plant protection specialization: botany and plant physiology, general ecology, soils, crop science, and microbial ecology. Additional courses in introductory entomology, introductory plant pathology, plant disease control, weed science, and integrated pest management are recommended
In addition, a number of other subjects pertinent to plant protection are recommended, depending upon the student's interests: agricultural economics, agricultural and biological engineering, soil, crop, and atmospheric sciences, biochemistry, communication, pathology and entomology, general physics, genetics, meteorology, mycology, pesticides in the environment, and plant anatomy. Employment involving practical experience in plant protection between the junior and senior years is encouraged. The job may be on a farm, at an experimental station, with an agrichemical company, or with a regulatory agency
Pomology (the science of fruit growing) provides students with knowledge of the scientific technology and the influence of environmental factors on the production, handling, and storage of deciduous fruit crops New York is a national leader in fruit production. An on-farm value of over $\$ 155$ million generates an estimated $\$ 620$ million for the state's economy
Courses are selected by students in consultation with a faculty adviser. Flexibility in programs makes it possible to establish a course of study to fit the desired goals of individual students. The diverse pomology curriculum, complemented by courses in basic sciences and arts and electives in a student's area of interest, prepares pomology majors for a career in fruit production, agricultural business related to the fruit industry, storage and merchandising, or professional pomology. Job opportunities for graduates can be found in fruit production, marketing, sales and service, research, teaching, and extension.
Vegetable crops is offered for students with an interest in either applied or basic aspects of vegetable production. The high value of vegerables and their importance in the human diet assures a continued demand for trained personnel in all aspects of vegetable technology. A flexible curriculum is provided to prepare undergraduates for careers in a diversity of fields, including: horticultural research, teaching, extension, production, processing, and marketing. A faculty adviser assists individual students in the selection of courses, which usually include: general horticulture, soils, botany, vegetable types and identification, vegetable production, and postharvest handling or marketing. Additional course work depends upon the interest of the student, and may include: vegetable physiology. plant breeding, entomology, plant pathology, weed science, ecology, soil, crop. and atmospheric sciences, nutritional science. agricultural economics, international agriculture, and agricultural and biological engineering
The vegetable industry is an economically important component of agriculture in New York and in the United States. Recently, there has been increased interest in growing vegetables in tropical countries. Exciting challenges are facing the industry. Greater
awareness of environmental and health issues is driving a change toward farming practices that depend less upon agricultural chemicals than in the recent past. New technologies are being developed and implemented to help growers make this change while remaining profitable. Among these technologies are: integrated pest management, genetic engineering, breeding for insect and disease resistance, low-input and organic cropping systems, and cultural practices that improve production efficiency and conserve agricultural resources.

The Department of Fruit and Vegetable Science has on-campus greenhouses and laboratories as well as two research farms in the Ithaca area that support our teaching program. Students are encouraged to gain hands-on experience growing vegetables and to pursue their individual interests through course work and by taking advantage of the many resources available in the College of Agriculture and Life Sciences.

## Rural Sociology

Technological, economic, demographic, and environmental changes are social processes, and each has major impacts on individuals, social groups, societies, and the international order. At Cornell, rural sociology students study these and other facets of social change in both domestic and international settings. Among the topic areas in which faculty members in the Department of Rural Sociology specialize are international agricultural and rural development, community and regional development and changes in the United States, environmental sociology, aging and the life course, sociology of agriculture, rural industrialization and labor markets, technology and social change, population and development, political economy, women in development, race and ethnic relations, and research methodology. Most courses provide background in both domestic and international aspects of the subject matter. Normally, students will develop a specialization with either a domestic or international emphasis by choosing appropriate elective courses. All students learn the theory and methodology of sociology, and how to apply both to research and policy in their subject areas.
Recognizing that students are concerned with future career opportunities, the undergraduate program emphasizes acquisition of skills as well as general knowledge in preparation for jobs or further study upon graduation. Accordingly, students are expected to become involved in the application of theory, methodology, principles, and concepts in the analysis of practical problems.
Rural sociology offers degree programs at both the undergraduate and graduate levels (B.S., M.S., M.P.S., or Ph.D.). These programs are offered through the Department of Rural Sociology and the Graduate Field of Development Sociology, both of which are located in Warren Hall. For many years, the department and graduate field have been recognized as among the top programs in the country, and both are known for innovative program orientations. The department is particularly well known for providing instruction in international as well as domestic aspects of community and rural development, environmental sociology, sociology of agriculture, population studies, and other topics. Faculty
members in this department are committed to both quality instruction and research programs. Being located in a college of agriculture, faculty members maintain strong ties with the technical fields in the college as well as with the International Agriculture Program, the Biology and Society Program, the Cornell Institute for Social and Economic Research, the Community and Rural Development Institute, the Gender and Global Change Program, the Life Course Institute, the Rural Development Program, the Hispanic Studies Program, the Program on Science, Technology, and Society, and the Center for International Studies. Nearly half of the department faculty are associated with one or more area studies programs (the Southeast Asia Program, South Asia Program, Latin American Studies Program, East Asia Program, or the Institute for African Development). Department members also maintain working relations with faculty in the Department of Sociology and other social science units located in other colleges at Cornell. Students are encouraged to supplement their course work by electing courses in these other departments and programs, thereby rounding out their educations by acquiring different perspectives.

The courses offered in rural sociology can be grouped in three broad categories: development sociology; population, environment, and society; and social data and policy analysis. All students majoring in Rural Sociology are required to take five core courses: an introductory course ( R SOC 101), methods (R SOC 213), theory (R SOC 301), social stratification (R SOC 370), and a course in statistics. Four elective Rural Sociology courses are also required of all majors.

## The focus area in development sociology

 provides an understanding of the processes and policies that influence social and economic development in rural settings in North America and low-income countries in the developing world. Courses provide background in the sociology of development in both the advanced and developing countries. Students normally select a set of elective courses in which either domestic or international development is emphasized.These courses provide background in several aspects of development sociology, including (1) an understanding of the processes of socioeconomic development in low-income or Third World countries and training in the formulation of strategies to enhance the socioeconomic well-being of citizens of those countries, (2) analysis of the social structures and processes for development in
nonmetropolitan settings in the United States, (3) analysis of the processes of agricultural change and development in industrialized and low-income countries, and (4) an understanding of the processes of technological development and change in agriculture and other rural industries in developed and developing countries.
Students are encouraged to complement courses in the department with course work in the history and economics of development, area studies, and the policy sciences.
Courses in the population, environment, and society focus area provide an under standing of (1) the causes and consequences of the major components of population change-fertility, mortality, and migration (2) the major patterns of population distribution and population characteristics in the United States and the developing world,
(3) the relationships between social structure and the biophysical environment, (4) the relationships between population change and natural resource utilization in development, and (5) impacts of public policy interventions on population size, growth and composition or on natural resource availability and environmental quality. Students normally select the elective courses for the major in such a way as to stress either population studies or sociological aspects of natural resources and the environment.

Stuclents are encouraged to complement courses in the department with course work in demographic methods, household analysis, ecology and evolution, environmental studies, natural resources, and policy sciences.
Courses in the social data and policy analysis focus area provide (1) knowledge of research methodology, statistics, and computer applications, (2) an understanding of social, economic, political, and historical concepts essential for conducting meaningful analyses of practical problems and issues faced by organizations, communities, regions, and states, and (3) knowledge and practice in policy analysis. Students ordinarily select electives in order to specialize in either policy analysis or in a particular area of public policy (international development policy, domestic rural development policy, environmental policy, or population policy, etc.).
Students are encouraged to complement courses in the department with course work in data collection and research design, evaluation research, computing, and advanced statistics.

## Soil, Crop, and Atmospheric Sciences

The Department of Soil, Crop, and Atmospheric Sciences provides instruction in five specializations: atmospheric science, agronomy, crop science, soil science, and weed science. Employment opportunities are increased with practical experience, which is emphasized in the laboratories of our beginning courses. For students wishing additional credentials, preparation for professional certification is provided in all five specializations

Atmospheric science is the study of the atmosphere and the processes that shape our weather. The core curriculum in meteorology is designed to provide students with an understanding of the fundamental physical and dynamic properties and processes of the atmosphere. All students are required to complete a minimum of five semesters of calculus; two semesters of physics; a semester each of chemistry, computer science, and statistics; and a sequence of eight courses covering observational, general, theoretical, and synoptic meteorology. Additional courses are available for students interested in specialized areas of meteorology. The curriculum satisfies the basic requirements for employment as a professional meteorologist and provides a sound background for graduate study or work in the numerous specialized areas of meteorological science. Students are encouraged to choose additional course work in related or complementary areas of interest, such as agriculture, biology, computer science, mathematics, statistics, physics, chemistry, or engineering.
Agronomy combines the study of crop production and soil management. It provides the student with a broad array of career
opportunities after completion of the B.S degree, including agricultural business, extension service work, and farming. Graduate school can also follow a well planned program. The student should take at least 12 credits of crops and 12 credits of soils and design the remainder of his or her curriculum to meet specific interests and goals. Some students pursue a double major in agronomy and international agriculture

Crop science is the application of basic biological and ecological science to the improvement and management of the world's main field crops used for human food and livestock feed. Courses required include 18 credits of crops, 12 credits of plant biology, and 6 credits of soils. Students who anticipate a career in agricultural production or service after completion of the B.S. degree should take additional courses in economics, communication, plant pathology, entomology, and nutrition. Students planning graduate or professional study beyond the bachelor's
degree should take advanced course work in organic chemistry and biochemistry, calculus, physics, and statistics.

Soil science is a basic discipline important in ecology, engineering, agriculture, and conservation. The curriculum in soil science combines physical and biological training to address critical issues in environmental and agriculture management related to soils. Students take 18 credits in soil science, including 4 credits in the introductory course. In addition, chemistry, mathematics, physics, and microbiology are required, as well as 6 credits of crop science to satisfy the major.
Weed science is that branch of pest management which emphasizes the principles and practice of weed control. The scientific basis for mechanical, cultural, chemical, and biological control procedures is considered. Plant physiology, organic chemistry, biochemistry, soil science, and plant taxonomy are required in addition to twelve credits in weed science and plant protection. The specialization is offered cooperatively by the departments of Soil, Crop, and Atmospheric Sciences, Floriculture and Ornamental Horticulture, and Vegetable Crops so that a variety of managed plant systems may be studied.

## Special Programs in Agriculture and Life Sciences

Some students are interested in pursuing a general education in the agricultural sciences. Others are uncertain about career objectives in agriculture and the life sciences. The opportunity to develop an independent major in general studies in agriculture and the life sciences is available for such students. In consultation with a faculty adviser, they may plan a sequence of courses suited to their individual interests, abilities, and objectives in an area not encompassed by the existing programs. In addition to the distribution and other college requirements, this major may include a concentration of courses in one or several academic units of the university.

Students completing this major are often planning a career in agriculturally related food and service enterprises. Many of the fastgrowing occupations require the broad perspective, the scientific and technical skills, the attitudes, and the analytical ability that a general education fosters. A course of study for a special program must be planned with
and approved by a college faculty adviser. Information on the options and names of faculty advisers prepared to advise in special programs are available in the Office of Student Services, 140 Roberts Hall.
General studies includes production agriculture as well as technical work in the agricultural and life sciences. Many biotechnology concerns deal with aspects of agriculture, especially plants, crops, and ecosystems in the natural environment. A strong grounding in biological sciences as well as knowledge of the agricultural sciences is essential in this rapidly growing field. Students should plan basic course work in the major areas of study in the college-animal sciences, plant sciences, environment and technology, agronomic sciences, biological sciences, and social sciences. Advanced courses may be selected in those and other areas of individual interest or career aspiration.
International Agriculture provides students with an understanding of the special problems of applying basic knowledge to the processes of agricultural development in low-income countries. The student typically specializes in a particular subject and works with an adviser to plan a program oriented toward international agriculture. The courses in International Agriculture are designed to acquaint students with the socio-economic factors in agricultural development, with the physical and biological nature of tropical crops and animals, and with various world areas for which study programs exist. Competence in a foreign language is required.
In addition to the college distribution requirement of 36 credits, students majoring in International Agriculture must take a minimum of 30 credits. A minimum of 7 credits in International Agriculture and 8 credits (or equivalent competence) in a modern foreign language are required. The other courses recommended are drawn from a wide range of disciplines. The objective is to acquaint students with the many facets of agricultural development in low-income countries. Students are encouraged to take additional specialized courses in one of the other program areas of the college.

## DESCRIPTION OF COURSES

Undergraduate and graduate courses in the college are offered through the sixteen academic departments and units and also through the Divisions of Biological Sciences and Nutritional Sciences.
Descriptions of courses, both undergraduate and graduate, are given by department, arranged in alphabetical order.
Graduate study is organized under graduate fields, which generally coincide with the departments. Graduate degree requirements are described in the Announcement of the Graduate School. Courses for graduate students are described in the section on the academic department that offers them.

## NONDEPARTMENTAL COURSES

## ALS 127 Introduction to Farm Techniques

127, fall and spring. 1 credit each semester. Prerequisite: permission of instructor. S-U grades only. Limited to 8 students per section.

T or W, 1:25-4:30. Class assembles in the lobloy of Roberts Hall for transport to various facilities. G. Tennant, staff.
Practical instruction in the basic skills of farming and field research. Includes safe tractor and equipment operation and maintenance; harvesting and planting crops; caring for and handling dairy and beef animals, sheep, and poultry; and milking by machine and by hand. General orientation in the day-to-day procedures of farm operation. Field trips to area farms and agribusinesses will provide knowledge of farmers' skills, problems, and way of life.

## ALS 400 Internship

Fall, spring, or summer. 6 credits maximum. Not open to students who have earned internship credits elsewhere or in previous terms. S-U grades only.

## Staff.

Students may register only for internships approved by the College Internship Committee. Currently, the opportunities are available in the New York State Assembly Intern Program, the New York State Senate Session Assistant's Program, and the Albany Semester Program. A learning contract is negotiated between the student and the faculty supervisor, stating conditions of the work assignment, supervision, and reporting. Participation is required in any structured learning activities associated with the internship.

## ALS 500 Politics and Policy: Theory, Research, and Practice (also Government 500, and HSS 404)

Students in the College of Agriculture and Life Sciences must register for ALS 500.
S. Jackson and staff.

This course, taught in Washington, D.C., forms the core of the Cornell-in-Washington program. The central course objective is to provide students with the instruction and guidance necessary to analyze and evaluate their own chosen issue in public policy. Toward that end, the course has three components: (1) weekly lectures providing background on the structures and processes of national politics and policy as well as training in research methodology; (2) student externships; and (3) individual research papers or projects. All three components interrelate so as to provide students with a strategy and framework for integrating classroom-based learnings, field experience, and individual research. Applications are made through the Cornell-in-Washington office, 131 Sage Hall.

## ALS 661 Environmental Policy (also

 Biological Sciences 661 and Biology and Society 461)Fall and spring. 3 credits each term. (Students must register for 6 credits each term since an " $\mathrm{R}^{\text {" grade is given at the end of the fall term.) }}$ Limited to 12 students. Prerequisite: permission of instructor.

Sem R 2:30-4:30 p.m. D. Pimentel.
This course uses an interdisciplinary approach to focus on complex environmental and policy issues. Ten to twelve students, representing several disciplines, investigate significant environmental problems. The research team spends two semesters preparing
a scientific report for publication in Science or BioScience.

## Related Courses in Another Department

Agriculture, Science and Society (HIST 233)
Seminar in the History of the Agricultural Sciences (HIST 687)

## AGRICULTURAL AND BIOLOGICAL ENGINEERING

R. B. Furry, chair; L. D. Albright,<br>D. J. Aneshansley, J. A. Bartsch, S. G. Capps,<br>T. J. Cook, J. R. Cooke, A. K. Datta,<br>R. C. Derksen, K. G. Gebremedhin,<br>W. W. Gunkel, D. A. Haith, P. E. Hillman,<br>J. I3. Hunter, W. W. Irish, L. H. Irwin,<br>W. J. Jewell, H. A. Longhouse,<br>D. C. Ludington, J.-Y. Parlange, R. E. Pitt,<br>G. E. Rehkugler, T. S. Steenhuis,<br>M. B. Timmons, L. P. Walker, M. F. Walter

## ABEN 102 Introduction to

 Microcomputer ApplicationsFall. 3 credits. S-U grades optional. Each lab section limited to 16 students. All students, including those pre-enrolled, must attend the first lecture to guarantee admittance to the course.

Lecs, T R 10:10 or 12:20; lab M 1:25-4:25 or 7:30-10:30 p.m., or T 1:25-4:25, or W
1:25-4:25 or 7:30-10:30 p.m., or R 1:25-
4:25. 1 evening prelim. P. E. Hillman. Introduction to application packages on microcomputers. A laboratory, using the Macintosh, provides hands-on experience with word processing, spreadsheets, and clatabase managers. These packages and others such as desktop publishing, telecommunications, statistics, and presentation graphics are discussed and demonstrated in the lecture, as well as computer hardware and DOS.

## ABEN 104 Introduction to Programming

 using Pascal and FORTRANSpring. 4 credits. Each lab section limited to 20 students. S-U grades optional.

Lecs, T R 11:15; lab), T or W 12:20-2:15.

## P. E. Hillman.

An introductory course in computer programming using microcomputers to handle data. Topics include preparing and processing programs in Pascal and FORTRAN. Students are expected to spend 5 to 8 hours outside their scheduled laboratory periods to complete problem sets. No prior knowledge of computers or computer language is necessary

## ABEN 110 Introduction to Metal

 Fabrication TechniquesSpring. 2 credits. Each lab limited to 18 students.

Lec, R 9:05; lab, M or T or R 1:25-4:25, or M 7-10 p.m. T. J. Cook.
Emphasis on selection of proper materials and techniques to accomplish a variety of metal fabrication and maintenance projects. To include both hand and machine tools, fasteners, strengths of materials, classification and identification of metals, soldering, brazing, forging, pipe fitting, sheet metal work, controlling distortion, oxy-acetylene cutting, and arc welding.

## ABEN 132 Introduction to Wood Construction

Fall. 2 credits, Each lab limited to 15 students

Lec, T 9:05; lab, T or W or R 1:25-4:25, or M 7-10 p.m. T. J. Cook.
Principles and practice of wood construction. To include site selection and preparation, drainage, water and septic development, footers and foundations, material properties, framing and roofing, comparison of alternatives to wood construction, use of hand and power tools, wood joining methods, fasteners, concrete work, and block construction. Each student will plan and construct an approved carpentry project.

ABEN 151 Introduction to Computing Fall. 4 credits.

Lecs, M W F 11:15; lab, W or R 12:20-2:20 or $2: 30-4: 30$, or $F 1: 25-3: 25$. Each lab section limited to 22 students.
D. J. Aneshansley.

An introduction to computer programming and concepts of problem analysis, algorithm development, and clata structure in an engineering context. The structured programming language, Pascal, is used, implemented on interactive personal computers, and applied to problems of interest in agricultural and biological engineering. No previous programming experience is assumed.

ABEN 153 Engineering Drawing
Fall. 2 credits. Limited to 30 students ( 15 in each lab).

Lec, M 9:05; lab, T or W 1:25-4:25.
H. A. Longhouse.

Designed to promote an understanding of engineering universal graphic language. The lectures and laboratories develop working knowledge of drawing conventions, drafting techniques, and their application to machine and pictorial drawing problems. The course will involve both instrument and Autocad computer drawings.

ABEN 200 Undergraduate Seminar Spring. 1 credit. S-U grades optional. Lec, T 1:25. K. G. Gebremedhin A forum to discuss the contemporary and future role of agricultural and biological engineering in society. A required course for freshmen majors in Agricultural and Biological Engineering academic programs. A series of seminars will be given by practicing engineers, Cornell faculty members, and students. Students are expected to develop written career statements and select future courses to meet their career goals.

ABEN 221 Plane Surveying
Fall. 3 credits. S-U grades optional. Lecs, M W 12:20. lab, M 1:25-4:25 H. A. Longhouse.

Principles and practice of measurement of distance, elevation, and direction. Use and care of equipment is stressed during field problems related to mapping, engineering design, and construction. Other topics include surveying specifications, error analysis, and standards of accuracy

## ABEN 250 Engineering Applications in

 Biological SystemsFall. 3 credits. Prerequisite: enrollment in an engineering curriculum. Recommended for the sophomore year

Lecs, M W F 12:20. L. P. Walker.
Case studies of engineering problems in agricultural and biological systems, including animal and crop production, environmental
problems, energy, biomedicine, and food engineering. Emphasis is on the application of mathematics, physics, and the engineering sciences to energy and mass balances in biological systems.

## ABEN 301 Introduction to Energy

 TechnologySpring. 3 credits. Prerequisite: college physics. S-U grades optional.

Lecs, M W F 10:10. D. C. Ludington Basic concepts of energy; traditional sources, conversion processes to provide usable forms of energy and environmental impact; concepts of energy conservation and reducing environmental impact; alternate sources of energy and their potential.

## ABEN 305 Principles of Navigation [also

 Naval Science 301)Fall. 4 credits. Lecture limited to 34 students Each lab limited to 17 students.

Lecs, M W F 8:00. Lab, R 8:00 or R 9:05.
C. D. Myers.

An introduction to the fundamentals of marine navigation, emphasizing piloting and celestial navigation procedures. The course covers coordinate systems, chart projections, navigational aids, instruments, compass observations, time, star identification, use of the nautical almanac, tides, and currents. Electronic navigation systems are also briefly discussed.

## ABEN 310 Advanced Metal Fabrication

 TechniquesSpring. 1 credit ( 2 -credit option available) Prerequisite: ABEN 110 or permission of instructor.

Lab F 1:25-4:30. T. J. Cook.
Principles and practices extending beyond the scope of ABEN 110. To include out-ofposition, high carbon steel and cast iron welding. Soldering and brazing of aluminum, hard surfacing, both tungsten (TIG) and metallic (MIG) inert gas welding, plasma-arc and oxy cutting of metals. Planning, development, and fabrication of a metal construction project for the 2 credit option.

ABEN 321 Soil and Water Management
Spring. 2 credits. S-U grades optional. Concurrent registration in SCAS 321 required. Lecs, M W F 9:05; disc-lab, M 1:25-4:25.
M. F. Walter, T. W. Scott.

An interdisciplinary course intended to introduce students to the general principles of soil and water interaction and to the effects of human intervention in these processes
Aspects of soil and water management, including hydrology, soil erosion, irrigation, drainage, and water quality are examined Case studies from both the United States and the tropics are used to illustrate basic principles

## ABEN 331 Environmental Control for Agricultural Production Systems

Fall. 3 credits. S-U grades optional.
Lecs, M W F 11:15. K. G. Gebremedhin A study of environmental requirements, ventilation design, and control of agricultural production systems (dairy, swine, poultry, and fruit and vegetable storage facilities). Animal physiology and homeothermy, material handling, waste management, alternate energy sources on the farm, farmstead planning and layout, and engineering economic analysis of systems and alternatives.

ABEN 350 Transport Principles
Fall. 3 credits. Prerequisites: MATH 294 and fluid mechanics (co-registration permissible)

Lecs, M W F 11:15. J. B. Hunter.
Integration of heat and mass transfer combined with reaction kinetics in the context of agricultural and biological systems Emphasis is on physical understanding of transport processes and simple reaction rates with application examples from plant and animal biology, the environment (soil/water/ air), and food processing.

## ABEN 367 Introduction to Biological Engineering

Spring, 3 credits. Prerequisites: one year each calculus and introductory biology; minimum one term each college chemistry and physics. Not open to freshmen. S-U grades optional.

Lecs, T R 10:10; lab, R or F 1:25-4:25.

## J. B. Hunter.

Explores the use of engineering principles to solve biological problems in the context of laboratory experiments. Topics may include artificial organs, neuromuscular electrical signals, mass transfer in fermentation, enzyme kinetics, mechanics of plant or animal tissue, and DNA transfer. Many topics relate to ongoing research at Cornell. Appropriate for engineering and life science students. Field trips, demonstrations, and readings in current scientific literature.

## ABEN 371 Hydrology and the

 Environment (also Soil, Crop, and Atmospheric Sciences 371, and Geological Sciences 204)Spring. 3 credits. Students enrolled in the statutory colleges must enroll in ABEN 371 or SCAS 371. Prerequisite: 1 course in calculus. Lecs, T R 9:05; lab, F 1:25-3:20.
T. S. Steenhuis, J.-Y. Parlange,
P. C. Baveye, L. M. Cathles.

Introduction to hydrology as a description of the hydrologic cycle and the role of water and chemicals in the natural environment. Includes precipitation, infiltration, evapotranspiration, groundwater, surface runoff, river meandering floods, and droughts. Case studies, short field trips, computer programs, and laboratories are used to foster an understanding of concepts and principles of hydrologic processes.

## ABEN 401 Career Development In Agricultural and Biological Engineering

Fall. 1 credit. Limited to seniors. S-U grades only.

Lec, M 12:20. G. E. Rehkugler A career development seminar for majors in the field of agricultural and biological engineering. Career opportunities in corporations, independent businesses, consulting, and public service. Professional ism, ethics, public policy and personal and corporate management issues are discussed

ABEN 435 Principles of Aquaculture Spring. 3 credits. Prerequisite: junior standing and above.

Lecs, T R 1:25-2:15, lab, R 2:30-4:25.
M. B. Timmons, W. D. Youngs,
C. A. Bisogni, G. A. German,
G. L. Rumsey, P. R. Bowser,
J. M. Regenstein, J. Meade, and
G. H. Ketola.

An in-depth treatment of the principles of aquaculture: fish biology, waste treatment, engineering design, fish health, nutrition, processing, etc. This course is intended to
build upon the undergraduate's previous course background and interests. Supervised "hands-on" laboratory experiences. A term project is required.

## ABEN 450 Instrument Design: Signal Processing and Data Acquisition

Fall. 3 credits. Prerequisites: Linear Differential Equations, physics or electrical science, computer programming.

Lecs, M W (also F first 4 weeks) 9:05; lab
to be arranged. D. J. Aneshansley. An introduction to static and dynamic characteristics of instruments, electronic instruments, digital and analog signal conditioning circuits and techniques, data acquisition and instrument control with personal computers and micro-controllers, and computer data analysis. Biological and agricultural examples of instrument problems and designs are used. A final design project is required.

## ABEN 451 Biomass Conversion

 Processes for Energy and Chemicals Spring. 3 credits. Prerequisites: ABEN 250 and 350, MATH 294, Thermodynamics (coregistration permissible), and CHEM 211.Lecs, M W F 9:05. L. P. Walker. A variety of physical and biological processes are available for converting plants and other biomass resources into fuels, industrial chemicals, and foods. The design of these processes is accomplished through fusing concepts from biochemistry, microbiology, and plant biology with the concepts and methods of engineering. There are five major components to this course: plants as biochemical resources, heat and mass transfer, enzyme catalysis, fermentation kinetics, and biological filtration with plants. The last four components are concluded with case studies that demonstrate how the scientific and engineering concepts are used to design a biomass conversion process.

## ABEN 454 Physiological Engineering

Fall. 3 credits. Prerequisites: Introductory biology, computer programming. Corequisite: fluid mechanics.

Lecs, T R 12:20; secs, T or R 1:25-4:25. R. E. Pitt.

Engineering analysis and design in the physiology of animals and humans. Topics include osmometric behavior of cells, cardiovascular control models, mechanical operation of the hear, sensory ecology, neural transmission, EEGs, physiology of sight, bioacoustics, respiration, whole-animal models, and the fluid mechanics of flying and swimming. Laboratories involve experiments, computer applications, field trips, and guest lectures.

## ABEN 466 Food Process Engineering: A

 Transport Phenomena Approach Spring. 3 credits. Prerequisite: courses in either fluid mechanics and heat transfer or unit operations in food processing.Lecs, T R 9:05; disc-lab, F 1:25-3:25.
A. K. Datta.

A unified transport phenomena based quantitative engineering approach to basic and advanced food processing concepts including sterilization, concentration, drying, freezing, separation, extrusion, etc. Considerable emphasis on microwave heating applications to these processes.

## ABEN 467 Bioprocessing Applications in

 AgricultureFall. 4 credits. S-U grades optional. Prerequisites: BIOBM 231, college biology and calculus, one year each; ABEN 250 or ENGR 219, or senior standing in life sciences. May not be taken for credit after CHEME 643.

Lecs, T R 10:10-12. J. B. Hunter. An introduction to microbial and enzymatic process technology for engineers and life scientists. A substantial introduction to process engineering is illustrated by case studies of food and agricultural bioprocesses. Emphasis on engineering analysis and design. Suitable for both engineers and life scientists seeking careers in the biotechnology industry.
ABEN 471 Geohydrology (also Geology 445 and Civil and Environmental Engineering 431. Students enrolled in the statutory colleges must enroll in Agricultural and Biological Engineering 471.)
Fall. 3 credits. Prerequisites: MATH 294 and ENGR 202.

Lecs, M W 10:10 and F 2:30-4:30.
T. S. Steenhuis, J.-Y. Parlange, A. L. Bloom,
W. H. Brutsaert, L. M. Cathles.

An intermediate course in surface and groundwater flow and related design factors. Includes principles of fluid flow, the hydrologic cycle, natural channel dynamics and sediment transport, description and behavior of natural aquifers, groundwater hydraulics, soil water, and solute transport.

## ABEN 473 Watershed Engineering

Fall. 3 credits. Prerequisite: Fluid Mechanics or Hydrology.

Lecs, T R 9:05, disc, R 1:25. M. F. Walter. Engineering principles are applied to the design of soil and water management technologies aimed at solving natural resource problems in the context of watersheds. Emphasis will be placed on rural and countryside engineering and small-scale design for soil erosion control, flond damage control, earthen dams, ponds, moisture conservation, drainage, irrigation, and water supply.
ABEN 474 Drainage and Irrigation Design Spring. 3 credits. Prerequisites: Fluid Mechanics or Hydrology.

Lecs, T R 11:15 and disc, F 8:00.
M. F. Walter.

This course will focus on design of drainage and irrigation systems for agriculture and nonagricultural purposes. The course will also briefly cover design for rural water supply and sanitation systems. Emphasis is placed on problem solving with actual situations used wherever possible. One major design project is required of each student.

## ABEN 475 Environmental Systems

 AnalysisFall. 3 credits. Prerequisites: computer programming and one year of calculus.

Lecs, M W F 1:25. D. A. Haith. Systems analysis and its use in environmental quality management. Emphasis is on modeling of environmental problems, translation of models into efficient computational algorithms, and use of computer simulation and optimization procedures (search techniques, linear programming, dynamic programming, and separable programming) to evaluate management altematives. Applications include pollution control and resource management problems.

ABEN 476 Solid Waste Engineering
Spring. 3 credits. Prerequisites: 1 year of calculus and physics; 1 semester of chemistry. Lecs, M W F 1:25. D. A. Haith. Planning and design of processes and facilities for management of municipal solid wastes. Source characterization and reduction; waste collection, storage, and transport; sanitary landfills; incineration; resource (energy and materials) recovery; composting; air and water pollution impacts; economic and social factors.

## ABEN 477 Treatment and Disposal of Agricultural Wastes

Spring. 3 credits. Prerequisites: One environmental science course and at least junior-level standing; or permission of instructor.

Lecs, T R 2:30-3:45. W. J. Jewell. Overview of pollution problems in agriculture, legal restrictions, and technologies used to control pollution. Biological, physical, and chemical processes are applied to solve problems associated with animal wastes, food production, and food and fiber processing.

## ABEN 481 Design of Wood Structures

Spring. 3 credits. Prerequisite: ENG 202.
Lecs, M W F 10:10. K. G. Gebremedhin. Computer-aided and design code manual procedures of engineering wood structures. Estimation of design loads, wood stress properties, design of columns, beams, frames, trusses, post-frame buildings, shear walls, horizontal diaphragms, connections, and special wood (glue-laminated) structural systems.
ABEN 482 Bioenvironmental Engineering Spring. 3 credits. Prerequisite: ABEN 250 and 350 , or equivalent.

Lecs, T R 11:15-12:30. L. D. Albright. Analysis and design of structures to modify the thermal and aerial environment of animals and plants. Environmental requirements of animals and plants, and the design of buildings to act as buffers between biological systems and climate. Heat flow, air flow, psychrometrics, energy balances, thermal biology, animal and plant models, thermal modeling, mechanical and natural ventilation, solar energy, and weather phenomena.
ABEN 491 Highway Engineering (also Civil and Environmental Engineering 362)

Fall. 3 credits. Prerequisites: junior standing in engineering, fluid mechanics, and soil mechanics (may be taken concurrently).

Lec, F 1:25-4:25; lab, M 1:25-4:25.
L. H. Irwin.

An introduction to highway engineering with an emphasis on design. Students will work in teams to apply the current standards and design criteria used in professional practice to several highway design projects. Topics of discussion include route location and design, traffic engineering, economic analysis, human factors and public safety, hydrology and drainage design, highway materials, pavement design, and maintenance.

ABEN 494 Special Topics in Agricultural and Biological Engineering
Fall or spring. 4 credits maximum.
S-U grades optional.
Hours to be arranged. Staff.
The department teaches "trial" courses under this number. Offerings vary by semester and will be advertised by the department. Courses offered under the number will be approved
by the department curriculum committee, and the same course will not be offered more than twice under this number.

## ABEN 496 Senior Design in Agricultural and Biological Engineering

Spring. 3 credits. Prerequisite: senior standing in ABEN engineering program or instructor's permission.

Lecs, T R 10:10. Disc, to be arranged S. G. Capps.

Capstone design course for senior level students. Topics and skills discussed will include time and team management, salesmanship and motivation, design constraints, design, problem definition and specification, project scheduling, materials selection, cost estimation, and design evaluation. Team format design projects will be required; mentorship of projects will be provided by faculty.

## ABEN 497 Individual Study in Agricultural and Biological Engineering

Fall and spring. $1-4$ credits. S-U option Prerequisite: written permission of instructor and adequate ability and training for the work proposed. Normally reserved for seniors in upper two-fifths of their class. Students must register with an independent study form (available in 140 Roberts Hall)

Staff.
Special work in any area of agricultural and biological engineering on problems under investigation by the department or of special interest to the student, provided, in the latter case, that adequate facilities can be obtained.

## ABEN 498 Undergraduate Teaching

 Fall and spring. 1-3 credits. Prerequisite: written permission of instructor. Students must register with an independent study form (available in 140 Roberts Hall)Staff.
The student assists in teaching an agricultural and biological engineering course appropriate to his/her previous training. The student meets with a discussion or laboratory section, prepares course materials, grades assignments, and regularly discusses objectives and techniques with the faculty member in charge of the course.

## ABEN 499 Undergraduate Research

Fall and spring. 1-3 credits. Prerequisites: normally reserved for seniors in upper twofifths of their class. Adequate training for work proposed. Written permission of instructor. Students must register with an independent study form (available in 140 Roberts Hall).

Staff.
Research in any area of agricultural or biological engineering on problems under investigation by the department or of special interest to the student, provided that adequate facilities can be obtained. The student must review pertinent literature, prepare a project outline, carry out an approved plan, and submit a formal final report.

ABEN 501-502 M.P.S. Project
Fall and spring. 1-6 credits. Required of each M.P.S. candidate in the field

Hours to be arranged. Staff
A comprehensive project emphasizing the application of agricultural technology to the solution of a real problem.

## ABEN 551-552 Agricultural and

 Biological Engineering Design ProjectFall and spring. 3-6 credits. Prerequisite: admission to the M.Eng. (Agr.) degree program.

Hours to be arranged. J. B. Hunter and staff.
Comprehensive design projects dealing with existing engineering problems in the field. Emphasis is on the formulation of alternative design proposals that include consideration of economics, nontechnical factors, engineering analysis, and complete design for the best design solution. Projects are supervised by faculty members on an individual basis. However, there is a formal orientation during the first four weeks of the semester. A formal report and public presentation of the results of the design project are required for completion of the course(s)

ABEN 652 Instrumentation: Sensors and Transducers
Spring. 3 credits. Prerequisites: Linear differential equations, introductory chemistry and introductory physics, or permission of the instructor.

Lecs, T R 12:20; lab to be arranged.
D. J. Aneshansley

Application of instrumentation concepts and systems to the measurement of environmental, biological, and agricultural phenomena. Construction and characterization of electronic sensors and transducers will be emphasized. Image processing techniques will be introduced. A final project is required.

## ABEN 655 Thermodynamics and Its Applications

Spring. 3 credits. Prerequisite: Mathematics 293 or equivalent.

Lecs, M W F 12:20. J.-Y. Parlange Thermodynamics and its applications to problems in engineering and agriculture. Topics include basic concepts (equilibrium, entropy, processes, systems, potentials, stability, phase transitions) and applications (soil and water processes, dilute solutions, electromagnetism, surface phenomena, heat and mass transport, structure of organizations).

## ABEN 665 Engineering Properties of

 Foods (also Food Science 665) Spring. 2 credits. Prerequisite: course in transport processes or unit operations as applied to foods; or permission of instructor. Offered alternate years.Lecs, T R 12:20. S. S. H. Rizvi, A. K. Datta, and S. J. Mulvaney.
Theories and methods of measurement and prediction of rheological, thermal, and mass transport properties of foods and biomaterial systems. Emphasis is on physical-mathematical basis of the measurement as well as the prediction processes. Examples of appropriate use of these properties in engineering design and analysis of food processes will also be provided.

## ABEN 671 Analysis of the Flow of Water

 and Chemicals in SoilsFall. 3 credits. Prerequisites: two calculus courses and fluid mechanics.

Lecs, T R 3:35-4:50. J.-Y. Parlange,
T. S. Steenhuis.

The course encompasses the full range from simple to complex methods to describe the chemical and water flows on the surface, in the vadose zone, and through the aquifer. Current analytical, semi-analytical, and
computer-based techniques are discussed. Both homogeneous and heterogeneous soils are analyzed. Offered alternately with Civil and Environmental Engineering 633-a complementary, but not identical, course.

ABEN 672 Drainage
Spring. 4 credits. Prerequisites: ABEN 471 and two calculus courses. S-U grades optional. Offered alternate years. Not offered 1995-96.

Lecs, M W F 10:10; lab, T 1:25-4:25. T. S. Steenhuis.

Theory of water and solute flow in aquifers, hillslopes, and the vadose zone as it relates to artificial drainage is discussed. Drainage design as it relates to agricultural land, landfills, and land application sites will be critically reviewed. The importance of preferential flow and matrix flow on water quality of drainage waters is examined. Laboratories are used for hands-on experience with measuring soil parameters and for actual drainage design.

## ABEN 673 Irrigation Systems

Spring. 3 credits. Prerequisite: permission of instructor. Offered alternate years.

Lecs, M W F 10:10. M. F. Walter. An introduction with a systems perspective to the design and implementation of irrigation. Topics include systems planning and appraisal, irrigation structures, equipment, and measuring devices, water distribution, and scheduling. The course will include design for both domestic and Third World systems. Case studies will be used to help students develop a broad understanding of irrigation systems.

## ABEN 677 Treatment and Disposal of Agricultural Wastes

Spring. 3 credits. Prerequisite: permission of instructor.

Lecs, T R 2:30-3:45. W. J. Jewell. Emphasis is on the causes of agricultural waste problems and the application of fundamentals of treatment and control methods to minimize related pollution. Fundamentals of biological, physical, and chemical pollution control methods are used in design problems with animal wastes, food production, and food and fiber processing. A semester-long design project is required.

## ABEN 678 Nonpoint Source Models

Spring. 3 credits. Prerequisites: computer programming and calculus.

Lecs, M W F 2:30. D. A. Haith. Development and programming of simulation models for management of water pollution from runoff and percolation. Emphasis is on prediction of water and chemical inputs to surface waters and groundwater. Applications include urban and rural runoff, lake eutrophication, groundwater waste loadings from land disposal sites, pesticides and nutrients in agricultural drainage, irrigation return flows, and watershed stream flow and sediment yield.

## ABEN 685 Biological Engineering

 AnalysisSpring. 4 credits. Prerequisite: T\&AM 310 or permission of instructor.

Lecs, M W F 11:15. J. R. Cooke. Engineering problem-solving strategies and techniques are explored. Students solve several representative engineering problems that inherently involve biological properties. Emphasis is on formulation and solution of mathematical models and the interpretation of
results. The student's knowledge of fundamental principles is used extensively.

ABEN 692 Pavement Engineering (also Civil and Environmental Engineering 643)

Spring. 4 credits. Limited to engineering seniors and graduate students. Prerequisite: one introductory course in soil mechanics or highway engineering.

Lec, F 1:25-4:25; lab, M 1:25-4:25.
L. H. Irwin

Application of geotechnical engineering principles to the selection of materials and the design of highway and airfield pavements, computer-based methods for pavement design, structural evaluation of pavements, and pavement systems management. Topics of discussion will include bituminous mixture design; base courses; soil stabilization methods; seal-coat design; design of flexible and rigid pavements; pavement design for frost conditions; and pavement evaluation using nondestructive test methods. Laboratory will provide a case study of pavement systems management

## ABEN 694 Special Topics in Agricultural and Biological Engineering <br> Fall or spring. 4 credits maximum.

S-U grades optional.
Hours to be arranged. Staff.
The department teachers "trial" courses under this number. Offerings vary by semester, and will advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number

## ABEN 700 General Seminar

Fall. No credit. S-U grades only.
M, hours to be arranged. Staff.
Presentation and discussion of research and special developments in agricultural and biological engineering and related fields.

## ABEN 701 Special Topics in Agricultural

 and Biological EngineeringFall or spring. $1-6$ credits. Prerequisite: permission of instructor. S-U grades optional.

Hours to be arranged. Staff.
Topics are arranged by the staff at the
beginning of the term
ABEN 750 Orientation for Research
Fall. 1 credit. Limited to newly joining graduate students. S-U grades only. Lecs, first 7 weeks, $M 3: 35$; remainder to be arranged
An introduction to departmental research policy, programs, methodology, resources, and degree candidates' responsibilities and opportunities.

## ABEN 754 Sociotechnical Aspects of Sustainable Watersheds (also Agricultural Economica 754, and Government 644)

Spring. 2-3 credits. S-U grades optional
Hours to be arranged. M. Walter,
R. Barker, N. Uphoff

Examines sustainable agriculture in the context of watersheds and its relation to agricultural development. Emphasis on social processes within water and soil management systems and interactions with social setting, including political and administrative aspects. Provides an opportunity to examine systematically the institutional and organizational policy issues associated with the design and operation of systems of irrigated and nonirrigated agriculture in developing countries.

ABEN 761 Power and Machinery Seminar Spring. 1 credit. Limited to graduate students. Prerequisite: permission of instructor. S-U grades only.

Hours to be arranged. Staff.
Study and discussions of research and new developments in agricultural power and machinery.
ABEN 771 Soil and Water Engineering Seminar
Fall and spring. $1-3$ credits. Prerequisite: graduate status or permission of instructor. S-U grades optional

Hours to be arranged. T. S. Steenhuis,
M. F. Walter, J.-Y. Parlange.

Study and discussion of research or design procedures related to selected topics in irrigation, drainage, erosion control, hydrology, and water quality

## ABEN 775 Agricultural Waste

 Management SeminarSpring. 1 credit. Limited to graduate students Prerequisite: permission of instructor. S-U grades only.

Hours to be arranged. Staff. Management of agricultural wastes, with emphasis on physical, chemical, biological, and economic factors affecting waste production, treatment and handling, utilization, and disposal.

## ABEN 781 Structures and Related Topics

 SeminarSpring. 1 credit. Prerequisite: graduate status or permission of instructor. S-U grades only

Disc to be arranged. K. G. Gebremedhin. Advanced analysis and design of production systems with emphasis on structural and environmental requirements, biological responses, and economic considerations.

## ABEN 785 Biological Engineering

 SeminarSpring. 1 credit. Prerequisite: graduate status or permission of instructor. S-U grades only.

Disc to be arranged. J. R. Cooke.
The interactions of engineering and biology, especially the environmental aspects of plant. animal, and human physiology, are examined in order to improve communication between engineers and biologists.

## AGRICULTURAL, RESOURCE, AND MANAGERIAL ECONOMICS

A. M. Novakovic, chair; D. J. Allee,
B. L. Anderson, R. D. Aplin, R. Barker, N. L. Bills, R. N. Boisvert, J. Brake, K. Bryant, D. L. Call, G. L. Casler, L. D. Chapman, R. D. Christy, G. J. Conneman, J. Conrad, H. de Gorter, E. E. Figueroa, O. D. Forker, G. A. German, D. A. Grossman, M. Hubbert, H. M. Kaiser, R. J. Kalter, W. A. Knoblauch, S. C. Kyle, E. L. LaDue, D. Lee, W. H. Lesser, E. W. McLaughlin, R. A. Milligan, T. D. Mount, G. L. Poe, T. T. Poleman, J. Pratt, C. Ranney, W. D. Schulze, D. G. Sisler, D. Streeter, L. Tauer, E. Thorbecke, W. G. Tomek, C. van Es, G. B. White, L. S. Willett

## Courses by Subject

Farm management, finance, and production economics: $302,402,403,404,405,406,407$, $408,409,605,608,708$
Statistics, quantitative methods, and price analysis: $310,410,411,412,413,415,419$, $710,711,712,713,717$

Business management, law, and accounting 220, 221, 320, 321, 323, 324, 325, 422, 424. $425,426,427,428,429$
Public policy: 430, 431, 432, 630, 730, 731
Marketing and food distribution: 240, 340, $342,346,347,443,446,447,448,449,640$, 641, 740, 741
Resource economics: $250,450,652,750,751$, 754
Economics of development: $464,660,665$, 763
General, contemporary issues, research, and other: $100,380,494,497,498,499,694,698$, 699, 700

## AG EC 100 Introduction to Global Economic Issues

Fall. 3 credits.
Lecs, M W F 11:15. 2 evening prelims. W. D. Schulze

The economics and geography of world agriculture, providing a basis for understanding past development and future changes. Elementary economic principles, historical development, physical geography, and population growth are studied in their relation to agricultural development and the economic problems of farmers. Where possible, current domestic and foreign agricultural issues are used to illustrate principles.

## AG EC 220 Introduction to Business Management

Spring. 3 credits.
Lecs, M W F 10:10 or 11:15; disc, M
2:30-4:25 or 7:30-9:25 p.m. (2 secs); T 8-9:55, or 2:30-4:25; W 10:10-12:05, $12: 20-2: 15,2: 30-4: 25,7: 30-9: 25$ p.m. (2 secs); R 8-9:55 or 2:30-4:25. In weeks when discs are held, there will be no $W$ lecture. 2 evening prelims. R. D. Aplin An overview of management and business. Provides exposure to key management functions, a firm's internal and external environments, business ethics, forms of business ownership, some key concepts and tools in human resource management, financial management and marketing and important current issues such as quality, global competition, and corporate governance Several guest executives.

## AG EC 221 Financial Accounting

Spring. 3 credits. Not open to freshmen. Lecs, M F 11:15 or $12: 20$; sec, T 10:1012:05 (2 secs), 12:20-2:15, or 2:30-4:25; W 10:10-12:05 ( 2 secs), 12:20-2:15 ( 2 secs), $2: 30-4: 25$ ( 2 secs), or $7-9$ p.m. R 10:10-12:05, 12:20-2:15, or 2:30-4:25. 2 evening prelims and a comprehensive final. J. Dentes.
A comprehensive introduction to financial accounting concepts and techniques, intended to provide a basic understanding of the accounting cycle, elements of financial statements, and statements interpretation. Elements examined include inventory, depreciation, internal control of assets, time value of money, notes, stocks, bonds, and the statement of cash flows. Limited use of a financial data base of publicly held companies.

## AG EC 240 Marketing

Fall. 3 credits
Lecs, M W F 10:10; discs, M 2:30-4:00,
T 12:20-1:50 or $2: 30-4: 00$ ( 2 secs), W
2:30-4:00 (2 secs), R 12:20-1:50 ( 2 secs) or
2:30-4:00 ( 2 secs ), or F 10:10-11:40. In
weeks discs are held, there will be no $F$ lecture. E. W. McLaughlin This course provides a broad introduction to the fundamentals of marketing. We will explore the components of an organization's strategic marketing program, including how to price, promote, and distribute goods, services ideas, people, and places. We will examine specifically the central role played by changing consumers; our primary emphasis will be placed on consumer goods industries Although examples will frequently be drawn from the food and agricultural system, the principles and concepts from this course will apply equally well to the marketing of goods and services in all sectors of the economy Case studies, industry guest lectures, and current marketing applications from various companies will be presented and analyzed.

## AG EC 250 Natural Resource and Environmental Economics

Spring. 3 credits. Prerequisite: ECON 101 or equivalent

Lecs, T R 9:05-10:35 or 2:30-4:00
1 evening prelim. D. Chapman. An introduction to the concepts and methods of analysis in the public and private use of resources, particularly valuation of environmental resources, benefit-cost analysis, and discounting. Major current economic problems in global warming, endangered species protection, forestry, acid rain, energy use, and world petroleum resources. The growing world trade in resource-intensive manufactured products and the impact on income, employment, and pollution. Comparative resource use and environmental protection in industrialized and developing countries.

AG EC 302 Farm Business Management Fall. 4 credits. Not open to freshmen. This course is a prerequisite for AG EC 402 and 405.

Lecs, M W F 9:05; sec, W or R 1:25-4:25
On days farms are visited, the section
period is $1: 25-6: 00$. W. A. Knoblatuch.
An intensive study of planning, directing, organizing, and controlling a farm business, with emphasis on the tools of managerial analysis and decision making. Topics include financial statements, business analysis,
budgeting, and acquisition, organization, and management of capital, labor, land, buildings and machinery.

## AG EC 310 Introductory Statistics

Fall, spring, or summer. 4 credits. Prerequisite: EDUC 115 or equivalent level of algebra Lecs, M W F 1:25; sec T 9:05-11,
12:20-2:15, or $2: 30-4: 25$ ( 2 secs);
W 11:15-1:10 or $2: 30-4: 25$ ( 2 secs); or
R 12:20-2:15 or $2: 30-4: 25$ ( 2 secs).
3 evening exams. C. van Es.
An introduction to statistical methods. Topics to be covered include the descriptive analysis of data, probability concepts and distributions, estimation and hypothesis testing, regression, and correlation analysis. Applications from business, economics, and the biological sciences are used to illustrate the methods covered in the course.

## AG EC 320 Business Law I

Fall. 3 credits. Limited to juniors, seniors, and graduate students.

Lecs, M W F 9:05. 1 evening prelim.
D. A. Grossman.

Consideration is given chiefly to legal
problems of particular interest to persons who expect to engage in business. Emphasis is on
the law pertaining to contracts, sales, agency, property, and the landlord-tenant relationship.

## AG EC 321 Business Law II

Spring. 3 credits. Limited to juniors, seniors, and graduate students. Prerequisite: a course in business law

Lec, T R 8:30-9:55. D. A. Grossman The first portion of this course examines legal issues in the formation and operation of business enterprises, particularly partnerships and corporations. The second portion of the course will review selected topics in business law, including employment discrimination, secured transactions, product liability,
bankruptcy, and commercial paper.

## AG EC 323 Managerial Accounting

Fall. 3 credits. Prerequisite: AG EC 221 or equivalent.

Lecs, M W 12:20; disc, R 10:10-12:05.
12:20-2:15 ( 2 secs), or $2: 30-4: 25$ ( 2 secs);
or F $12: 20-2: 15$ ( 2 secs). 2 evening prelims, a third exam, and a project on an electronic spreadsheet. J. Dentes
An intreduction to cost accounting that emphasizes the application of accounting concepts to managerial control and decision making. Major topics include product costing, standard costing, cost behavior, cost allocation, budgeting, inventory control, variance analysis, measuring divisional performance, and accounting systems in the manufacturing environment. Limited use of Lotus on the IBM PC.

## AG EC 324 Financial Management

Spring. 4 credits. Prerequisite: AG ECC 220 or equivalent. Recommended: AG EC 221 and 310 or equivalents.

Lecs, M W F 9:05; disc, W 2:30-4:25 or R 9:05-11, 12:20-2:15, or 2:30-4:25, or F 10:10-12:05 or $12: 20-2: 15$. 2 evening prelims. I3. L. Anderson. Focuses on three major questions facing management: how to evaluate capital investment decisions, how to raise the capital to finance the firm, and how to generate sufficient cash flows to meet the firm's cash obligations. Major topics include methods to analyze investment decisions, impact of taxes, techniques for handling risk and uncertainty, effects of inflation, sources and costs of debt and equity, capital structure, leverage, and working capital management. Microcomputers are used for analyzing financial problems. Previous computer experience is preferred, but optional instruction offered.

## AG EC 325 Personal Enterprise and Small Business Management

Spring. 3 credits. Limited to juniors and seniors. Prerequisites: AG EC 220 and 221 or permission of instructor. Absolutely no adds or drops after second class meeting.

Lec, M W 1:25; disc, R $10: 10-12: 05$ or $2: 30-$
$4: 25$, or $\mathrm{F} 10: 10-12: 05$ or $2: 30-4: 25$. Staff. Acquaints students with the changing role of small businesses in the global economy. special emphasis on the problems of planning and starting a new business, including strategic planning, marketing, financing, and managing growth. Term project, development of a business plan, is done in groups assigned within discussion sections. Case studies and visiting entrepreneurs illustrate various small business issues.

## AG EC 340 Futures and Options Trading

Spring. 3 credits. Prerequisites: ECON 101 Open by application only. S-U grades optional.

Lec, T R 10:10-11:25. Evening prelim. D. Streeter

The focus of the course is on the use of agricultural financial futures and options as marketing and management tools. A primary objective is to understand how companies, financial institutions, and farm businesses can employ hedging strategies to manage risk. Students will participate in a simulated trading exercise in which they will use real-time price and market information and input from industry experts to manage a hedge position.
AG EC 342 Marketing Management
Spring. 3 credits. Limited to juniors, seniors, and graduate students. Prerequisites: AG EC 240 and ECON 101-102.

Lecs, M W F 10:10; disc, R 12:20-1:50 or
2:30-4 (2 secs), F 10:10-11:40 (2 secs), or
12:20-1:50 (2 secs). In weeks discs are
held, there is no F lecture. R. D. Christy. Deals with the central link between marketing at the societal level and everyday consumption by the general public. As such, this course emphasizes the management aspects of marketing by considering consumer behavior, strategies in product and brand selection, pricing, promotion, sales forecasting, and channel selection. Identification and generation of economic data necessary for marketing decisions are considered. Public policy and ethical dimensions of marketing are examined.

AG EC 346 Dairy Markets and Policy Spring. 3 credits. Limited to juniors and seniors. Prerequisite: ECON 101 or equivalent.

Lecs, T R 8:30-9:55. H. M. Kaiser. A survey of the structural and institutional characteristics of dairy markets and the analysis of policy issues, pricing systems, and government programs, including marketing orders, price supports, and import policies.

## AG EC 347 Marketing Fruits, Vegetables,

 and Ornamental ProductsFall. 3 credits. S-U grades optional. Estimated cost of field trip, $\$ 50$.

Lec M W F 12:20. A two-day field trip.
E. E. Figueroa.

A study of fruits, vegetables, and ornamental product marketing, including seasonal variations. Role of market intermediaries, role of government agencies, and the price discovery process. Discussion and description of horticultural product market orders in the U. S. The emerging importance of interregional and international markets.

## AG EC 380 Independent Honors Research in Social Science

 Fall or spring, $1-6$ credits. Limited to students who have met the requirements for the honors program. See "Honors Program" in CALS section of this catalog. Provides qualified students an opportunity to conduct original research under supervision.
## AG EC 402 Advanced Farm Business <br> \section*{Management}

Spring. 3 credits. Prerequisite: AG EC 302 or equivalent

Lecs, M W 10:10; disc, W 1:25-3:20.
G. L. Casler.

Emphasis is on evaluating the profitability of alternative investments and enterprises.
Principal topics include strategic planning, the effects of income taxes on investment decisions, capital investment analysis, linear programming, forms of business organization, and financial risk and uncertainty. Experience
in computer applications to farm business management is provided. Previous computer experience is not required.
AG EC 403 Farm Management Study Trip Spring. 1 credit. Prerequisite: AG EC 302. Open by application only.

Lecs, arranged. W. A. Knoblauch. A special program to study production and management systems in diverse agricultural regions of the U.S. Includes a trip (usually taken during spring break) to the region being studied. A different region is visited each year. The course meets in advance of the study trip and upon return from trip. A paper, selected by the student, which further explores an aspect of the trip, is a requirement for completing the course.

## AG EC 404 Advanced Agricultural

 Finance SeminarSpring. 2 credits. Limited to 16 seniors with extensive course work in farm management and farm finance. Open by application prior to March 1 of the year before the course is offered.

W 3:35-5:30. E. L. LaDue.
A special program in agricultural finance, conducted with financial support from the Farm Credit System. Includes two days at Farm Credit Banks of Springfield, one week in Farm Credit Association offices, a field trip to observe FHA financing during fall term, a four-day trip to financial institutions in New York City during intersession, and an actual farm case analysis in the spring term.

## AG EC 405 Farm Finance

Spring. 4 credits. Prerequisite: AG EC 302 or equivalent.

Lecs, M W F 9:05; disc, T 1:25-3:20.
E. L. LaDue.

The principles and practices used in financing farm businesses, from the perspectives of the farmer and the farm lender. Topics include sources of capital, financing entry into agriculture, financial analysis of a business, capital management, financial statements, credit instruments, loan analysis, financial risk, and leasing.

## [AG EC 406 Farm and Rural Real Estate Appraisal

Spring, weeks 7-15. 2 credits. Limited to 40 students. Prerequisites: AG EC 302 or equivalent and permission of instructor. Not offered 1994-95.

Lec, R 11:15; lab, R 1:25-5:30. 6 half-day
field trips, 1 all-day field trip.
G. J. Conneman.

The basic concepts and principles involved in appraisal. Factors governing the price of farms and rural real estate and methods of valuation are studied. Practice in appraising farms and other rural properties.]

## AG EC 407 Financial Management in Farming

Fall. 2 credits. Limited to ALS majors. Prerequisite: AG EC 405.

Lecs, M W 1:25. J. R. Brake. Financial markets and policies affecting agriculture and farmers. How money and capital markets affect credit cost and availability in agriculture. Insurance concepts for farmers. Financial considerations in starting to farm. Issues in choice of farm organizational structure. Present value concepts.
[AG EC 408 Seminar in Farm Business Decision Making
Fall ( 1 week in intersession). 1 credit. Prerequisites: AG EC 302 and 405 or equivalent, and permission of instructor. Not offered 1994-95.

M T W R F 8-5. G. J. Conneman. Develops method of analyzing farm business management problems. Gives student experience in identifying alternatives in problem solving. Provides opportunities to analyze and evaluate actual farm situations. Two field trips and intensive work with a farm family.]
AG EC 409 Farm Management Workshop Fall. 1 credit. Limited to seniors and graduate students.

T 12:20-2. W. A. Knoblauch and staff. Presentation of current topics in farm management, farm finance, and production economics. Participants take part in seminars where research, teaching, and extension program methodology and results are presented by faculty and graduate students. Students prepare a summary and evaluation of a recent research publication.

## AG EC 410 Business Statistics

Spring. 3 credits. Prerequisite: AG EC 310 or equivalent.

Lecs, M W F 10:10. C. van Es.
This course focuses on four major topics used to analyze data from marketing research, business, and economics. Topics studied are: survey sampling procedures, contingency table analysis, time series and forecasting, and experimental design and ANOVA. The course will involve a research project designed to give experience in collecting and interpreting data.
AG EC 411 Introduction to Econometrics Spring. 3 credits. Limited to juniors, seniors, graduate students. Prerequisite: AG EC 310 or equivalent.

Lecs, T R 10:10-11:25. L. Willett. The course introduces students to basic econometric principles and the use of statistical procedures in empirical studies of economic models. Assumptions, properties, and problems encountered in the use of multiple regression procedures are discussed and simultaneous equation models are introduced. Students are required to specify. estimate, and report the results of an empirical model using econometric methods covered in class.

## AG EC 412 Introduction to Mathematical Programming

Fall. 3 credits. Primarily for juniors, seniors. and M.S. degree candidates. Prerequisite: AG EC 310 or equivalent.

Lecs, T R 12:20-1:35. J. Pratt.
This is a course in applied linear programming. Following a review of linear algebra, the emphasis will be on formulation, specification, and interpretation of solutions to mathematical models of economic problems. Standard LP problems such as work scheduling, blending, resource allocation, capital budgeting, transportation and financial planning, inventory management, etc., will be studied. Integer and nonlinear programming will be introduced, if time permits.

## AG EC 413 Information Systems and Decision Analysis

Fall. 3 credits. Limited to 80 juniors and seniors. Prerequisites: ABEN 102 or equivalent, ECON 101 or equivalent, and AG EC 310.

Lecs, M W 9:05 or 10:10; labs arranged.
2 evening prelims. D. Streeter.
The focus of the course is on management decision making and the support provided by various components of an information system. The computer models presented support various stages of decision-making: the information seeking stage (e.g., forecasting models), the selection stage (e.g., decision analysis and analytic hierarchy process models), and the implementation stage (e.g. project management models). Students are encouraged to develop their critical thinking about the output from quantitative models and sensitivity analysis is emphasized. Both the promise and the limitations of information technologies are discussed.

## AG EC 415 Price Analysis

Fall. 3 credits. Prerequisites: ECON 313 or CEH 210 or equivalent, AG EC 310 or equivalent.

Lecs, M W F 11:15. L. Willett.
The focus of this course is on the analysis of supply and demand characteristics of commodities with particular attention to agricultural products. Institutional aspects of pricing, temporal and spatial price relationships, price forecasting, and the economic consequences of pricing decisions are included.
AG EC 419 Expert Systems Workshop
Fall. 3 credits. Prerequisite: one computer use or programming course. Absolutely no adds or drops after second class meeting.

Lec, T $2: 30-4: 25$; lab, hours to be arranged.
R. J. Kalter.

A hands-on introduction to the use of expert systems by business managers. Topics include the concepts behind knowlege-based applications, domain selection, knowledge engineering, representation, and processing, reasoning mechanisms, rule and object dynamics, and the integration of expert systems with quantitative models and computer databases. Students will work in groups to design, implement, and test an expert system relevant to a contemporary business problem. Interested students need not be proficient in computer programming to take this course.

## AG EC 422 Estate Planning

Fall. 1 credit. Limited to juniors, seniors, and graduate students. S-U grades only.

Lec, M 3:35. D. A. Grossman.
Fourteen sessions on the various aspects of estate-planning techniques. The law and use of trusts, the law of wills, federal and New York State estate and gift taxes, and probate procedures are covered.

## AG EC 424 Business Policy

Fall. 3 credits. Limited to seniors majoring in business management and marketing.

T R 9:05-10:35, 11:15-12:45, or 2:30-4.
R. D. Aplin.

An integrating course that examines business policy formulation and implementation from the standpoint of the general manager of an organization, focusing on decision making and leadership. The course is built around a series of cases. Several guest executives. Emphasizes improving oral and written communication skills.
[AO EC 425 Small Business Counseling Fall. 4 credits. Limited to seniors. Prerequisite: AG EC 325 or NBA 300. Not offered 1994-95

Lec, M W 2:30-4:25; disc, 2 hours per
week, arranged. Staff.
Students serve as counselors to small businesses in the central New York area and confront problems facing small personal enterprises. Encourages the application of business principles to an existing business and the witnessing of the results of firm-level decision making. Student teams meet with the business owners and course staff at arranged times during the semester.]

## AG EC 426 Cooperative Management and Strategies

Spring. 3 credits. Recommended: AG EC 220 or equivalent. Estimated cost of field trip, $\$ 50$.

Lecs, M W F 12:20. 2-day field trip
required. B. L. Anderson.
Investigates the unique aspects of cooperative, membership, and not-for-profit organizations. Issues are approached from the point of view of management, the board of directors, and members. Topics include characteristics of various types of business organizations, cooperative principles, legislation, taxation, as well as the unique nature of corporate strategies, management, financing, and marketing in cooperative, membership, and not-for-profit organizations. Primary focus is on operating cooperatives in agriculture although alternative types of cooperative organizations are discussed, such as: credit unions, insurance cooperatives, employee stock ownership plans, housing cooperatives, flexible manufacturing networks, consumer cooperatives, and membership organizations.

## [AO EC 427 Advanced Personal Enterprise Seminar

Spring. 3 credits. Limited to 18 seniors. Prerequisites: AG EC 325 and 425 . Open by application only. Not offered 1994-95.

Lecs, M W 2:30-4:25. Staff.
Designed for seniors who have a demonstrated interest in starting or managing their own business. A discussion format is used to address current topics that will affect the success of business ventures. Students lead discussions, make presentations, study a business, industry, or issues, and prepare a major project documenting the results of their inquiry. Visits by current enterprise leaders will be an important aspect of the course.]

## AG EC 428 Technology: Management and Economic Issues

Spring. 3 credits. Prerequisites: ECON 101102, or permission of instructor. Limited to juniors and seniors.

Lecs, T R 10:10-11:25. R. J. Kalter. Designed to acquaint students with the role of technology in modern society, business, and education. Emphasis is placed on the context for managerial analysis and decisions with respect to technological adoption. Topics include the historical influence of technology on economic structure and activity, contemporary technological trends, implications for business managers, adoption and diffusion, public acceptance, implications for future structural and spatial organization of economic activity, impediments to technological advancement, and public policy considerations.

## [AG EC 429 Small Business Advisory Group

Fall or spring. 2 credits. Prerequisites: Limited to seniors or graduate standing. AG EC 424 and 425 or equivalents, or permission of instructor. S-U grades optional. Not offered 1994-95.

Lecs, M W 7:30-10:30 p.m.; disc arranged. Staff.
Course provides an opportunity for students to explore a diverse array of small business problems through working with local businesses. Approximately 10-12 businesses are advised by the group each semester. Students work in teams to visit the business and gather background information, and the business owner attends a class session to discuss his or her problems. Student teams then complete a detailed report and provide recommendations to the business owner, which are delivered in a final meeting with the owner at the business location.J
AG EC 430 International Trade Policy Spring. 3 credits. Prerequisites: ECON 101-102 or equivalents.

Lecs, T R 12:20-1:35; optional discussion
to be arranged. D. R. Lee.
This course examines the economic principles underlying international trade and monetary policy, and the policies, practices, and institutions that influence trade and foreign exchange markets. Applications to current topics in international trade policy, to trade in primary commodities, and to both developed and developing countries are also emphasized.

## AC EC 431 Food and Agricultural Policies

Spring. 3 credits.
Lecs, T R 9:05; disc, R 11:15 or 1:25. H. deGorter.

The course deals broadly with food and agricultural policies, including price support and storage or reserve policies, agricultural protection, soil conservation programs, the structure of agriculture, domestic food subsidy programs, environmental issues, and food safety. The importance of international trade and agricultural policies in other countries is emphasized.

## AG EC 432 Economics of the Public

 SectorSpring. 3 credits. Prerequisite: ECON 313 or CEH 210 or equivalent.

Lecs, T R 2:30-4:00. Staff.
The application of economic concepts to the evaluation of the structure and performance of the public sectors of the economy. Emphasis on microeconomic analysis of public finance and public resource allocation. Principal topics: market failure, articulation of public choice and interests, evaluation of public decisions, and current public policy.

## AG EC 443 Food-Industry Management

Fall. 4 credits. Limited to juniors and seniors. Prerequisite: AG EC 448 or 342 or permission of instructor.

Lecs, T R 9:05-10:35; sec, T 2-3:30.
G. A. German.

A case-study approach is used to examine the application of management principles and concepts to marketing and distribution problems of the food industry. Cases covering new product introductions, merchandising strategies, and investment decisions are included. Guest speakers from the food industry present case-study solutions at the Tuesday session.

AG EC 446 Food Marketing Colloquium
Fall. 1 credit. Limited to juniors and seniors with extensive course work in food industry management and marketing. Permission of the instructors. $\mathrm{S}-\mathrm{U}$ grades only.

R 3:35-5. G. A. German and
E. W. McLaughlin.

AG EC 446 and 447 have been developed as a two-semester special seminar that provides the weekly focus for the Food Marketing Fellows Program. The seminar will cover advanced topics in food marketing, many of which will have an important international dimension and will be presented by industry members. A number of field trips will be taken, including an international trip during January intersession and a five-day trip to the Food Marketing Institute Convention in Chicago during the first week in May. Students will prepare research topics on various aspects of the food industry.

## AG EC 447 Food Marketing Colloquium

Spring. 1 credit. Limited to juniors and seniors with extensive course work in food industry management and marketing.
Permission of instructors. S-U grades only.
R 3:35-5. G. A. German and
E. W. McLaughlin.

AG EC 446 and 447 have been developed as a two-semester special seminar that provides the weekly focus for the Food Marketing Fellows Program. The seminar will cover advanced topics in food marketing, many of which will have an important international dimension and will be presented by industry members. A number of field trips will be taken, including an international trip during January intersession and a five-day trip to the Food Marketing Institute Convention in Chicago during the first week in May. Students will prepare research topics on various aspects of the food industry.

## AG EC 448 Food Merchandising

Spring. 3 credits. Limited to juniors and seniors. Prerequisite: AG EC 240.

Lecs, T R 10:10-11:25. G. A. German. Merchandising principles and practices as they apply to food industry situations. The various elements of merchandising such as buying, pricing, advertising, promotion, display, store layout, profit planning and control, and merchandising strategy are examined in this course. The consequences of food industry trends and initiatives for other industry members, public policymakers, and consumers are considered.

## AG EC 449 Global Marketing Strategy

Fall. 2 credits. Prerequisite: AG EC 342 or permission of instructor. Cost of field trip, about $\$ 125$.

W 2:30-4. One 2-day field trip to the New
York City area during early November.
E. W. McLaughlin.

This course will examine the marketing environment, opportunities, and challenges in the rapidly changing global marketplace. We will explore what factors are predictive of business success in various national markets and the means by which these factors can be incorporated into firm strategy. The focus of the course will be kept practical and managerial through liberal use of actual case studies, industry guests, and a field trip.
[AG EC 450 Resource Economics
Fall. 3 credits. Prerequisites: MATH 111 and ECON 313. Not offered 1994-95.

Lecs, M W F 2:30-3:20. J. Conrad. Dynamic models of renewable, nonrenewable, and environmental resources will be constructed to examine market allocation and optimal resource management.]

## AG EC 464 Economics of Agricultural Development

Spring. 3 credits. Prerequisites: ECON 101102 , or permission of instructor.

Lecs, T R 8:40-9:55. R. Barker.
This course is designed to provide an understanding of the economics of the agricultural sector in low-income countries. In addition, more general issues of economic development beyond the agricultural sector will be covered in order to provide the necessary context for an understanding of rural problems. Among the areas covered are the nature of development and technical change, welfare and income distribution, land reform, food and nutrition policy, food security and food aid, competition with more developed countries and international markets, the effect of U.S. policy on agricultural development, and the role of international institutions. Examples from a wide variety of developing countries will be used to illustrate the basis for economic analysis.

## AG EC 494 Undergraduate Special

 Topics in Agricultural Economics Fall or spring. 4 credits maximum. S-U grades optional.Hours to be arranged. Staff.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department.

## AG EC 497 Individual Study in

 Agricultural EconomicsFall or spring. Variable credit. S-U grades optional. Students must register with an Independent Study form (available in 140 Roberts Hall).

Hours to be arranged. Staff. To be used for special projects designed by faculty members.

## AG EC 498 Supervised Teaching Experience

Fall or spring. 1-3 credits. Total of 4 credits maximum during undergraduate program. Students must register with an Independent Study form (available in 140 Roberts I Hall).

Hours to be arranged. Staff.
Designed to give qualified undergraduates experience through actual involvement in planning and teaching courses under the supervision of department faculty. Students are expected to actually teach at least one hour per week for each credit awarded. Students cannot receive both pay and credit for the same hours of preparation and teaching.

## AC EC 499 Undergraduate Research

Fall, spring, or summer. $1-4$ credits. Limited to students with grade-point averages of at least 2.7. Prerequisite: written permission of the staff member who will supervise the work and assign the grade. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional. Permits outstanding undergraduates to carry out independent study of suitable problems under appropriate supervision. Students cannot receive both pay and credit for the same hours of work.

## AG EC 605 Agricultural Finance and

 Capital ManagementFall. 3 credits. Prerequisite: AG EC 402 or 405 , or equivalent. Offered alternate years. $\$ 25$ charge for reading materials; no text.

T R 8:40-9:55. E. LaDue and L. Tauer. Advanced topics in capital management and financing of agriculture. Special emphasis on current issues. Example topics: farm-sector funds flows, financial risk and decision analysis, agricultural finance policy, financial intermediation and intermediaries, firm growth, inflation, loan evaluation, and selected topics on financing agriculture in developing countries.

## AG EC 608 Production Economics

Fall. 3 credits. Recommended: ECON 313 and MATH 111 or equivalents.

Lecs, M W F 10:10. L. W. Tauer. The theory of production economics with emphasis on applications to agriculture. Topics include the derivation, estimation, and use of production, cost, profit, demand, and supply functions. Production response over time and under risk is introduced.

## AG EC 630 Policy Analysis: Welfare Theory, Agriculture, and Trade

 Spring. 4 credits. Prerequisites: AG EC 608 or CE\&H 603, ECON 313, or equivalent intermediate micro theory incorporating calculus.Lecs T R 8-9:55. H. deGorter and staff. The first half of the course surveys the theory of welfare economics as a foundation for public policy analysis. Major issues addressed include the problem of social welfare measurement, the choice of welfare criteria, and the choice of market or nonmarket allocation. Basic concepts covered include measurement of welfare change, including the compensation principle, consumer and producer surplus, willingness-to-pay measures, externalities, and the general theory of second-best optima. The second half of the course focuses on public policy analysis as applied to domestic agricultural policy and international trade. The domestic policy component examines major U.S. farm commodity programs and related food and macroeconomic policies and analyzes their effects on producers, consumers, and other groups. The international trade component examines the structure of world agricultural trade, analytical concepts of trade policy analysis, and the principal trade policies employed by countries in international markets.

## AG EC 640 Analysis of Agricultural

 MarketsFall, weeks 1-7. 2 credits. Prerequisites: AG EC 411 and 415 or equivalents.

Lecs, T R 2:30-4:25. W. G. Tomek. This course is about markets for agricultural products. Focus is placed on identifying their distinguishing characteristics, establishing criteria for evaluating performance, analyzing models for price determination, and evaluating selected public-policy issues related to market performance.
AG EC 641 Commodity Futures Markets Fall, weeks $8-14$. 2 credits. Prerequisites: AG EC 411 and 415 or equivalents. Recommended: AG EC 640.

Lecs, T R 2:30-4:25. W. G. Tomek. This course is primarily about markets for agricultural futures contracts. Emphasis is placed on price behavior on cash and futures markets and the relationships among prices.

These principles provide a foundation for a discussion of hedging, speculation, and public-policy issues.

## AG EC 652 Land Economics Problems

 Fall or spring. 1 or more credits. Limited to graduate students. Prerequisite: permission of instructor. S-U grades optional.Hours to be arranged. D. J. Allee Special work on any subject in the field of land economics.

## AG EC 660 The World's Food

Spring. 3 credits. S-U grades optional.
T R 12:20-1:40. T. T. Poleman.
Designed to introduce first-year graduate students to food economics and the linkages between food, population, and employment in developing countries. Among the topics considered are the extent of hunger, income and dietary change, control of population growth, and the outlook for feeding an eventual population of $10-12$ billion.

## AG EC 665 Food and Nutrition Policy

(also Nutritional Sciences 685)
Spring. 3 credits. Prerequisites: CE\&H 310 or 603 or ECON 313 or AG EC 415 or equivalent. Knowledge of multiple regression. S-U grades optional.

Lecs, M W 1:25-2:35. D. Sahn.
The course will identify the principal links between human nutrition, incomes, food consumption, and government action, with emphasis on developing countries. The process of policy formation and the role of economic analysis of foud and nutrition information and surveillance in policy design, and evaluation will be analyzed. Methodologies for empinical data analysis of food and nutrition policy issues, along with approaches for linking macroeconomic and sectoral policies with household-level outcomes will be addressed.

## AG EC 694 Graduate Special Topics in Agricultural Economics <br> Fall or spring. 4 credits maximum. S-U

 grades optional.Hours to be arranged. Staff.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department.

## AG EC 698 Supervised Graduate

 Teaching ExperienceFall or spring. $1-3$ credits. Total of 4 credits maximum during graduate program. Students must register with an Independent Study form (available in 140 Roberts Hall). Open only to graduate students. Undergraduates should enroll in AG EC 498. S-U grades optional. Prerequisite: permission of instructor.

Hours to be arranged. Staff.
Designed to give graduate students teaching experience through involvement in planning and teaching courses under the supervision of departmental faculty members. The experience may include leading discussion sections, preparing, assisting in, or teaching lectures and laboratories, and tutoring. Students are expected to actually teach at least one hour per week for each credit awarded. Students cannot receive both pay and credit for the same hours of preparation and teaching.

## AG EC 699 M.P.S. Research

$1-6$ credits. Prerequisite: registration as an M.P.S. student. Credit is granted for the M.P.S. project report.

## AG EC 700 Individual Study in

 Agricultural EconomicsFall or spring. Limited to graduate students. S-U grades optional. Credit, class hours, and other details arranged with a faculty member. This course is used for special projects designed by faculty members. More than one topic may be given each semester in different sections. The student must register in the section appropriate to the topic being covered; the section number is provided by the instructor

## AG EC 708 Advanced Production Economics

Fall. 3 credits. Prerequisite: AG EC 608, 710, or equivalents; ECON 509 is highly recommended. Offered alternate years.

Hours to be arranged. R. N. Boisvert. Theoretical and mathematical developments in production economics, with emphasis on estimating micro- and macro-production relationships, scale economies, technical change, factor substitution. Recent developments in flexible functional forms, duality and dynamic adjustment models are emphasized. Discussions of several other selected topics such as risk, supply response, and household production functions change from year to year based on student interest.

## AG EC 710 Econometrics I

Spring. 4 credits. Prerequisite: matrix algebra and statistics (e.g., BTRY 417 and 601) sufficient to use G. Judge, et al., Introduction to the Theory and Practice of Econometrics, 2d edition, chapters 5 ff.

Lecs, T R 2:30-4:25. W. G. Tomek. This intermediate-level course covers linear statistical models and associated estimators used in econometrics. Topics include dynamic and other stochastic regressor models, seemingly unrelated regression and simultaneous equation models, nonspherical error terms, and specification errors and misspecification tests. Students seeking an introduction to econometrics should take AG EC 411.

## AG EC 711 Econometrics II

Fall. 4 credits. Prerequisite: AG EC 710 or equivalent. BTRY 417 recommended.

Lecs, T R 10:10-12:05. T. D. Mount. Coverage beyond that of Agricultural Economics 710 of linear regression models, including alternative methods of incorporating non-sample information and testing restrictions, diagnostic techniques for collinearity and influential observations, pooling data, stochastic coefficients, limited dependent variables and latent variables.

AG EC 712 Quantitative Methods I Fall. 4 credits. Prerequisite: some formal training in matrix algebra. A course at the level of BTRY 417 is highly recommended.

Lecs, M W 8:00-9:55. R. N. Boisvert. A comprehensive treatment of linear programming and its extensions, including postoptimality analysis, goal programming, and the transportation model. Special topics in nonlinear programming, including separable, spatial equilibrium and risk programming models. Input-output models and their role in social accounting matrices and computable general equilibrium models are discussed. Applications are made to agricultural, resource, and regional economic problems.

## AG EC 713 Quantitative Methods II

Spring. 4 credits. Prerequisites: ECON 509 and AG EC 710.

Lecs, W F 9:05-11. J. M. Conrad and T. D. Mount.

This course is concerned with the analysis and optimization of dynamic systems. Course objectives are to (1) present the basic theory of dynamical systems and dynamic optimization, (2) introduce associated methods of numerical and econometric analysis, (3) review some applications of dynamic analysis from various subfields in economics, and thereby (4) equip students with basic theory and methods to perform applied research on dynamic allocation problems.

## AG EC 717 Research Methods in

Agricultural Economics
Spring. 2 credits. Limited to graduate students.

M 1:25-3:20. D. G. Sisler and staff. Discussion of the research process and scientific method as applied in agricultural economics. Topics include problem identification, hypotheses, sources of data, sampling concepts and designs, methods of collecting data, questionnaire design and testing, field organization, and analysis of data. During the semester each student develops a research proposal that may be associated with his or her thesis.

## AG EC 730 Seminar on Agricultural

 Trade PolicySpring. 3 credits. Limited to graduate students. Prerequisites: AG EC 630. Offered alternate years.

Hours to be arranged. D. R. Lee. This course examines selected topics in the professional literature on agricultural trade policy and related topics, including trade liberalization, trade and environmental linkages, technological change and trade policy, and agricultural trade and development.

## [AG EC 731 Seminar on Agricultural

 PolicyFall. 3 credits. Limited to graduate students. Offered alternate years. Not offered 1994-95.

T R 12:20-1:50. H. de Gorter.
A review of the professional literature relating to agricultural policy issues and techniques appropriate to the analysis of such issues.]

## AG EC 740 Agricultural Markets and

 Public PolicySpring, weeks $1-7.2$ credits. Limited to graduate students. Prerequisite: familiarity with multiple regression techniques at the AG EC 411 level or higher. Recommended: AG EC 640.

T R 12:20-2:15. Staff. Develops the concepts and methodology for applying and analyzing the effects of publicpolicy directives to the improvement of performance in the U.S. food marketing system. Topics include a survey of industrial organization principles, antitrust and other legal controls, and coordination systems in agriculture.

## AG EC 741 Space, Trade, and

 Commodity AnalysisSpring, weeks $8-14$. 2 credits. Limited to graduate students. Recommended: AG EC 412 or equivalent and AG EC 640.

T R 12:20-2:15. J. Pratt.
Principal topics are spatial micro-economics of the firm, spatial pricing and location decisions, the forms of spatial competition, and
quantitative methods for spatial analyses, which include techniques for finding spatial equilibriums and selected network optimization algorithms.

## AG EC 750 Resource Economics

Spring, 4 credits. Prerequisites: ECON 509 and 518 , or AG EC 713.

Lecs, T R 2:30-4:20. J. M. Conrad. Optimal control and other methods of dynamic optimization will be used to study the allocation and management of natural resources.

## AG EC 751 Environmental Economics

Fall. 4 credits. Prerequisites: ECON 509 and 518 , or AG EC 713. S-U grades optional. Lecs, T R 2:30-4:20. D. Chapman and staff.
Economic theory will be applied to the problems of managing environmental quality. Static and dynamic models of externality, decisions to preserve or develop natural environments, and methods of valuation will be presented.

## AG EC 754 Sociotechnical Aspects of Irrigation (also Agricultural and Biological Engineering 754, and Government 644)

Spring. 2 or 3 credits. S-U grades optional. W 7-9:30 p.m. M. Walter, N. Uphoff, and R. Barker.

Examines irrigated agriculture and its relation to agricultural development. Emphasis on social processes within irrigation systems and interactions with social setting, including political and administrative aspects. Provides an opportunity to examine systematically the institutional and organizational policy issues associated with the design and operation of systems of irrigated agriculture in developing countries.

## AG EC 763 Macro Policy in Developing

## Countries

Spring. 3 credits. Prerequisites: ECON 509, 510,513 (may be taken concurrently), or permission of instructor. Offered altemate years.

Lecs, T R 12:20-1:35. S. Kyle.
This course examines macroeconomic policies in developing countries and their interaction with economic growth, development, and stability. Theoretical models useful for analysis of macro policies will be covered as well as an examination of empirical studies. Emphasis will be on research topics of current interest to students and professionals in the field, particularly those relating to the interaction of macro policy with micro and sectoral analysis.

## ANIMAL SCIENCE

H. F. Hintz, chair; B. J. Apgar, R. E. Austic,
D. E. Bauman, D. H. Beermann, A. W. Bell,
R. W. Blake, W. R. Butler, L. E. Chase,
W. B. Currie, H. N. Erb, R. W. Everett, D. G. Fox, D. M. Galton, R. C. Gorewit, D. E. Hogue, P. A. Johnson, L. R. Jones, K. Keshavarz, W. G. Merrill, E. A. Oltenacu, P. A. Oltenacu, J. E. Parks, A. N. Pell, E. J. Pollak, R. L. Quaas, J. B. Russell, R. D. Smith, M. L. Thonney, D. R. Van Campen. P. J. Van Soest

## AN SC 100 Domestic Animal Biology I

 Fall. 4 credits. S-U grades optional. Lec, M W F 9:05; sec, T W or R 2-4:25.W. B. Currie, M. L. Thonney, and staff. An introduction to the science of raising animals in the context of commercial animal production. Lectures and labs address the biology of economically important species (morphology, anatomy, and physiology) and application of the biology to the management of animals within major livestock industries. Topics covered include fundamentals of anatomy, regulatory mechanisms, vital systems, digestion, and metabolism. Students care for small numbers of cattle, sheep, pigs, and chickens in different phases of their life cycle to maximize hands-on contact. Living animals will be used noninvasively, and fresh organs and tissues from dead animals will be used in laboratories.

## AN SC 105 Contemporary Perspectives of Animal Science

Spring. 1 credit. Limited to freshmen, sophomores, and first-year transfers.

T 1:25 or W 12:20. R. C. Gorewit. A forum to discuss the students' career planning and the contemporary and future role of animals in relation to human needs.
AN SC 110 Animals in Agriculture and Society
Spring. 3 credits. S-U grades optional. Lec, T R 12:20, lab T 2-4:25. D. E. Hogue. Primarily for nonmajors who wish to gain a broad understanding of the role of domestic animals in human society from both an historical and a modern agricultural aspect. Laboratories include practical "hands-on" experiences and visits to the university farms. Proper animal care and management are emphasized.

## AN SC 150 Domestic Animal Biology II Spring. 4 credits. S-U grades optional.

 Lec, M W F 9:05; lab/disc T W or R 2-4:25. W. R. Butler and staff.Second of a two-semester sequence ( $100 / 150$ ) applying the basic biology of growth, defense mechanisms, reproduction, and lactation to aspects of the production of domestic animals. Fresh tissues and organs from dead animals will be used in laboratories.

## AN SC 212 Animal Nutrition

Fall. 4 credits. Prerequisite: CHEM 104 or 208. Recommended: AN SC 100 and 150. Lecs, M W F 10:10; lab, M T W R or F 1:25-4:25. A. W. Bell.
An introduction to animal nutrition, including digestive physiology and metabolism of livestock and other species; nutrient properties and requirements for different aspects of animal production; principles of feed evaluation and ration formulation. Laboratory classes include gastrointestinal tract dissections and a nutritional experiment performed on a laboratory or farm animal species.

## AN SC 213 Nutrition of Companion

 AnimalsSpring, weeks 1-7. 1 credit. Prerequisite: AN SC 212 or equivalent. Offered alternate years. Lec $w 7: 30-9: 25$ p.m. H. F. Hintz. Nutrition of companion animals, with emphasis on the dog and cat. Digestive physiology, nutrient requirements, feeding practices, and interactions of nutrition and disease.

## [AN SC 214 Nutrition of Exotic Animals

Spring, weeks 1-7. 1 credit. Prerequisite: AN SC 212 . Offered alternate years. Not offered 1994-95

Lec W 7:30-9:30 p.m. H. F. Hintz. Principles of nutrition for exotic animals including birds and fish. Nutrient requirements, sources of nutrients, feeding management systems, and ration formulation will be discussed. Signs of nutrient deficiencies and excesses will be described.I

## AN SC 215 Exotic Avian Husbandry and

 PropagationSpring, weeks $1-8$. 1 credit. Limited to 100 students. Prerequisites: AN SC 100, 150 or Bio G 103, 104 or equivalent.

Lec M 7:30-9:25. J. Parks.
Natural history, care, management, health and breeding of exotic avian species with emphasis on psitticines (parrots and related species) and raptors (birds of prey). Lectures, demonstrations, and local field trips.

AN SC 221 Introductory Animal Genetics Spring. 3 credits. Prerequisite: a year of college biology

Lecs, T R 9:05; sec, T W R or F 2-4:25. E. J. Pollak.

An examination of basic genetic principles and their application to the improvement of domestic animals, with emphasis on the effects of selection on animal populations.

## AN SC 230 Poultry Biology

Spring. 3 credits. Prerequisites: AN SC 100 and 150 or introductory biology. Offered altemate years.

Lecs, T R 11:15; lab, M 2-4:25.
R. E. Austic.

A course designed to acquaint the student with principles of avian biology and their application in the various aspects of poultry production. Some laboratory sessions involve dissection and/or the handling of live birds.

## AN SC 250 Dairy Cattle

## Fall. 3 credits. S-U grade optional.

Lecs, T R 10:10; lab, M T or R 1:25-4.
D. M. Galton, K. Wagner.

Introduction to the background and scientific principles relating to dairy cattle production. Laboratories are designed to provide an understanding of production techniques. This course is a prerequisite for AN SC 351.

## AN SC 251 Dairy Cattle Selection

Spring. 2 credits. Prerequisite: AN SC 250 or equivalent.

Lalh, W 12:20-4:25. D. M. Galton. Emphasis on economical and type traits to be used in the selection and evaluation of dairy cattle, including breeding programs that lead to greater genetic progress and herd profitability. Practical sessions include planned trips to dairy herds.

## AN SC 265 Horses

Spring. 3 credits. Prerequisites: AN SC 100 and 150 or permission of instructor. S-U grades optional.

Lecs, T R 10:10; lab, R 1:25-4:25.
C. Collyer.

Selection, management, feeding, breeding, and training of light horses.

## AN SC 290 Meat Science

## Fall. 3 credits

Lecs, T R 11:15; lab, M or R 12:20-3:20.
D. H. Beermann and staff.

An introduction to meat science through a study of the structure, composition, and function of muscle and its conversion to meat. Properties of fresh and processed meat, microbiology, preservation, nutritive value, inspection, and sanitation are also studied. Laboratory exercises include anatomy, meatanimal slaughter, meat cutting, wholesale and retail cut identification, processing, inspection, grading, quality control, and meat merchandising. An all-day field trip to commercial meat plants is taken.

## AN SC 300 Animal Reproduction and Development

Spring. 3 credits. Prerequisite: AN SC 100-150 or equivalent and one year of introductory biology.

> Lecs, M W F 10:10. J. Parks.

Comparative anatomy and physiology of mammalian and avian reproduction, with emphasis on domestic and laboratory animals. Fertilization through embryonic development, pregnancy, and growth to sexual maturity; emphasis on physiological mechanisms and application to fertility regulation. Separate laboratory offered to demonstrate fundamental aspects of reproduction and reproductive technology.

## AN SC 301 Animal Reproduction and Development Lab

Spring. 1 credit. Prerequisite: AN SC $100-$ 150 or equivalent. Concurrent enrollment in or completion of AN SC 300 required to register.

Labs, M W or F 1:25-4:25. Each lab
limited to 30 students. J. Parks.
Demonstration of fundamental principles and applied aspects of mammalian and avian reproduction. A limited number of live animals will be used in some demonstrations. Dissection and examination of tissues from vertebrate animals will be included in selected laboratories.

## AN SC 305 Farm Animal Behavior (also

 BIOAP 312)Spring. 2 credits. Prerequisites: introductory course in animal physiology; at least one animal production course or equivalent experience is recommended. S-U grades optional.

Lec, T R 11:15. E. A. Oltenacu and K. A. Houpt.

The behavior of production species (avian and mammalian) influences the success of any management program. Students study behaviors relating to feeding, reproduction, and social interactions of domestic animals and their physiological basis. Management systems for commercial livestock production and their implications for animal behavior and welfare are stressed.

## AN SC 312 Applied Cattle Nutrition

Spring. 4 credits. Prerequisites: AN SC 100 and 212 (or equivalent).

Lecs, M W F 10:10; lab, M 1:25-4:25 or
T 9:05-12:00.. D. G. Fox.
An applied approach to predicting nutrient requirements and feed utilization to meet requirements with wide variations in cattle
type, feed composition, and environmental conditions. Dairy cattle are emphasized. Nutrient management to minimize cost of production and environmental effects is cliscussed. Computer models are used in the laboratory to apply the information presented in lectures, including evaluation of feeding programs on case study farms.

## AN SC 321 Cenetic Improvement of

 AnimalsSpring. 3 credits. Prerequisite: AN SC 221 or equivalent

Lecs, M W 9:05; Iab, R 1:25.
P. A. Oltenacu.

Translating genetic principles into effective breeding schemes is approached from the farm and industry perspectives in a decisionmaking framework. Current animal improvement strategies as well as potential systems incorporating new developments in reproductive biology and molecular genetics will be addressed in genetic and economic terms.

## [AN SC 330 Commercial Poultry

 ProductionSpring. 2 credits. Prerequisites: AN SC 100, 150 , and 230 or permission of instructor. Offered alternate years. Not offered 1994-95. F 2-4 (occasional field trips run past 4 p.m.). K. Keshavarz.

The course emphasizes production and business management aspects of commercial poultry farm operation and is designed to acquaint the student with current technology involved in commercial poultry production.]
AN SC 341 Physiology of Lactation
Spring. 3 credits. Prerequisite: AN SC 150 or AN SC 300 or equivalent.

Lecs, T R 9:05; lab, R 2-4:25.
R. C. Gorewit.

The physiology of milk production is covered with emphasis on mammary gland development, anatomy, hormonal control of milk secretion, and the biosynthesis of milk constituents. The dairy cow serves as the model system, hut all livestock species are considered.

## AN SC 351 Dairy Herd Management

Spring. 4 credits. Prerequisites: AN SC 250 or permission of instructor. Recommended: AG F.C 302.

Lecs, M W F 11:15; labs, T 1:25-4:25 or
R 9-12, and F (alternate weeks) 1:25-4:25.
D. M. Galton and staff.

Application of scientific principles to practical herd management with components of reproduction, milking, housing, records, and production economics. Laboratories emphasize practical applications, analyses of alternatives, decision making, field trips, and discussion.

## AN SC 360 Beef Cattle

Spring. 3 credits. Limited to 32 students. Lecs, T R 10:10; lab, W 2-4:25.
M. L. Thonney.

Emphasis is on the management of reproduction, nutrition, and selection in beef cattle enterprises. A cattle growth model is studied. Laboratories acquaint students with the management skills needed for a beef operation. Students are required to spend several days during the semester feeding and caring for cattle and observing calving.
[AN SC 370 Pig Management and Biology Fall. 3 credits. Recommended: AN SC 100. S-U grades optional.

Lecs, T R 11:15; sec, T 2-4:25. Staff. Not
offered 1994-95.

Lectures emphasize fundamentals in production and management and the biological basis for recommended practices and anticipated developments. An attempt is made to illustrate where management principles can be broadly applied to other large farm and companion animals. Labs apply principles discussed in lecture with emphasis on problem solving and extensive "hands-on" experience. Opportunity for extensive experience is provided through Pig Teaching and Research Farm.]

## AN SC 380 Sheep

Fall. 3 credits.
Lec, T R 9:05; sec, W 1:25-4:25 every other week. D. E. Hogue.
The breeding, feeding, management, and selection of sheep from a production-system approach. Lectures and laboratories are designed to give students a practical knowledge of sheep production as well as the scientific background for improved practices.

## AN SC 392 Animal Growth Biology

Fall. 2 credits. Not open to freshmen; sophomores by permission of instructor only. Prerequisites: one year of college biology and one course in animal or human physiology, AN SC 212 and 221.

Lec, R 1:25-3:25; sec, F 1:25-2:15.
D. H. Beermann and staff.

A detailed discussion of the anatomy and physiology of growth in domestic farm animals. Cellular aspects of tissue-growth patterns, their relationship to body composition, and measurement of growth and body composition will be discussed. Endocrine, genetic, nutritional, and pharmacological influences on growth, metabolism, and body composition will be emphasized.

## AN SC 400 Tropical Livestock Production

Spring. 3 credits. Prerequisite: Upperclass standing.

Lecs, T R 9:05; disc W 1:25-3:20.
R. W. Blake.

An analysis of constraints on livestock production in developing countries of the tropics, economic objectives and risk, and production methods. Emphasis is on strategic use of animal and plant resources, animal performance with inputs restricted, decision making, and alternative systems of production. Principles, real examples, independent study projects, and classroom interactions will aid problem-solving efforts to improve food security

## AN SC 401 Dairy Production Seminar

 Spring. 1 credit. Limited to juniors and seniors.Disc, M 7 p.m. D. E. Bauman. Students, with the help of faculty members, complete a study of the research literature on topics of current interest in the dairy industry Students then make an oral and a written report on their topic
AN SC 402 Seminar in Animal Sciences Spring. 1 credit. Limited to juniors and seniors. May be repeated. S-U grades optional.

M 4:30. W. B. Currie and P. A. Johnson. Review of literature pertinent to topics of animal science or reports of undergraduate research and Honors projects. Students present oral reports of their work for class discussion in addition to written reports.

## [AN SC 403 Tropical Forages

Spring. 2 credits. Limited to seniors and graduate students except by permission of instructor. Prerequisites: crop production and livestock nutrition. Offered alternate years. Not offered 1994-95.

Lecs, T R 12:20. P. J. VanSoest.
An overview of tropical grasslands, seeded pastures, and crop residues as feed resources; grass and legume characteristics; establishment and management of pastures; determination of feeding value forages and crop residues; physiology of digestion of ruminants that affects feeding behavior of various species; problems of chemical inhibitors in plants; and utilization of tropical forages as hay or silage.]

## AN SC 410 Principles of Animal Nutrition

 Fall. 3 credits. Prerequisites: biochemistry and physiology.$$
\text { M W F } 11: 15 . \quad \text { R. E. Austic and }
$$

D. E. Bauman

A fundamental approach to nutrition focusing on the metabolism as well as the biochemical and physiological functions of the known nutrients. The basic principles of nutrition are elaborated with examples drawn from a broad range of animal species, including humans.

## AN SC 415 Poultry Nutrition

Spring. 1 credit. Prerequisite: AN SC 410 or permission of instructor.

F 11:15. G. F. Combs, Jr. A practical consideration of principles of nutrition applied to feeding poultry, including use of linear programming techniques in diet formulation.

## AN SC 420 Quantitative Animal Genetics

 Fall. 3 credits. Prerequisite: AN SC 221 or equivalent.Lecs, T R 11:15; sec, W or R 2-4:25.
E. J. Pollak.

A consideration of problems involved in improvement of animals, especially farm animals, through application of the theory of quantitative genetics, with emphasis on selection index.

## [AN SC 425 Gamete Physiology and Fertilization

Fall. 2 credits. Limited to 50 students.
Prerequisite: AN SC 300 or equivalent.
Offered alternate years. Not offered 1994-95.
Lecs, R 2:30-4:25. J. Parks.
Study of the formation, growth, differentiation, and maturation of mammalian sperm and oocytes; gamete transport and interaction with male and female reproductive tracts; and cytological, physiological, and molecular changes required for fertilization. Lecture, discussion, and demonstration of selected aspects of gamete physiology and in vitro technologies such as oocyte maturation and fertilization.]

## AN SC 427 Fundamentals of Endocrinology

Fall. 3 credits. Prerequisite: animal or human physiology or permission of instructor.

Lecs, M W F 9:05. P. A. Johnson.
Physiology and regulation of endocrine secretions. Neuroendocrine, reproductive, growth, and metabolic aspects of endocrinology are emphasized. Examples are selected from many animals, including humans.

AN SC 430 Embryo Biotechnology
Fall. 1 credit. Prerequisite: a course in reproductive physiology and permission of instructor at preregistration. Limited enrollment. Fee of $\$ 50$ includes books and supplies.

All day, 5 days during fall or to be
arranged. R. H. Foote and X. Yang. Principles and practice of superovulation, freezing of embryos, in vitro fertilization, embryo collection, evaluation, embryo culture micromanipulation, and transfer in cattle and rabbits. Embryo transfer may require surgery.

## AN SC 455 Dairy Nutrition and Health

Fall. 3 credits. Prerequisite: AN SC 351 and permission of instructor.

Lecs, W F 12:20; lab, M or T 1:25-4:25; and
F (alternate weeks) 1:25-4:25.
D. M. Galton, K. Wagner.

Application of scientific principles to practical herd management with components of nutrition and herd health. Laboratories emphasize practical applications, analyses of alternatives, decision making, field trips, and discussion.

## AN SC 456 Dairy Management

 FellowshipSpring. 2 credits. Limited to seniors. Prerequisites: AN SC 351 and 455, and permission of instructor. S-U grades only.

Hours to be arranged. D. M. Galton,
K. Wagner.

The program is designed for undergraduates who have a sincere interest in dairy farm management. Objectives are to gain further understanding of the integration and application of dairy farm management principles and programs with respect to dairy farmers' objectives and methodology, to expand the concept of team approach in the development and implementation of management programs, and to gain further understanding of the role of research and industry in agriculture.

## AN SC 457 Livestock Fellowship

Spring. 2 credits. Prerequisite: permission of instructor. S-U grades only.

F 1:00-4:25. D. E. Hogue.
A program for students with particular interests in meat animal production, beef cattle, sheep, and swine. Objectives are to gain a more thorough understanding of the production of these species and their integration in various farm management situations. Students will participate in extension education programs and have contact with representative livestock producers as well as the agribusiness organizations important to livestock production.

## [AN SC 490 Commercial Meat

 ProcessingSpring. 3 credits. Prerequisite: AN SC 290 or permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, T R 9:05; lab, T 1:25-4:25. Field trip
to commercial meat processing plants.
D. H. Beermann.

A study of the classification, formulation, and production of commercially available processed meat products. Physical and chemical characteristics of meat and nonmeat ingredients; their functional properties; various processing methodologies; microbiology; packaging, handling, and storage; and quality assurance are discussed.]

AN SC 494 Special Topics in Animal Science
Fall or spring. 4 credits maximum. S-U grades optional.
The department teaches "trial" courses under this number. Offerings vary by semester and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## AN SC 496 Animal Sciences Honors Seminar

Fall weeks 1-8. 1 credit. S-U grades only. Students must be accepted into the Animal Sciences Honors Program.

Disc, M 2:30-4. W. B. Currie.
The course is designed to provide information and guidance for students enrolled in the honors program in animal sciences and expecting to complete an honors thesis. The following topics will be presented and discussed: requirements and expectations of the honors program, formulating hypotheses, the scientific method, literature search techniques ethics in science, and scientific communication. Students are required to make verbal presentations.

## AN SC 497 Individual Study in Animal Science

Fall or spring. 1-3 credits; may be repeated for credit. Intended for students in animal sciences. Prerequisite: permission of instructor. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional. Staff.
May include individual tutorial study or a lecture topic selected by a professor. Since topics may change, the course may be repeated for credit.

## AN SC 498 Undergraduate Teaching

 Fall or spring. 1 or 2 credits; 4 credits maximum during undergraduate career. Limited to students with grade-point averages of at least 2.7. Students must register with an Independent Study form (available in 140 Roberts Hall).Designed to consolidate the student's knowledge. A participating student assists in teaching a course allied with the student's education and experience. The student is expected to meet regularly with a discussion or laboratory section, to gain teaching experience, and regularly to discuss teaching objectives, techniques, and subject matter with the professor in charge.

## AN SC 499 Undergraduate Research

Fall or spring. 6 credits maximum during undergraduate career. Not open to students who have earned 6 or more undergraduate research credits elsewhere in the college. Limited to juniors and seniors with gradepoint averages of at least 2.7. Students must register with an Independent Study form (available in 140 Roberts Hall).
Affords opportunities for students to carry out independent research under appropriate supervision. Each student is expected to review pertinent literature, prepare a project outline, conduct the research, and prepare a report.

## AN SC 600 Research

Fall or spring. Credit to be arranged.
S-U grades optional.
Hours to be arranged.
Faculty in the field of animal science.

AN SC 601 Amino Acids (also Nutritional Sciences 601)
Spring. 2 credits. Prerequisites: physiology, biochemistry, and nutrition. Offered altemate years.

Lecs, W F 12:20. R. E. Austic.
A course emphasizing the dynamic aspects of protein digestion and absorption, amino acid transport and amino acid and nitrogen metabolism, and their relationships to the requirements for, and nutritional interactions of, amino acids.

## AN SC 604 Vitamins

Fall. 2 credits.
T R 10:10. G. F. Combs, Jr.
The biochemical, physiological, and clinical aspects of the vitamins presented in an interactive discussion-based format.

AN SC 605 Forage, Fiber, and the Rumen Spring. 4 credits. Prerequisites: either general nutrition and biochemistry or permission of instructor. S-U grades optional. Offered alternate years.

M W F 12:20; disc, W 11:15 or F 1:25.
P. J. Van Soest.

Ruminant nutrition; lower-tract fermentation in monogastrics; nutritional biochemistry of forage plants, fiber, and cellulosic material.

## AN SC 610 Seminar

Fall and spring. 1 credit. S-U grades only. T 4:15. Department faculty.

## AN SC 613 Forage Analysis

Spring. 2 credits. Prerequisite: permission of instructor. S-U grades optional.

Lab, R 2-4. P. J. Van Soest.
Chemical composition and nutritive evaluation of forage plants and related materials. The course includes a term paper summarizing results of independent laboratory study of either materials or methods.

## AN SC 619 Field of Nutrition Seminar

Fall and spring. No credit. No grades given. M 4:30. Faculty and guest lecturers.
Lectures on current research in nutrition
AN SC 620 Seminar in Animal Breeding
Fall and spring. 1 credit. Limited to graduate students with a major or minor in animal breeding. S-U grades only.

Hours to be arranged.

## AN SC 621 Seminar: Endo/Reprod Biology

Fall and spring. 1 credit. Prerequisites: Permission of instructor. Registration limited to graduate students. S-U grades only.

W 4:30. W. R. Butler and staff.
Current research in reproductive physiology is presented by staff members, graduate students, and visitors.

## AN SC 630 Bioenergetics/Nutritional Physiology

Spring. 3 credits. Prerequisites: AN SC 410 and biochemistry or physiology, or permission of instructor. S-U grades optional. Offered alternate years.

Lec, M W F 10:10. A. W. Bell and
D. E. Bauman.

An integrated systems approach to the nutritional physiology and energy metabolism of productive animals. Emphasis on extracellular regulation of tissue and organ metabolism of specific nutrients in relation to pregnancy, lactation, and growth. Critical discussion of techniques and approaches to the study of animal bioenergetics.

## AN SC 640 Individual Study in Animal Science

Fall or spring. 1 or more credits. S-U grades optional

Hours to be arranged. Staff.
Study of topics in animal science more advanced than, or different from, other courses. Subject matter depends on interests of students and availability of staff.

## AN SC 694 Special Topics in Animal Science

Fall or spring. 4 credits maximum
S-U grades optional.
The department teaches "trial" courses under this number. Offerings vary by semester and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number

## AN SC 720 Advanced Quantitative Genetics

Spring. 3 credits. Prerequisites: matrix algebra, linear models, and mathematical statistics. S-U grades optional. Offered alternate years. Not offered 1994-95.

Hours to be arranged. R. L. Quaas. Estimation of genetic and environmental parameters required to design efficient selection programs. Emphasis is given to interpretation of experimental and survey data with unequal subclass numbers, and prediction of genetic progress resulting from alternative selection methods.]

## Related Courses in Other Departments

Introductory Animal Physiology (BIOAP 311) Introductory Animal Physiology Laboratory (BIOAP 319)

Milk Quality (FOOD 351)
Agriculture in the Developing Nations (INTAG 602 Lipids (NS 602)
Basic Immunology, Lectures (BIOBM 305)
Basic Immunology, Laboratory (BIOBM 307)

## BIOLOGICAL SCIENCES

The program of study in biology is offered by the Division of Biological Sciences. For course descriptions, see the section on the Division of Biological Sciences.

## BIOMETRY AND STATISTICS

C. E. McCulloch, chair; N. S. Altman, G. Casella, C. Castillo-Chavez, G. A. Churchill, S. J. Schwager, S. R. Searle

Courses in biometry and statistics are offered by the Biometrics Unit in the Department of Plant Breeding and Biometry.

## BTRY 102 Introduction to Biometry

 Fall. 3 credits. S-U grades optional. Prerequisites: ALS 115 or equivalent.Lec, M W 11:15-12:05; lab, 2 hr. and 25
min. to be arranged. C. Castillo-Chavez. An introductory survey course in the use of mathematics, computing, and probability and statistics in the biological sciences. Case studies are used to develop the ideas of statistics, curve fitting, elementary matrix algebra, basic probability, and differentiation Selected topics in differential and difference
equations and integration will also be covered. A symbolic mathematics and graphics package (e.g., Maple or Mathematica) will be taught and used throughout the course.

## BTRY 200 Statistics and the World We

 Live InSpring. 3 credits.
Lecs, T R 10:10-11:25; disc, 1 hr . to be arranged. Staff
Major concepts and approaches of statistics are presented at an introductory level. Three broad areas are covered: collecting data, organizing data, and drawving conclusions from data. Topics include sampling, statistical experimentation and design, measurement, tables, graphs, measures of center and spread, probability, the normal curve, confidence intervals, and statistical tests.

## BTRY 215 Introduction to Statistical

 MethodsFall. 3 credits. Prerequisite: BTRY 200 is recommended for students with no prior experience in data collection and interpretation.

Lecs, M W F 11:15; lab, 50 min . to be arranged. R. W. Doerge.
Statistical methods are developed and used to analyze data arising from the biological sciences. Topics include point and confidence interval estimation, hypothesis testing, t-tests, correlation, simple linear regression, and analysis of variance and multiple regression. Statistical computing is taught and used throughout the course. Emphasis is on proper use of statistical methodology and interpretation of statistical analyses.

## BTRY 408 Theory of Probability

Fall. 4 credits. Prerequisite: MATH 112, 122 or 192 , or permission of instructor.

Lecs, M W F 10:10; disc, M 3:35-5
G. A. Churchill.

An introduction to probability theory foundations, combinatorics, random variables and their probability distributions, expectations, generating functions, and limit theory Biological and statistical applications are the focus. Can serve as either a one-semester introduction to probability or a foundation for a course in the theory of statistics.

## BTRY 409 Theory of Statistics

Spring. 4 credits. Prerequisite: BTRY 408 or equivalent.

Lecs, M W F 10:10; disc, M 3:35-5.
C. E. McCulloch.

The concepts developed in BTRY 408 are applied to provide an introduction to the classical theory of parametric statistical inference. Topics include sampling distributions, parameter estimation, hypothesis testing, and linear regression. Students seeking applied courses in statistical methodology should consider BTRY 601-602 or BTRY 215

## BTRY 417 Matrix Algebra

Fall. 3 credits. Prerequisite: precalculus mathematics.

Lecs, M W F 9:05; disc, M 1:25-3:10
C. E. McCulloch and S. R. Searle Definitions, basic operations and arithmetic, determinants, and the inverse matrix. Rank, linear dependence, canonical forms, linear equations, generalized inverses and eigenroots and vectors. Emphasis is on understanding basic ideas and on developing skills for applying matrix algebra.

## BTRY 451 Mathematical Modeling of Populations

Fall. 3 credits. S-U grades optional. Prerequisites: MATH 111 and 112, or equivalent. Offered alternate years. Not offered 1995-96. Lecs, M W F 1:25-2:15.
C. Castillo-Chavez

This course concentrates in the analysis and simulation of mathematical models, and it will focus in the study of models relevant to population genetics and population biology. Mathematical techniques that are relevant to these areas will be presented. The course will emphasize stochastic and deterministic models. Computer simulations and the use of mathematical packages will be an integral part of this course.

BTRY 494 Undergraduate Special Topics in Biometry and Statistics
Fall or spring. 1-3 credits. S-U grades optional.

Staff.
A course of lectures selected by the faculty. Because topics usually change from year to year, this course may be repeated for credit.

## BTRY 495 Statistical Consulting

Spring. 2 credits. S-U grades only. Limited to undergraduates. Prerequisites or co-requisites: BTRY 409 and 602 and permission of instructor.

Lec, W 1:25-2:15 plus 1 hr . of consulting
to be arranged. Staff.
Participation in the Biometrics Unit consulting service: faculty-supervised statistical
consulting with researchers from other disciplines. Discussion sessions for joint consideration of selected consultations encountered during previous weeks

## BTRY 497 Undergraduate Individual

 Study in Biometry and StatisticsFall or spring, 1-3 credits. S-U grades
optional. Students must register with an Independent Study form (available in 140 Roberts Hall).

Staff.
Consists of individual tutorial study selected by the faculty. Because topics usually change from year to year, this course may be repeated for credit.

## BTRY 498 Undergraduate Supervised

 TeachingFall or spring. 2 credits. S-U grades only Students must register with an Independent Study form (available in 140 Roberts Hall). Staff.
Students assist in teaching a course appropriate to their previous training. Students will meet with a discussion or laboratory section and regularly discuss objectives with the course instructor.

BTRY 499 Undergraduate Research
Fall or spring. $1-3$ credits. S-U grades optional. Limited to statistics and biometry undergraduates. Prerequisite: permission of faculty member directing research. Students must register with an Independent Study form (available in 140 Roberts Hall).

Staff.

## BTRY 600 Statistics Seminar

Fall or spring. 1 credit. S-U grades only. Sem, w 3-4:30. Staff.

## AGRICULTURE AND LIFE SCIENCES - 1994-1995

## BTRY 601 Statistical Methods I

Fall and summer. 4 credits. Limited to graduate students; others by permission of the instructor.

Lecs, M W F 12:20; lab, 1 hr . and 30 min .
to be arranged. C. E. McCulloch Statistical methods are developed and used to analyze data arising from a wide variety of applications. Topics include descriptive statistics, point and interval estimation, hypothesis testing, inference for a single population, comparisons between two populations, one- and two-way analysis of variance, comparisons among population means, analysis of categorical data, and correlation and regression analysis. Interactive computing is introduced through MINITAB statistical software. Emphasis is on basic principles and criteria for selection of statistical techniques.

## BTRY 602 Statistical Methods II

Spring. 4 credits. Limited to graduate students; others by permission of instructor. Prerequisite: BTRY 601 or equivalent.

Lecs, M W F $11: 15$; lab, 1 hr . and 30 min .
to be arranged. Staff.
A continuation of BTRY 601. Emphasis is on the use of multiple regression analysis, analysis of variance, and related techniques to analyze data in a variety of situations. Topics include an introduction to data collection techniques; least squares estimation; multiple regression; model selection techniques; detection of influential points, goodness-of-fit criteria; principles of experimental design; analysis of variance for a number of designs, including multi-way factorial, nested, and split plot designs; comparing two or more regression lines; and analysis of covariance. Emphasis is on appropriate design of studies prior to data collection, and the appropriate application and interpretation of statistical techniques. For practical applications, computing is done with the MINITAB and SAS statistical packages.

## BTRY 603 Statistical Methods III

Fall or spring. 3 credits. Prerequisite: BTRY 601 and 602 or permission of instructor. Offered alternate years. Offered Spring 1995.
G. A. Churchill.

Categorical data analysis, including logistic regression, loglinear models, combining contingency tables, and applications to case control studies. Statistical aspects of survival analysis, and statistical analyses for clinical trials.

## [BTRY 604 Statistical Methods IV:

 Applied DesignFall or spring. 3 credits. Prerequisites: BTRY 601 and 602 or permission of instructor. Offered alternate years. Not offered 1994-95.
G. Casella.

Applications of experimental design including such advanced designs as split plots,
incomplete blocks, fractional factorials. Use of the computer for both design and analysis will be stressed, with emphasis on solutions of real data problems.l
[BTRY 605 Applied Regression Analysis Fall, $1 / 3$ of the term. 1 credit. Prerequisites: BTRY 409 and 602 . Offered alternate years. Not offered 1994-95.
A continuation of BTRY 602, with emphasis on data analysis including logistic and nonlinear regression.]

## BTRY 606 Sampling Biological

 PopulationsFall, $1 / 3$ of the term. 1 credit. Prerequisite: BTRY 601 or equivalent. Offered alternate years. Not offered 1995-96.
S. J. Schwager.

Standard methods of sample-survey design and estimation are presented, including stratified random sampling, cluster sampling, double sampling, and variable probability sampling. Special emphasis given to methods of particular utility or specifically designed for biological sampling. Examples are taken from forestry, fisheries, and other biological areas.

## [BTRY 607 Nonparametric and

Distribution-Free Statistical Methods Spring, $1 / 3$ of the term. 1 credit. S-U grades optional. Prerequisite: BTRY 601 or equivalent. Offered alternate years. Not offered 1994-95.

Staff.
Nonparametric and distribution-free alternatives to normal-theory testing procedures are presented: sign or rank tests for one or two populations; analyses for completely randomized and randomized blocks designs; comparisons among several means; correlation and regression; goodness-of-fit: and tests based on randomization of the data.]

## BTRY 639 Epidemiology Seminar (also Nutritional Sciences 639)

Fall and spring. 1 credit, variable. S-U grades only. Permission of instructor.

Sem, M 12:20. Staff.
This course will develop skills in the preparation and interpretation of epidemiological data by discussing current research topics and issues.
[BTRY 642 Advanced Mathematical Methods in Biometry and Statistics Spring. 3 credits. S-U grades optional. Prerequisites: MATH 411 or 421 , or equivalent. Offered alternate years. Not offered 1994-95.

Lecs, T R 12:20-1:50. C. Castillo-Chavez. This advanced level course will cover classical mathematical methods that are useful in statistics, biometry, and biomathematics, with an introduction to MACSYMA. Topics include: Introduction to MACSYMA, complex numbers and their elementary properties, analytic functions, contour integration, special functions, asymptotic methods, generalized functions, and the Fourier transform. Techniques will be illustrated with examples drawn from statistics, biometry, and biomathematics.]

## [BTRY 651 Mathematical Population

 Studies and ModelingSpring. 3 credits. S-U grades optional. Prerequisites: BTRY 408 and 417, or equivalent. BTRY 409 is recommended. Offered altemate years. Not offered 1994-95.

Lecs, T R 12:20-1:50. C. Castillo-Chavez. Model formulation, parameter estimation, and mathematical analysis of stochastic and deterministic models in population dynamics. Emphasis will be put on the interactions between human demography and sociology (human behavior), and their relationship to disease dynamics of microparasitic and macroparasitic infections. The process of pair formation and dissolution and their impact on demography, sociology, and epidemiology will also be studied.]

## BTRY 662 Mathematical Ecology (also BIOES 662)

Spring. 3 credits. Prerequisites: a year of calculus and a course in probability. Offered alternate years. Not offered 1995-96.

Lecs, M W F 12:20. Staff.
Mathematical and statistical analysis of populations and communities: theory and methods. Spatial and temporal pattern analysis, deterministic and stochastic models of population dynamics. Model formulation, parameter estimation, and simulation and analytical techniques.

## BTRY 681 Topics in Environmental

 StatisticsFall and spring. 2 credits. S-U grades optional. Prerequisite: BTRY 601 or permission of the instructor.

Lec, R 10:10-11:25. Staff.
This course is a discussion group focusing on statistical problems arising in the environmental sciences. These issues are explored in a number of different ways, such as student presentations of research papers, directed readings, and outside speakers.

## BTRY 694 Graduate Special Toples in Biometry and Statistics

Fall or spring. $1-3$ credits. S-U grades optional.

Staff.
A course of lectures selected by the faculty. Because topics usually change from year to year, this course may be repeated for credit.

## BTRY 697 Individual Graduate Study in Biometry and Statistics

Fall, spring, or summer. $1-3$ credits. S-U grades optional.

Staff.
Consists of individual tutorial study selected by the faculty. Since topics usually change from year to year, this course may be repeated for credit.

## BTRY 717 Linear Models

Spring. 3 credits. S-U grades only. Prerequisites: BTRY 409 or equivalent and BTRY 417 and 602. Offered alternate years. Not offered 1995-96.

M W F 11:15. S. R. Searle.
Analysis of variance and estimation procedures for unequal-subclass-numbers data. Cell means models for the 1 -way classification, nested classifications, and the 2 -way crossed classification, both with and without interactions; introduction to multinormal variables and the distribution of quadratic forms. The general linear model (in matrix and vector form), estimable functions, and testable hypotheses. Overparameterized models, restricted models, multifactor cases, covariables, computing.

## [BTRY 718 Variance Components

 Spring. 3 credits. S-U grades only. Prerequisite: BTRY 717. Offered alternate years. Not offered 1994-95.S. R. Searle.

Several methods of estimating variance components are explained and compared: for balanced data (equal subclass numbers), the analysis of variance method; for unbalanced data (unequal subclass numbers), the three Henderson methods and the methods of maximum likelihood, restricted maximum likelihood, and minimum norm quadratic unbiasedness. Also included: estimation from mixed models, prediction of random variables, the dispersion-mean model, and computer package output for variance component estimation.]

BTRY 795 Statistical Consulting
Fall and spring. 2 credits. S-U grades only. Limited to graduate students.

Lec, W $1: 25$ and 1 hr . of consulting to be arranged. Staff.
Participation in the Biometrics Unit consulting service: faculty-supervised statistical consulting with researchers from other disciplines. Discussion sessions for joint consideration of selected consultations encountered by the service during previous weeks. Since consultations usually change from semester to semester, this course may be repeated for credit.

## BTRY 899 Research

Fall or spring. Credit to be arranged. S-U grades only. Limited to candidates for graduate degrees. Prerequisite: permission of the graduate field member concerned. Research at the M.S. level.

## BTRY 999 Research

Fall or spring. Credit to be arranged. S-U grades only. Limited to candidates for graduate degrees. Prerequisite: permission of the graduate field member concemed. Research at the Ph.D. level.

## COMMUNICATION

R. D. Colle, chair; N. E. Awa, B. O. Earle,
G. Gay, C. J. Glynn, D. A. Grossman,
J. E. Hardy, B. Lewenstein, A. Marshall,
D. G. McDonald, R. E. Ostman, T. M. Russo,
C. Scherer, D. F. Schwartz, M. A. Shapiro,
P. Stepp, R. B. Thompson, M. Toor,
L. VanBuskirk, W. B. Ward, S. A. White,
J. P. Yarbrough

The middle and last digits of course numbers are used to denote specific areas:
00-09 Speech communication
10-19 Interpersonal communication
20-29 Mass communication
30-39 Visual communication and graphic design
40-49 Electronic media
50-59 Journalistic writing
60-66 Professional writing
67-69 Editing
70-79 Communication planning and strategy (advertising and public relations)
80-89 Research methods and interdisciplinary courses
90-94 Special topics and seminars
95-99 Individualized study

## COMM 116 Theories of Human Communicatlon

Spring or summer. 3 credits. Not open to first-semester freshmen. S-U grades optional. Spring: lecs, M W 12:20; disc., F 12:20. Staff.
Designed to introduce students to the basic areas of study common in communication theory and research. Basic ideas and theories about language, interpersonal communication, small-group communication, nonverbal
communication, organizational communication, and the mass media will be covered.

## COMM 120 Understanding Mass

 CommunicationFall: lecs, M W 12:20; sec. 1, R 12:20, sec. 2, R 12:20, sec. 3, F 10:10, sec. 4, F 10:10, sec. 5 , F 12:20, sec. 6, F 12:20. D. McDonald. Mass communication and its impact. Emphasis on understanding contemporary mass communication through four approaches: the information revolution; living in the information sociery; contemporary research and theory; and implications of mass communication in understanding contemporary social issues.

## COMM 190 Communication Perspectives

 SeminarFall. 1 credit. S-U grades optional.
Lec, M 1:25. B. O. Earle and staff. Open to freshmen/transfer students in the Department of Communication. The course will provide an orientation to the department and university and serve as a forum to discuss contemporary and future roles of communication in society. Presentations by Cornell faculty and staff members, and by professionals in the field. Topics will be selected from areas such as new technology, constitutional and policy issues, career opportunities, professionalism and ethics, societal changes and implications.

## COMM 191 Topics In Communication

 Summer. 1-3 credits.Hours to be arranged. Staff.
Sudy of topics in communication at lowerdivision level. Special emphasis on topics reflecting the expertise of visiting faculty available in summer session and on topics suitable for entry-level college students.

## COMM 201 Oral Communication

Fall, spring, or summer. 3 credits. Each section limited to 24 students (fall and spring) or 15 students (summer). Preference given to sophomores, juniors, and seniors. Fluency in spoken English is assumed. Students missing the first two class meetings without university excuse are dropped so others may register. No student will be added or dropped after the second week of classes.

Disc, M W F 8; M 8 and W F 9:05; M 9:05 and W F 8; M W F 9:05; M 9:05 and W F
10:10; M 9:05 and W F 11:15; M 9:05 and
W F 12:20; M W F 10:10; M 10:10 and W F 11:15; M F $11: 15$ and W 1:25; M F 12:20
and W 1:25; M 12:20 and W F 9:05; M
12:20 and W F 10:10; M W F 1:25; M T W
12:20; T R 9:05 and W 12:20; T R 10:10 and W 12:20; T R 10:10 and W 1:25; T R 11:15 and W 12:20; T R 11:15 and W 1:25; T W R 12:20; T W R 1:25; M 10:10 and T R 9:05; M T R 10:10. Some section times may be omitted in some semesters.
R. B. Thompson, T. Russo, M. Korcok, and staff.
Through theory and practice students develop self-confidence and competence in researching, organizing, and presenting material to audiences. Students give four graded speeches, write short papers, perform speaker evaluations, and engage in other speechrelated activities.

## COMM 203 Argumentation and Debate

Fall, spring, or summer. 3 credits.
T R 10:10-11:35. P. Stepp.
The student will learn the principles of argumentation and the rules of debate. Classroom debates on the CEDA national topic will provide experience in critical thinking, rapid organization of thoughts, employment of
research, and writing and speaking in a logical, persuasive manner.

## COMM 204 Effective Listening

Fall, spring, or summer. 3 credits. Limited to 25 nonfreshman students per section. No students accepted or allowed to drop after the second week of classes.

Lec, M 1:25-2:40; sec., T, W, R, F
1:25-2:40, or R 2:50-4:05 (two evening prelims per semester). Staff.
Lecture and sections are used to present an analysis of the process of listening, to identify barriers to effective listening, and to develop students' listening skills. Topics include audiology, cultural contexts, intercultural communication, linguistics, therapeutic
listening, and critical analysis of information. Students are involved in skill-building exercises and in writing self-analytical papers, as well as attending seminars.

## COMM 216 Communicating

Interpersonally
Fall, spring, or summer. 3 credits. Prerequisite: COMM 116 or permission of instructor. Not open to freshmen. Communication sophomore majors are given first priority.

Lecs, T R 10:10-11:25. Staff.
The course emphasizes understanding the dynamics affecting interpersonal communication in personal, social, and professional circumstances. It addresses self-awareness, assertiveness, person perception, attraction, and conflict management. Instruction techniques include in-class exercises, assigned reading, class discussion and lecture, plus report of field observation and journal-

## keeping assignments.

## COMM 230 Visual Communication

Fall. 3 credits. Limited to nonfreshmen and communication freshmen. Not recommended for design or ant majors. Cost of individual project materials, $\$ 20-\$ 30$.

Lec, T R 9:05; computer lab 1, T 1:25-3:20,
lab 2, R 10:10-12:05, lab 3, F 1:25-3:20, lab
4, F 10:10-12:05. Scherer.
A basic course in the use and importance of visual communication. Course focuses on objectives, audiences, and methods of visual production. Particular emphasis is placed on the visual communication of scientific and technical information. The laboratory concentrates on the use of computers for production of visual materials. Practical projects are assigned.

## COMM 232 Art of Publication

Fall, spring, or summer. 3 credits. Each lab limited to 25 nonfreshman students. Students missing the first two classes without university excuse are dropped so others may register. Project materials cost $\$ 50-\$ 75$.

Fall and spring. M or W 1:25-4:25.
M. Toor.

A basic course designed to explore visual concepts that increase communication effectiveness through the printed word. The importance of selecting and coordinating format, layout, typography, and illustrations is stressed. Lectures, in-class laboratory assignments, and outside projects examine opportunities and problems in publication design and desktop publishing.

## COMM 250 Newswriting for Newspapers

 Fall, spring, or summer. 3 credits. Limited to 25 students. Prerequisite: Major in communication, or permission of instructor. Keyboarding ability essential. Students missing first two classes without university excuse will bedropped.

Lec, R 1:25-2:20; lab, R 2:30-4:25, plus out-of-class writing assignments. Staff. Writing and analyzing news stories. A study of the elements that make news, sources of news, interviewing, writing style and structure, press problems, and press-society relations. Concentration on newswriting as it is practiced by newspapers in the United States. Two writing assignments each week, one done in class, one done out of class.

## COMM 272 Principles of Public Relations

 and AdvertisingFall or summer. 3 credits. Preference given to ALS students. Not open to freshmen. Lecs, M W F 12:20. Staff.
Survey of the fields of public relations and advertising. Descriptions of organizations, jobs, and functions in the industry. The roles of public relations and advertising in society, the economic system, and organizations. Psychological and sociological principles as bases for appeals. Strategies for media selection and message execution. Introduction to research and regulation.

## COMM 280 Critical Thinking about Communication*

Spring. 3 credits. Prerequisite: Comm 116, 120 , and at least one writing or oral communication course. Communication majors only. Not open to freshmen. Communication sophomores given priority. Each section limited to 17 students.

T R 12:20-1:50; T R 2:30-4:00. Staff. Expanding upon conceptual knowledge gained in introductory communication courses, students will learn critical thinking in the context of communication topics, issues, problems, and questions selected annually by individual instructors. After leaming, discussing, and practicing critical thinking, students will have an enhanced ability to create and sustain responsible dialogue, as well as to evaluate implications and applications of thought.
*Pending approval by College Curriculum Committee
COMM 284 Cender and Communication Spring. 3 credits. Not open to freshmen. M W F 2:30. L. VanBuskirk and staff. The course explores the construction of gender and personal, social, and economic implications of gender categories. Topics considered include history, social structures, personal relationships, nonverbal and mass communication. Distinctions among ways that the arts, mass media, social and historical forces, and intra- and interpersonal relationships communicate gender will be considered.

## COMM 301 Business and Professional

 SpeakingFall, spring, or summer. 3 credits. Prerequisite: COMM 201.

Lec, M 11:15; sec., T 2:30-4:25, W
11:15-1:10 or R 10:10-12:05. B. Earle. The study and practice of written and oral communication skills used in formal and informal organizations, including interviews, informative and persuasive speeches, reports, and discussions. Students exercise and enhance the organizational, analytical, and presentational skills needed in particular settings suited to their own business and professional careers.

COMM 303 Advanced Public Address I
Fall and spring. 2 credits. Limited to 10-15 Program in Speech and Debate members only; permission of instructor and completion of one-year trial basis.

To be arranged. P. Stepp.
The first course in a year-long sequence Students prepare and present speeches not covered in introductory courses, including limited preparation events (e.g., extemporaneous speaking, in which one composes and presents a speech on current events within a 30 -minute period); rhetorical criticism (students apply analytic tools to extant speeches to reveal their structure and intent); and special events, which typically involve unusual constraints upon the speaking situation. Students also do advanced work in informative and persuasive speech. Students prepare a minimum of four different kinds of speeches for tournament presentation.

## COMM 304 Oral Interpretation of

 LiteratureFall or spring. 2 credits. Limited to $10-15$ Program in Speech and Debate members only; permission of instructor and completion of one-year trial basis.

To be arranged. P. Stepp. Students consider the structures of literary works for intellectual and emotional content; practice the techniques of composing programs of prose, poetry, or drama for presentation; and develop the skills necessary to realize such programs in live performance. Students prepare a minimum of three different programs for tournaments.
COMM 314 Small-Group Communication Spring. 3 credits. Limited to juniors and seniors. Prerequisite: COMM 116 or permission of instructor.

T R 1:25-2:45. N. E. Awa.
The course is designed to help students explore the dynamics of group interaction processes through exposure to small-group constructs and research and development of skills vital to application of principles to real life situations. The approach is eclectic, covering theories from such cognate fields as psychology, sociology, education, and organizational behavior. Students will learn experientially about groups by participating in group (problem solving) projects. Among the areas covered are the role of groups in contemporary society, leadership, decision making and problem solving techniques, conflict management and resolution, groups in business and industry, and team development.

## COMM 316 Rhetorical Theory

Fall. 3 credits. Limited to 20 students. Communication majors have preference. Prerequisites: COMM 116 and 201 or permission of instructor.

M W F 1:25. R. Thompson.
Considers current views of rhetoric in historical perspective. Shows how assumptions about communication both shape the worldview of the communicator and either aid or hinder the reaching of various communication goals. Treats historical figures briefly; focuses on contemporary thinkers such as Toulmin, Ong, Burke, Habermas, Foucault, Perelman, Richards, Kuhn. Second half of course taught in seminar format.

## COMM 342 Electronic Media

Spring or summer. 3 credits. Limited to 18 communication majors. Prerequisite: COMM 120.

Lec, R 1:25; lab, R 2:30-4:25. T. Russo.

The techniques of audio and video message design and production. Emphasis on development of skills needed for the creation of effective audio/video production. Students complete exercises designed to develop specific competencies and work on productions from conception through completion.

## [COMM 346 Television Writing and

 Production ProjectsFall. 3 credits. Limited enrollment. Permission of instructor required. Prerequisite: COMM 342. Preference given to communication majors. Not offered 1994-95.

Arranged. Staff.
Video and audio production projects. Students gain experience in studio and field production. Course concentrates on developing a sense of project planning and production aesthetics. Production concentration is on producing full-scale information, documentary, or public affairs programs from development of the idea through research, scripting, planning, and production.]
COMM 348 Video Communication
Fall. 3 credits. Prerequisites: COMM 342, and/or permission of instructor.

R 1:25-4:25. S. A. White. An overview of video communication research and application, visual thinking and articulation as foundation for constructing messages using participatory approaches. Covers basics of interactive media. Hands-on team project, which integrates knowledge and skill in theory and practice. Students have access to camcorders and editing equipment. Emphasis is on use of video as a communication tool in organizations grounded in organizational and visual communication theory.

## COMM 350 Writing for Magazines

Fall or spring. 3 credits. Limited to 25 juniors, seniors, and graduate students, or others with permission of instructor. No drops after third week. Extensive out-of-class writing assignments.

Fall: M 1:25-4:25, W. B. Ward; spring:
T R 11:15-12:45. Staff.
A course in nonfiction freelance writing for magazines. Intensive fact writing to help students communicate more effectively through the medium of the printed word in magazines. Art and techniques of good writing are studied; magazines in many fields of interest are reviewed. All articles are analyzed and returned to the student to rewrite and submit to a magazine.
COMM 352 Science Writing for the Mass Media
Fall. 3 credits. Not open to freshmen. Limited to 25 students. Prerequisite: one college writing course.
lecs, M W; 9:05. Lab, F to be arranged. B. Lewenstein.

How to write about science, technology, and medicine for the mass media. Discussion topics include accuracy, simplicity, comprehensiveness, risk communication, and the history and social structure of science. Writing assignments focus on writing news and feature stories for newspapers and magazines, with excursions into newsletters, radio, TV, and other media.

## COMM 354 Print Media Laboratory

Fall. 3 credits. Limited to junior, senior, and graduate communication majors. Prerequisite: COMM 232, 250, or 350.

R 1:25-4:25. J. E. Hardy and staff.

Writing, editing, and layout principles practiced in publishing the Cornell Countryman. Some additional outside work will be required. Students will use microcomputers.

COMM 356 Print Media Laboratory
Spring. 3 credits. Limited to junior, senior, and graduate communication majors Prerequisite: COMM 232, 250, or 350.

R 1:25-4:25. J. E. Hardy and staff. A continuation of Communication 354 Students will use microcomputers.

COMM 357 Advanced Reporting Fall and spring. 3 credits. Limited to 12 juniors and seniors.

T 1:25-4:25. Staff.
A course in sophisticated reporting techniques for students with basic reporting and newswriting skills. Students work independently on producing news stories of publishable merit. The emphasis is on information gathering, conducting document searches, document authentication, and identification of experts. Not open to graduate students.

## COMM 360 Scientific Writing for Public Information

Fall and spring. 3 credits. Limited to 25 nonfreshman or graduate students per section. Prerequisite: one college-level writing course. Fall: lecs, M W F 9:05, J. E. Hardy and staff, T R 9:05 and W 11:15, T R 10:10 and W 12:20, J. E. Hardy and staff. Spring: M W F 9:05, J. E. Hardy and staff, T R 10:10 and W 12:20, J. E. Hardy and staff
An intensive course in simplifying scientific and technical material for specific audiences within the general public. Weekly assignments include instructions, descriptions, explanations, and summaries in such formats as the newsletter, brochure, and report. Audience analysis will be emphasized. Not oriented to the mass media, or writing for scientists

## COMM 363 Organizational Writing

Fall, spring, or summer. 3 credits. Limited to 25 junior, senior, or graduate students per section. Prerequisite: any college-level writing course

M W F 11:15 and 12:20. L. VanBuskirk, and staff.
Students write as members of different organizations, in the position of supervisor, subordinate, colleague, and representative of business, government, community, and other organizations. Emphasis on adapting tone to the audience and the purpose of the message. Weekly writing assignments include various kinds of internal and external reports, memoranda, proposals, and letters. Assignments based on the Exxon Valdez oil spill and other case studies.

## [COMM 365 Writing in the Sciences and

 EngineeringSummer only. 3 credits. Limited to 25 junior, senior, or graduate students per section. Prerequisite: any college-level writing course. Not offered 1994-95.

M W F 10:10. Staff.
Students write scientific or technical material for colleagues in their own field. The objective is clear, concise writing, with attention to grammatical construction, usage, paragraph development, and organization. Weekly writing assignments include scientific or technical instructions, descriptions of equipment and procedures, definition and explanation of concepts, graphic presentations and discussion of data, abstract and summary,
memorandum, research proposal, progress report, and research report.]

## COMM 368 Editing

Spring. 3 credits. Limited to 25 junior, senior, or graduate students. Prerequisite: COMM $250,350,352$, or 360.

W F 10:10-11:25. J. E. Hardy Students will follow the process that takes a manuscript from final draft to page proof. Emphasis will be on copy editing, proofreading, fitting copy, working with authors, making editorial decisions, and developing skill in critical reading. Appropriate for any student who expects to work with manuscripts or do editorial work.

## COMM 375 Communication Planning and Strategy I

Spring. 3 credits. Limited to 35 juniors and seniors. Prerequisite: COMM 272 or permission of instructor.

Lec, T R 10:10-12:05. P. Yarbrough. Theories that guide and influence the solutions to public relations and public information problems in agriculture, business, government, social welfare, and other organizations. Examination of the process of the formation of public opinion. Discussion of research techniques and communication tools used in communication planning, and fundamentals of developing a communication plan. Case studies and projects.

## [COMM 376 Communication Planning and Strategy II

Spring. 3 credits. Limited to 25 juniors and seniors. Prerequisite: COMM 375 or permission of instructor. Not offered 1994-95.

Lec and lab, T R 10:10-11:40. C. Glynn. A continuation of Communication 375. Focus is on the development and implementation of actual communication campaigns. Students work closely with a community organization in designing and implementing a communication program.]

## COMM 380 Independent Honors

 Research in Social Science Fall or spring. $1-6$ credits. Limited to undergraduates who have met the requirements for the honors program.$B$. Lewenstein.

## COMM 382 Methods of Communication

 ResearchSpring. 3 credits. Limited to 20 junior, senior, or graduate communication majors; others by permission of instructor. Prerequisite: COMM 116 or 120 or permission of instructor.

Spring: M W 12:20, sec. 01, W 1:25-3:20,
sec. 02, F 10:10-12:05. P. Yarbrough. An analysis of the methods used in communication research. Emphasis on understanding the rationale for survey, textual, experimental, and ethnographic research methods. Development of class research project from research question to final report. Computer use of Statistical Package for the Social Sciences (SPSS) to assist in data analysis. Familiarity with basic statistical concepts helpful. Lectures concurrent with COMM 682 to promote interaction and learning across levels.

## COMM 402 Advanced Argumentation and Debate II

Fall and spring. 2 credits. Limited to $10-15$ Program in Speech and Debate members; permission of instructor required.

To be arranged. P. Stepp.
The second course in a year-long sequence that considers formal argumentation through lectures, readings, and practical exercises
including computer-aided case research, the construction of affirmative and negative debate cases, preparation of briefs, and participation in intercollegiate tournaments. The second semester places additional emphasis on argumentative and on general theories of argumentation.

## COMM 403 Advanced Public Address II

Fall and spring. 2 credits. Limited to $10-15$ Program in Speech and Debate members; permission of instructor required.

To be arranged. P. Stepp.
The second course in a year-long sequence Students prepare and present speeches not covered in introductory courses, including limited preparation events (e.g., extemporaneous speaking, in which one composes and presents a speech on current events within a 30-minute period); rhetorical criticism (students apply analytic tools to extant speeches to reveal their structure and intent); and special events, which typically involve unusual constraints upon the speaking situation. Students also do advanced work in informative and persuasive speech. Students prepare a minimum of four different kinds of speeches for tournament presentation.

## COMM 405 Communication and

 Leadership Challenge: Enrichment through InvolvementFail and spring. 2 credits. Limited to $10-15$ Program in Speech and Debate members; permission of instructor required.

To be arranged. P. Stepp. Students share their communication and leadership talents in structured experiences of help to others. They design and implement speech or debate projects for the benefit of one or more groups in our increasingly diverse population. Our students could create instructional modules with accompanying instructional materials for use in area schools and for local CATV and could appear at area public schools to demonstrate and teach their particular skill.

## COMM 410 Organizational Behavlor and

 CommunicationFall or summer. 3 creclits. Iabs limited to 15 junior, senior, or graduate students. Prerequisite: COMM 116 or equivalent.

Lec, T R 12:20; sec 01, W 12:20-2:15; sec.
02, R 2:30-4:25. D. Schwartz.
Study of management and leadership in formal organizations with emphasis on the psychology of communication between supervisor and employee; examination of formal and informal communication networks, and interpersonal communication in an organizational context. Case studies analyzed in lab. Lectures concurrent with COMM 510; graduate students should enroll in COMM 510.

## COMM 411 Leadership from a

Communication Perspective
Fall and spring. 3 credits. Limited to 30 students.

T R 12:20-2:15. P. Stepp and B. Earle. Leadership is a product of human communication. Leadership competence can be increased by increasing communication competence. Leadership theories, particularly transformational leadership will be studied, and gender/minority responsive leadership will be stressed. Practical application will include leadership exercises and observation of leaders.

## COMM 416 Psychology of

 CommunicationFall. 3 credits. Prerequisite: COMM 116, introductory psychology, or permission of instructor.

T R 10:10-11:25. N. E. Awa.
An advanced multidisciplinary study of psychological and sociological primary source materials that have influenced the development of communication theories and paradigms. Topics include thetoric and persuasion, power of language in advertising and social communication, behaviorism and social learning theories, attitudes and behavior, personal interaction, and effectiveness of messages. Students are expected to develop critical thinking skills for analyzing the work of major communication theorists.

## [COMM 418 Communication and

## Persuasion

Spring. 3 credits. Prerequisite: COMM 116 and 120 or introductory psychology or social psychology, COMM 382 or other introductory research methods course. Not offered 1994-95.

M W F 11:15 (one evening mid-semester prelim). M. Shapiro.
The course focuses on theories of communication influence on persuasion and attitude change. Students will become familiar with a variety of social-psychological theories of attitude change and persuasion. Those theories also will be applied to a variety of communication situations including mass communication, advertising, public relations public information, and interpersonal communication. Lectures concurrent with COMM 618; graduate students should enroll in COMM 618.]

## COMM 420 Public Opinion and Social

 ProcessesFall. 3 credits. Prerequisite: COMM 382; limited to seniors

T R 10:10-11:25. C. Glynn.
The course provides an overview of the theoretical and applied literature related to the concept "public opinion." Students investigate how public opinion is perceived and acted upon by society. Relationships between public opinion, communication and social psychological variables are examined. Public opinion is studied using current theoretical and practical applications. Analysis and interpretation of public opinion polls and trends in public opinion on specific issues. Lectures concurrent with COMM 620. Graduate students should enroll in COMM 620.

## COMM 421 Communication and the Environment

Spring. 3 credits. Limited to 20 junior, senior, or master's students or permission of the instructor.

T R 10:10-11:25. C. Glynn.
Students will investigate how values, attitudes. social structure, and communication affect public perceptions of environmental risk and public opinion about the environment. A primary focus will be mass media's impact in public perceptions of the environment, how the media portray the environment, and discussion of the implications of public consumption of environmental content.

COMM 422 Psychology of Television
Fall. 3 credits. Prerequisites: Introductory psychology and COMM 120; COMM 382 or other introductory research-methods course

M W F 12:20 (one evening mid-semester
prelim). M. Shapiro.
A survey of knowledge about the psychological influence of television and other audiovisual communication technologies. Topics may include: the history of concerns about television and movies, who watches television and why, how people understand and mentally process television, how television influences thinking and emotions, the effects of various forms (including entertainment, news, and advertising), the future forms of mass media including multimedia and virtual reality. Lectures concurrent with COMM 622; graduate students should enroll in COMM 622

## COMM 426 Ethics in the Media

Fall. 3 credits. Prerequisites: COMM 120 or permission of instructor.

Lecs, T R 9:05-10:35. L. Van Buskirk Course will examine the moral questions of deception, trade-offs in public vs. private interests, and manipulation in the context of specific issues arising in the daily operation of the media. Students will read or view cases, usually in advance of class, in preparation for discussion. In addition, there will be assigned readings in moral philosophy and ethics as background for case discussion. Requirements for the course are two papers, due midterm and at the end of the semester. Students from disciplines outside communication are encouraged to enroll.

## COMM 428 Communication Law

Spring. 3 credits. Limited to junior, senior, and graduate students; others by permission of the instructor.

M W F 11:15. D. A. Grossman. A practical survey of the law governing mass media, primarily for those working in the field. Coverage includes restraints on news gathering and publication, privacy, defamation, copyright, broadcast and cable regulation, access, and other issues of current interest

## COMM 439 Interactive Multimedia:

Design and Research Issues
Fall. 3 credits. Prerequisite: permission of instructor

Lec, T 10:10-1:10. G. Gay
An overview of interactive multimedia technologies (videodisc, CD-ROM, digital video technologies, computer graphics, and text). Course will focus on theories and research applicable to interactive multimedia such as visualization, learner control, mental models, knowledge representations, and information processing. Course will also emphasize interactive multimedia design, application, and evaluation.
COMM 460 Video Communication I: Basic Concepts and Theory, Planning, and Participatory Production
Summer only. 2 credits. Fee: $\$ 50.00$.
T R 9:00-4:00. S. White.
The course focuses on understanding video as a tool in development communication. Hands-on instruction covers use of the video portapak and editing systems. Participants produce videotapes emphasizing the power of images, video for individual feedback, group process ohservation, and process intervention for individual and community development.

COMM 461 Video Communication II: Video for Development/Social Intervention
Summer only. 3 credits. Prerequisite: COMM 460 or equivalent. Fee: $\$ 50.00$

M W F 10:00-1:00. S. White and staff. The use of video in participatory message construction within the context of development. In addition to classroom instruction, participants work as production teams with "grass-roots" groups to create a videotape design to meet a development objective.

## [COMM 465 Scientific Rhetoric

Spring. 3 credits. Not offered 1994-95.
T 2:30-4:30, discussion to be arranged.
B. Lewenstein, P. Dear.

Exploration of the development of scientific discourse since the Scientific Revolution, with special emphasis on understanding the rhetorical purposes served by differing forms and techniques both in historical context and in contemporary science. Readings will include classics from Newton, Darwin, Einstein, and others, along with representative samples of more routine scientific communications. Students will prepare brief reports and mid-term and final papers.]
COMM 466 Public Communication of Science and Technology
Fall. 3 credits. Limited to 15 students. Prerequisite: Comm 352 or 360 , or Engineering 350 , or permission of instructor.

W 1:25-4:25. B. Lewenstein.
Explore the structure, meanings, and implications of "public communication of science and technology" (PCST). Examine the contexts in which PCST occurs, look at motivations and constraints of those involved in producing information about science for nonprofessional audiences, analyze the functions of PCST. Tie existing ideas about PCST to general communication research, and learn how to develop new knowledge about PCST. Course format is primarily seminar/ discussion

## COMM 487 Communication, Mood, and

 EmotionFall. 3 credits. Prerequisites: COMM 382 or equivalent

M W F 1:25. D. McDonald. An examination of theory and research on communication and emotion. The course consists of the following seven areas: defining mood and emotion, tactics for investigation, emotion and cognition, mood and emotion as communication effects, communication as consequence, communication and mood management, and enduring issues. Lectures concurrent with COMM 687; graduate students should enroll in COMM 687.

## COMM 494 Special Topics in

Communication
Fall, spring, or summer. 1-3 credits variable. S-U grades optional. Prerequisite: permission of instructor.

Hours to be arranged. Staff.
Study of topics in communication not otherwise provided by a department course and determined by the interest of the faculty and students.

## COMM 496 Internship

Fall, spring, summer, and intersession. 1-3 credits. Students must apply no later than the spring pre-course enrollment period for a fall internship or the fall pre-course enrollment period for a spring or summer internship. Prerequisites: Limited to communication juniors or seniors, 3.0 average in communica-
tion courses, and approval of academic advisor. S-U grades only.

Arranged. Staff.
Structured, on-the-job learning experience under supervision of communication professionals in a cooperating organization Maximum of 6 credits total may be earned; no more than 3 per internship but flexibility allows 6 for 1 credit each, 3 for 2 credits each, or 2 for 3 credits each. Internships must be approved in advance by the student's academic adviser and must be supervised by a communication professional in fields of public relations, advertising, publishing, or broadcasting. Minimum of 60 on-the-job hours per credit required

## COMM 497 Individual Study in Communication

Fall or spring. 1-3 credits; may be repeated to 6 credits with a different supervising faculty member. Prerequisite: 3.0 cumulative average. Students must register with an Independent Study form (available in 140 Roberts Hall).

Staff.
Group or individual study under faculty supervision. Work should concentrate on locating, assimilating, synthesizing, and reporting existing knowledge on a selected topic. Attempts to implement this knowledge in a practical application are desirable.

## COMM 498 Communication Teaching Experience

Fall or spring. 1-3 credits; may be repeated to 6 credits with different courses. Limited to juniors and seniors. Intended for undergraduates desiring classroom teaching experience. Prerequisite: 3.0 cumulative average ( 2.7 if teaching assistant for a skill development course) and permission of the faculty member who will supervise the work and assign the grade. Students must register with an Independent Study form (available in 140 Roberts Hall).

Hours to be arranged. Staff. Periodic meetings with the instructor cover realization of course objectives, evaluation of teaching methods, and student feedback. In addition to ading with the actual instruction, each student prepares a paper on some aspect of the course.

## COMM 499 Independent Research

Fall or spring. 1-3 credits; may be repeated to 6 credits. Limited to seniors and graduate students. Prerequisite: 3.0 cumulative average. Students must register with an Independent Study form (available in 140 Roberts Hall).

Staff.
Permits outstanding students to conduct laboratory or field research in communication under appropriate faculty supervision. The research should be scientific: systematic, controlled, empirical. Research goals should include description, prediction, explanation, or policy orientation and should generate new knowledge.

## COMM 510 Organizational Behavior and Communication

Fall. 3 credits. Limited to seniors and graduate students. COMM 116 suggested. Lecs, T R 12:20; sec, W 3:00-5:00.
D. Schwartz.

Study of management and leadership in formal organizations with emphasis on the psychology of communication between supervisor and employee; examination of formal and informal communication networks,
and interpersonal communication in an organizational context. Communication audit for a local organization conducted in section. Lectures concurrent with COMM 410; students in COMM 510 must enroll in the 3:00-5:00 W section and will have more advanced readings and exams.

## COMM 610 Seminar in Organizational

 CommunicationSpring. 3 credits. Prerequisites: COMM 410 / 510 or one course in organizational behavior.

T R 12:20-2:15. D. Schwartz
Examination of contemporary research on the social psychology of interpersonal communication in organizations including supervisoremployee relations, leadership style, work motivation, organizational socialization, and formal and informal communication networks

## COMM 611 Communication for Renewal

 and ChangeFall. 3 credits. Prerequisite: Graduate or senior status and permission of instructor. M 1:25-4:25. S. White.
Experiential course focuses on the individual's need to reflect on experiences with interpersonal, intra group communication processes to understand human communications in an organization. Concepts and variables critical to participatory organizational development, renewal and change. Experiences are grounded in theory and research, relevant to understanding human behavior and communication in organizational contexts.

## COMM 612 Intercultural and

## Development Communication

Fall. 3 credits

> T 1:25-4:25. N. E. Awa

The course traces the imprint of culture in its effects on communication between people and groups from different backgrounds and assesses the role of communication in programs of social change and development. The first part of the course deals with perception, language, beliefs, attitudes, and world view (or what we bring to intercultural transactions) from a multidisciplinary social science perspective. The second part focuses on communication (interpersonal, and mass and traditional media) in technology transfer in agriculture, education, family planning, nutrition, and the like. The subtleties and complexities of nonverbal codes are explored and barriers to effective listening in intercultural trade and business broached.
COMM 616 Interpersonal Communication Spring. 3 credits. Limited to graduate students in communication; others by permission of instructor.

M W 10:10-12. N. E. Awa. The seminar explores foundational theories and principles of interpersonal communication as well as theories and methods in the newly emerging area of social cognition. Together, these groups of theories seek to explain human communicative behavior in a variety of settings through understanding of the cognitive processes and mental activities that undergird such behavior. In addition to theory, students will engage in experiential learning activities designed to provide balance between principles and practice. Topics covered include: the nature, structure, and functions of interpersonal communication; expectancy formation and development; stereotyping and attribution; perception, attention and memory; and the cognitionbehavior relationship.

## [COMM 618 Communication and

## Persuasion

Spring. 3 credits. Limited to graduate students. Prerequisites: introductory research methods or statistics. Not offered 1994-95.

M W F 11:15 (one evening mid-semester prelim). M. Shapiro.
The course focuses on theories of communication influence or persuasion and attitude change. Students will become familiar with a variety of social-psychological theories of attitude change and persuasion. Those theories also will be applied to a variety of communication situations including mass communication, advertising, public relations/ public information, and interpersonal communication. Graduate students will meet weekly (by arrangement) and will complete additional readings and assignments. Taught concurrently with COMM 418.]
COMM 620 Public Opinion and Social Processes
Fall. 3 credits. Limited to seniors and graduate students.

T R 10:10-11:25. C. Glynn.
The course provides an overview of the theoretical and applied literature related to the concept "public opinion." Students investigate how public opinion is perceived and acted upon by society. Relationships between public opinion, communication, and social psychological variables are examined. Public opinion is studied using current theoretical and practical applications, analysis and interpretation of public opinion polls, and trends in public opinion on specific issues. Taught concurrently with COMM 420. Graduate students will complete additional readings and assignments.

## COMM 622 Psychology of Television

Fall. 3 credits. Limited to seniors or graduate students. Prerequisites: introductory research methods or statistics.

M W F 12:20 (one evening mid-semester prelim). M. Shapiro.
A survey of knowledge about the psychological influence of television and other audiovisual communication technologies. Topics may include the history of concerns about television and movies, who watches television and why, how people understand and mentally process television, how television influences thinking and emotions, the effects of various forms (including entertainment, news, and advertising), and future forms of mass media including multimedia and virtual reality. Taught concurrently with COMM 422. Graduate students will meet weekly (by arrangement) and will complete additional readings and assignments.

## COMM 624 Communication in the Developing Nations

Fall. 3 credits. Open to seniors and graduate students.

Lec, R 1:25-4:25. R. D. Colle. The role of communication in development programs, particularly in Third World nations. Emphasis is on communication interventions in agriculture, health, nutrition, family planning and community development, and especially on methods for designing communication strategies for reaching low-income, rural people. Among the approaches considered are extension, social marketing, and development support communication.

COMM 625 Communication for Social Change
Summer only. 3 credits. Fee: $\$ 50.00$. T R 9:00-1:00. Staff.
A survey of international communication problems and perspectives on social change, with a special focus on the Third World Concentration on critical issues of communication policy and planning at local, national, and international levels. Extensive use of case studies.

## COMM 626 Impact of Communication Technologies

Fall. 3 credits. Open to seniors.
W F 12:20-2:15. P. Yarbrough.
A study of emerging technologies of communication, such as computer-based information systems and satellites and their potentials for influencing communication processes and social systems. Also examines the impacts of previous communication innovations from cave painting to television.

## COMM 640 Social Design of Communication Systems

Spring. 3 credits. Prerequisite: permission of instructor. S-U grades optional.

T 12:20-3:20. G. Gay.
Course will focus on the design of computer interfaces and software from the user's point of view. The goal is to teach user interface designs that "serve human needs" while building feelings of competence, confidence, and satisfaction. Topics include formal models of people and interactions, collaborative design issues, psychological and philosophical design considerations, and cultural and social issues.

## [COMM 665 Scientific Writing for

 ScientistsSummer only. 3 credits. Prerequisites: research in progress and permission of instructor. Not offered 1994-95.

T R 8:30-9:55. Staff.
Workshop for students with research in progress. Discussion and lectures on writing a journal article, thesis, report, and proposal; on objectives in scientific writing, relation of rhetoric and linguistics to scientific writing, process of publication and reviewing, and preparation of tables and illustrations; and on advanced and special problems in organization, paragraph development, sentence structure, and usage.]

## COMM 676 Communication Planning and Strategy

Spring. 3 credits. Primarily for graduate students but open to seniors.

T R 10:10-12. C. Scherer.
Seminar in the planning of communication activities for the support of directed socialchange programs. Examines communication and social theories, case studies, and planning models. Participants produce a comprehensive communication plan designed to solve a significant (real) communication problem. Case studies and discussion focus on communication problems from nutrition and health, rural development programs, marketing, nonformal education programs, and corporate and government public information campaigns.

## COMM 680 studies in Communication

Fall. 3 credits. Limited to graduate students in communication; others by permission of instructor.

M W 9:05-10:45. Staff.
A review of classical and contemporary readings in communication, including key
concepts and areas of investigation. An exploration of the scope of the field, the interrelationships of its various branches, and an examination of the role of theory in the research process.

## [COMM 681 Seminar in Psychology of

 CommunicationSpring. 3 credits. Prerequisite: graduate students in communication; others by permission of instructor. Not offered 1994-95. Lecs, T 3:35-4:25 and R 2:30-4:25.
M. Shapiro.

An introduction to theory and research in the mental processes of the communicating individual. Discussions and readings may include how individuals process and remember communication information, how communication information is used in decision processes, how motivation influences processing of mass communication information, and how attitudes form and change.]

## COMM 682 Methods of Communication

 ResearchSpring. 3 credits. Limited to graduate students.

M W 12:20, sec. F 12:20-2:15.
P. Yarbrough.

An analysis of the methods used in communication research. Emphasis on understanding the rationale for survey, lextual, experimental and ethnographic research methods.

## COMM 683 Quantitative Research

 Methods in CommunicationSpring. 3 credits. Prerequisite: COMM 682 or equivalent.

Lec, M 12:20-3:30. D. McDonald. Practical experience in quantitative social science research techniques. Course topics include design and measurement, data collection, data preparation, data analysis and hypothesis testing, and interpretation of results. Secondary analyses of available data sets are conducted within each topic area. The course provides an introduction to the use of several common statistical software packages.

## COMM 684 Qualitative Methods in Communication Research

Spring. 3 credits
W 12:20-3:30. R. E. Ostman.
This course explores the nature of communication research and the place of qualitative methods in that research. Through readings, discussions, and papers, students will examine the various techniques of qualitative research, gaining both an introduction to those methods and an appreciation of when those methods are appropriate for addressing particular issues in communication.
COMM 685 Training and Development: Theory and Practice (also Education 685, International Agriculture 685) Spring and summer. 4 credits. Charge for materials, \$45.

Lec, F 9:05-12:05; lab, 1 hour per week, to
be arranged. R. Colle, I). Deshler,
M. Ewert.

Analysis, design, conduct, administration, and evaluation of training programs for the development of human resources in smallfarm agriculture, rural health and nutrition, literacy and nonformal education, and general community development. Designed for scientists, administrators, educator-trainers, and leaders of national and local rural and agricultural development programs. Materials focus on programs in the U.S. and abroad,
with greater emphasis on "developing" nations.

## COMM 687 Communication, Mood and Emotion

Fall. 3 credits. Limited to seniors and graduate students. Prerequisites: COMM 382 or equivalent.

M W F 1:25. D. McDonald. An examination of theory and research in the area of communication and emotion. The course consists of the following seven areas: defining mood and emotion; tactics for investigation; emotion and cognition; mood and emotion as communication effects; communication and consequences; communication and mood management; and enduring issues. Taught concurrently with COMM 487. Graduate studients will meet weekly (by arrangement) and will complete additional readings and assignments.

## COMM 688 Participatory Communication

 for Research and Development Summer only. 3 credits. Prerequisites: Qualitative research or graduate-level communication course and/or permission of instructor.Lecs, T R 1:00-5:00; disc, arranged 2
hours/week. S. White.
Conceptual framework and theoretic rationale for utilizing participatory approaches in communication and research for rural development and social action. Case examples and video documentation from India, Africa, Latin America. Focus is on problem-solving approaches in communication and use of video as a communication tool for enhancing people's participation in the development context.

## COMM 693 Seminar: Topics in Communication

Fall and spring. No credit. S-U grades only. To be arranged. Staff. some weeks scholars from a wide variety of fields will present varied topics in theory or research as it relates to communication; other weeks graduate students will present thesis (project) proposals to faculty and peers.

## COMM 694 Special Topics in

 CommunicationFall, spring, or summer. 1-3 credits variable. S-U grades optional. Prerequisite: permission of instructor.

Hours to be arranged.
Study of topics in communication not otherwise provided by a department course and determined by the interest of the faculty and students.
COMM 710 Methods of Communication Analysis in Organization(s)
Spring. 3 credits. Prerequisite: Comm 610 or equivalent and one graduate level course in organizational behavior.

M W 3:35-5:05. D. Schwartz.
Methods for analyzing communication structure and processes in organizations with emphasis on communication network analysis and forms of intervention research such as communication audits and employee attitude surveys.

## COMM 792 Advanced Communication

 StudiesFall or spring. 3 credits. Limited to communication graduate students. May not be repeated. Students must use the faculty member's section number to register. Graduate faculty.

Independent studies and projects are carried out in conjunction with selected undergraduate courses.

## COMM 794 Seminar in Communication

 IssuesFail, spring, or summer. 1-3 credits.
Prerequisite: permission of instructor.
Hours to be arranged. Staff.
Small group study of topical issue(s) in communication not otherwise examined in a graduate field course.
COMM 797 Graduate Independent Study
Fall, spring, or summer. 1-3 credits.
Prerequisite: permission of instructor.
Hours to be arranged. Staff.
Individual study concentrating on locating, assimilating, synthesizing, and reporting
existing knowledge on a selected topic.

## COMM 798 Communication Teaching Laboratory

Fall and spring. 1-3 credits each semester. May be repeated once. Limited to graduate students. Prerequisite: permission of the faculty member who will supervise the work and assign the grade. Students must use the faculty member's section number to register.

Graduate faculty.
Designed primarily for graduate students who want experience in teaching communication courses. Students work with an instructor in developing course objectives and philosophy, planning, and teaching.
COMM 799 Graduate Research
Fall, spring, or summer. 1-3 credits. Prerequisite: appropriate communication graduate course work or permission of instructor.

Hours to be arranged. Graduate faculty. Small-group or individual research based on original, empirical, data-based designs regarding topical issues in communication not otherwise examined in a graduate field course.

## COMM 899 Directed Graduate Study

Fall or spring. 3-6 credits. S-U grades only. Students must use the faculty member's section number to register.

Graduate faculty.

## EDUCATION

H. D. Sutphin, chair; A. L. Berkey, W. S. Carlsen, J. Confrey, D. Deshler, J. A. Dunn, J. R. Egner, D. M. Ewert, J. H. Gould, E. J. Haller, D. E. Hedlund, J. McGonigal, J. Millman, D. H. Monk, J. D. Novak, D. Peasley, S. Piliero, G. J. Posner, R. E. Ripple, D. E. Schrader, K. A. Strike, D. J. Trumbull

## EDUC 005 Basic Review Mathematics

Fall. 3 credits (this credit is not counted toward the 120 credits required for the degree). Primarily for entering students.

Fall: M W F 8:00, 9:05. S. Piliero. Introduction to concepts necessary for success in EDUC 115 and basic statistics courses. Topics include problem solving, factoring rational expressions and equations, linear and quadratic functions, trigonometry and logarithms. Considerable emphasis is placed on learning to learn mathematics for understanding and on comprehending word problems.

## EDUC 115 Introductory College

 MathematicsFall or spring. 4 credits.
Lecs, M W 11:15 or 12:20; labs, R 8-9:55,
$10: 10-12: 05,12: 20-2: 15,2: 30-4: 25$, or $F$
8-9:55, 10:10-12:05, 12:20-2:15. S. Piliero.
Designed to give students with sound high school mathematics backgrounds a unified treatment of the basic concepts of college algebra, trigonometry, and geometry. Considerable emphasis is placed on the concept of function, graphing, problem solving, and applications. Contextual problems and the multi-representational tool Function Probec are used to enhance students' mathematical understanding.

## EDUC 120 Education for Empowerment

 Spring. 1-3 credits.T R 2:30-4. M. Ewert, J. Egner, J. Dunn. A modular course, with each module spanning 5 weeks for 1 credit. Common themes running through the modules include human learning, teaching strategies, political/ social/economic factors affecting education. The course provides an opportunity to sample different areas of study and to gain knowledge and awareness of one's own educational processes.

## EDUC 210 Psychology of Learning and Memory

Fall. 3 credits. Prerequisite: introductory psychology.

> M W F 10:10. J. A. Dunn.

This course deals with contemporary theories of learning, issues in the study of learning, and application of the principles of learning to the management of teaching and learning. Practical applications of research findings will be emphasized. One or more experimental projects and the use of microcomputers will be required.

## [EDUC 211 Psychology of Individual

 DifferencesFall. 2-3 credits. S-U option available. Prerequisite: introductory psychology. Not offered 1994-95.

M W F 12:20. J. A. Dunn.
An introductory course focused on basic concepts in the psychology of individual differences applicable to the teaching/leaming process. Topics include: intelligence, personality, motivation, cognition, memory, psychological testing, and measurement.]
EDUC 212 Psychological Foundations of Education
Spring. 2-3 credits. S-U option available. Prerequisite: introductory psychology. W 2-4:25. J. A. Dunn.
A lecture/discussion survey of the psychological foundations of educational practice. Topics include the selective contributions of developmental, social, and experimental psychology, including instructional technology, to American education.

## EDUC 240 The Art of Teaching

Fall and spring. 3 credits.
T 2:30-4:25 or W 2:30-4:25. 2-hour fieldwork to be arranged. Enrollment limited. Not open to freshmen.
J. R. Egner, G. J. Posner, and staff. This course is designed for all students interested in finding out more about teaching. Students engage in field experiences to find out what teaching involves. Possible field experiences range from large group to tutorial situations, from preschool to adult education, from traditional school subject matters to recreational and vocational areas, and from
school-based to nonformal situations. Class work builds on those experiences and provides skills and concepts to make the field experiences more profitable.

## EDUC 247 Instructional/Informational Application of Microcomputers and Related Technologies

Fall or spring. $2-3$ credits. Not available to students who have completed ABEN 102 or NR 107.

> R 2:30-3:20; lab to be arranged. D. Peasley

This course provides an introduction to instructional/information applications and strategies for using microcomputers and related technologies in public and private education and in the private sector. The course also helps students learn to use technologies to enhance their college studies. Wordprocessing, spreadsheets, databases, hypertext, development of electronic database searching, electronic networking, communications and desktop publishing are covered. Module A (1 credit) is the first seven weeks of the semester, focused on Macintosh technology. Module B (1 credit) is the second seven weeks, focused on IBM-compatible and related technologies. For Module C (1 credit) students propose and complete an approved special project related to the class.

EDUC 271 Sociology of Education Fall. 3 credits. Limited enrollment.
S-U grades optional.
T R 10:10-11:30. E. J. Haller.
An introduction to the sociological study of schooling and education. Topics include the effects of social factors on educational achievement, the norms and values learned as part of the process of schooling, the relations between students and teachers, and the school's relations to the economic and political systems. All levels of education, from elementary school to the university, are considered.

## EDUC 302 Observing Science and Math

 InstructionSpring. 3 credits. Prerequisite: enrollment in a teacher education program or permission of instructor.

W 2-4:25. W. S. Carisen and A. Solomon. The study of a variety of methods for recording and understanding science and mathematics teaching and learning. By reading and conducting research from a variety of analytic/interpretive paradigms, students will approach the familiar world of the secondary classroom with fresh perspectives. The course will include a final project that involves observing and evaluating a case of teaching. Students enrolled in teacher education programs will be expected to focus on their own teaching for the final project.

## [EDUC 310 Psychology of Instructional System Design

Fall. 2-3 credits. Prerequisite: EDUC 210 or permission of instructor. Not offered 1994-95. M W 11:15, hour to be arranged.
J. A. Dunn.

The course reviews the relevance of theories of learning and issues in the study of learning to the technology of instruction. Various examples of instructional systems will be considered. Student projects and lahoratory exercises will be required.]

## EDUC 311 Educational Psychology

Fall. 3 credits. Prerequisite: introductory psychology. S-U grades optional.

Fall: M W F 11:15. D. E. Schrader.

This course applies psychological concepts to educational settings such as schools with a focus on understanding the interaction between people, context and knowledge, schools and other learning environments, and education as a social, moral and interpersonal enterprise that respects differences between individuals. This course is designed to foster effective teaching and leaming in various educational contexts.

## [EDUC 312 Learning to Learn

Spring. 3 credits. Prerequisite: one or more courses in psychology or educational

## psychology. Not offered 1994-95

T R 9:05. J. D. Novak
This course is intended for persons interested in the improvement of their learning strategies and the application of new ideas and methods to improve educational programs. Lectures and discussions are based on assigned readings and the contributions of class members. The major focus of the course is how and why concepts play a central role in human learning. Concept mapping and other strategies for educating will be used. Students will apply principles and methodologies in a project related to their interests.]

## [EDUC 317 Psychology of Adolescence

Spring. 3 credits. Prerequisite: introductory psychology. S-U grades optional. Not offered 1994-95.

M W (Fridays to be arranged) 11:15. D. E. Schrader.

This course surveys the nature of adolescent cognitive, social, moral, and self-development Theories of adolescence are examined in the context of real-life experiences of adolescents using case analysis as a methodological tool. Educational implications will be discussed for both formal and informal settings.]
EDUC 331 Careers in Agriculture, Extension, and Adult Education
Fall. 1-3 credits. Letter grade only.
Lec, M 2-4:25; lab to be arranged.
D. Deshler, D. Foster, and J. Gould.

This course will offer modules in three areas of teaching: Adult Education, Cooperative Extension, and Agricultural Education. Each module will offer one hour of credit, and students may take one or more of the modules. The course will provide a historical perspective and an introduction to the organization and scope of programs for each module. Students will examine career opportunities and characteristics of the professions addressed by each module Course activities include field observations and experiences during arranged times.

## EDUC 332 Instructional Methods in

 Formal and Non-formal Education Spring. 3 credits.M 2-4:25 and F 12:20-1:10. J. Gould. Selection, practice, and evaluation of methods in formal and non-formal education will be stressed. The course will focus on both general teaching strategies and methodology unique to teaching in schools and non-formal sertings. Course activities include microteaching and field experience during arranged times.

## EDUC 335 Youth Organizations

Spring. 3 credits.
Lecs, T R 10:10; lab to be arranged J. H. Gould.

The role of selected youth organizations in providing educational experiences for youth. Factors affecting membership, purposes,
design, operation, and administration are surveyed, emphasizing the roles an adult volunteer leader may play. The course is designed to give students an in-depth, learning-by-doing experience of how youth organizations function. Field experience with a recognized youth organization is required

## EDUC 352 Reading Statistics

Fall or spring. 1 credit. Prerequisite for spring: concurrent registration in EDUC 353

$$
\text { Fall: T } 12: 20 \text {; spring: T R 8:30-9. }
$$

## J. Millman.

An introduction to statistical vocabulary and symbolism frequently used in reporting empirical research in education and other social sciences. Students are taught how to comprehend statistical terminology and results.
[EDUC 353 Introduction to Educational Statistics
Spring. 3 credits. Enrollment limited to 40 students. Prerequisite: EDUC 352 or concurrent registration, or permission of instructor

T R 9:05-11. J. Millman.
A study of common univariate and multivariate statistical procedures encountered in educational and psychological inquiry. Meaning of concepts and mastery of course content is emphasized; computational details are not. Microcomputers are used extensively in class to develop understanding of the properties of statistical indices.]

## EDUC 370 Issues in Educational Policy

 Spring. 3 credits.T R 10:10-11:30. K. A. Strike.
An examination of selected policy issues in current education. Included are such topics as equality of educational opportunity; student, parent, and teacher rights; and educational politics. Issues are treated from legal, sociological, and economic perspectives. Meets group C requirements for College of Agriculture and Life Sciences.

## EDUC 378 Political Economy of Education

Fall. 3 credits. S-U grades optional.
T R 12:20-2. D. H. Monk.
A policy oriented examination of educational systems with an emphasis on political and economic perspectives. Attention will be paid to both external and internal aspects of educational activities. Specific topics will include the changing contributions of education to earnings, school-community relations, power within educational organizations, the impact of technology in the workplace and in classrooms, and the sources and impact of educational costs. A variety of education settings will be examined including higher education and non-formal education.

## EDUC 380 Independent Honors Research in Social Science

Fall or spring. $1-6$ credits. Limited to students who have met requirements for the honors program. S-U grades optional. A maximum of 6 credits may be earned in the honors program.

## EDUC 401 Our Physical Environment

Fall. 3 credits. Prerequisite: permission of instructor. Charge for laboratory supplies, approximately $\$ 7$.

T 1:25-4:25. V. N. Rockcastle. A practical, relatively nonmathematical study of some basic relationships and physical interactions in the environment, with emphasis on physics and earth science.

Attention is paid to analysis for understanding and techniques for teaching. An individual research project is included. Useful for teachers, environmental educators, and those for whom physical science seems difficult or uninviting.

## EDUC 402 Knowing and Learning in

 Science and MathematicsFall. 4 credits. Prerequisite: enrollment in science and math certification program or permission of instructor.

W F 2:30-4:25. D. J. Trumbull. Students examine both current notions in the history and philosophy of science that explain how knowledge within a discipline develops and current theory and research that examines the individual's acquisition of knowledge. This material serves as a basis for students' individual research projects investigating neophytes' knowledge of science and mathematics concepts. All students enrolled must complete fieldwork. Fieldwork will comprise a minimum of three hours a week in an appropriate educational setting.
EDUC 403 Observing and Teaching Science and Math
Spring. 4 credits. Prerequisites: Enrollment in a Cornell teacher education program or permission of the instructor.

W F 3:15-5:15. William S. Carlsen. Designed for prospective secondary teachers, this course provides a multiple-perspectives orientation to the culture of schools and the work of teaching science and mathematics. Students spend 6-8 hours each week observing in area schools. Students also plan and teach innovative lessons in the scheduled teaching laboratory. Readings and discussions concern models of instruction, teacher knowledge, educational equity and tracking, and classroom language.

## EDUC 411 Introduction to Educational

 MeasurementFall. 3 credits
T R 9:05-10:20. J. Millman.
Presents practices and theories of the measurement of human knowledge and performance. Students will be expected to acquire the practical skills of planning and constructing tests for a variety of purposes, interpreting and using test results, evaluating commercially available instruments, and the like. Students will also be expected to discuss intelligently a myriad of social, ethical, legal, and technical issues associated with educational testing. One course in statistics or concurrent registration in Education 352 is recommended but is not required.

## EDUC 413 Psychology of Human Interactlon

Fall. 3 credits. Enrollment limired. Prerequisite: permission of instructor. Fee, $\$ 5$.

T R 10:10-12:05. D. E. Hedlund. Designed to develop skills for, and understanding of, effective interpersonal communication and interaction. Appropriate for students in the helping professions, education, and areas involving management of human resources.

## EDUC 414 Counseling Psychology

Spring. 4 credits. Limited to 30 students. Prerequisites: introductory psychology, social or personality psychology, and EDUC 413.

T R 10:10-12:05. D. E. Hedlund.
The processes of counseling are examined from various theoretical perspectives. Typical adult counseling issues are examined, and
implications are drawn for counseling strategies with an adult population, including psychological assessment, establishing therapeutic goals, intervention strategies, and evaluation of outcomes.

## EDUC 420 Field Experience

Fall or spring. $1-4$ credits. S-U grades optional. Undergraduates must attach to their course enrollment material written permission from the faculty member who will supervise the work and assign the grade

Staff.
Students may engage in planned, semiprofessional, or professional practice in an educational enterprise. Each student prepares a plan of action including rationale, purposes, and procedures and arranges with a faculty member to supervise and evaluate the field experience

## EDUC 430 Special Problems in Agricultural Education

Fall, spring, or summer. 1-3 credits
S-U grades optional
Fall and summer: hours to be arranged; spring: T 8. A. L. Berkey and
H. D. Sutphin

An opportunity to study individually selected problems in agricultural education.

## EDUC 432 Teaching Agriculture:

 Methods, Materials, PracticeFall. 9 credits. Prerequisites: EDUC 332 and concurrent registration in EDUC 430 and 497.

M TW R F 8-3. A. L. Berkey and staff. Directed participation in teaching agriculture at the secondary school level. Program includes a five-day intensive on-campus period and periodic seminars addressing selected methods and materials in teaching agriculture, combined with a 14 -week period in an off-campus student teaching center Includes evaluation of area resources, instructional materials and facilities, planning and executing instruction, directing work experience, and advising youth organizations.

## EDUC 445 Curriculum Design Workshop

Fall. 3 credits. Not offered 1994-95.
T R 10:10-11:30. G. J. Posner.
A general practical approach to course planning, Readings, group discussions, workshops, and individual conferences centering on each student's project. This project consists of designing a course in a subject area for an age level and an institutional setting of the student's choosing.]

## EDUC 472 Philosophy of Education

 Fall. 3 credits.T 2:30-4:25. K. A. Strike.
A study of central issues in the philosophy of education. Questions of ethics, political philosophy, and the theory of knowledge are examined and linked to current educational issues.

## EDUC 475 Epistemology and Teaching

Spring. 3 credits. Letter grade only
T R 3:30-4:45. K. A. Strike
This course emphasizes the critical examina tion of recent debates in philosophy of science concerning the nature of scientific knowledge and scientific inquiry. It applies these inquiries to such questions as the organization of curricular materials, the nature of effective science teaching, and the role of scientific knowledge in the deliberations of a liberal democracy

EDUC 477 Law and Educational Policy
Fall. 3 credits
M 2:30-4:25. K. A. Strike
A study of recent federal court decisions concerning education. Emphasis on examining legal issues against a background of related educational issues and in terms of the consequences of legal decisions for the development and operation of educational institutions

## EDUC 481 Educating for Community Action

Spring. 3 credits

> M 1:25-4. M. Ewert.

The design and execution of educational aspects of community-action and nonformal education programs. Deals with the identification and statement of educational goals, selection of teaching strategies, and evaluation of outcomes.

EDUC 483 Comparative Studies in Adult Education
Spring. 3 credits. S-U grades optional W 7:30-10:30 p.m. D. Deshler.
Focuses on the variety of adult-education programs in countries around the world. Literature on comparative adult education, international conferences on adult education, UNESCO adult-education publications, and international community development are analyzed in relationship to each student's exploration of adult education in two countries. Description of adult education in other countries is shared by international students.

## EDUC 494 Special Topics in Education

 Fall or spring. 4 credits maximumS-U grades optional.
Hours to be arranged. Staff
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number

EDUC 497 Individual Study in Education
Fall or spring. 1-3 credits. S-U grades optional. Students must register with an Independent Study form (available in 140 Roberts Hall)

## Staff

A student may, with approval of a faculty adviser, study a problem or topic not covered in a regular course or may undertake tutorial study of an independent nature in an area of educational interest

## EDUC 498 Undergraduate Teaching

Fall or spring. 1 or 2 credits; 4 credits maximum during undergraduate career. Limited to students with grade-point averages of at least 2.7. S-U grades optional. Students must register with an Independent Study form (available in 140 Roberts Hall).

Staff.
Participating students assist in teaching a course allied with their education and experience. Students are expected to meet regularly with a discussion or laboratory section, to gain teaching experience, and regularly to discuss teaching objectives, techniques, and subject matter with the professor in charge

EDUC 499 Undergraduate Research Fall or spring. 6 credits maximum during undergraduate career. Not open to students who have earned 6 or more undergraduate
research credits elsewhere in the college. Limited to juniors and seniors with gradepoint averages of at least 2.7. Students must register with an Independent Study form (available in 140 Roberts Hall).

Staff.
Affords opportunities for students to carry out independent research under appropriate supervision. Each student is expected to review pertinent literature, prepare a project outline, conduct the research, and prepare a report.

## EDUC 501 Communication Workshop

Summer and intersession. 2 credits. S-U grades optional

Lecs, M-F 9-12 and 1-4. Class meets six hours a day for five days. M. D. Glock. The course focuses on skills enabling individuals to cope with such concerns as motivation, dealing with difficult persons, criticizing productively, improving comprehension, adjusting to different learning styles, and communicating with the public. Practice is coordinated with theory and research findings. The ongoing dynamics of the course necessitate intense participation over a period of time, not provided by regularly scheduled fifty-minute class periods. Additional autotutorial lab time is scheduled. Appropriate for anyone who works with people.

## EDUC 513 Interpersonal Interaction

 Summer. 1-2 credits1-week course. Hours to be arranged. D. Hedlund

Designed to develop skills for an understanding of effective interpersonal communication and interaction. Appropriate for students in the helping professions, education, and areas involving management of human resources. A workshop design is required for the second credit. Participants must bring a tape recorder to class.

## EDUC 547 Improvement of College Teaching

Summer. 2 credits
1-week course, hours to be arranged J. I. Novak.

Concepts of teaching, learning, curriculum, and governance are used to guide practical activities that enhance faculty competence. Recent studies of concept mapping and learning, structure of knowledge, science teaching, adult learning, and evaluation provide a conceptual basis for improving teaching

EDUC 601 Secondary Science and Mathematics Teaching Practicum
Fall or spring. 3 credits. Prerequisite: permission of instructor. Letter grades only. For graduate students enrolled in the Teacher Education in Science and Mathematics program.

M T W R F 8-3. Staff.
Supervised student teaching in science or mathematics at the secondary level. Program includes teaching in a local school for ten weeks.

## EDUC 602 Teaching Science/

 Mathematics: Methods, Materials, PracticeFall. 9 credits. Prerequisite: concurrent enrollment in EDUC 601 or permission of instructor.

M F 9-12 and 1-3, first 5 weeks; last 10
weeks to be arranged. G. Posner, and staff.
The course begins with five weeks of
intensive consideration of theoretical
frameworks relevant to all aspects of student teaching. Assignments and a weekly seminar during the next ten weeks require students to use those theories to develop and evaluate teaching materials and practices. Students will complete an extensive portfolio documenting their work.

## [EDUC 603 Teaching Mathematics

Spring. 3 credits. Offered altemate years. Not offered 1994-95.

T R 10:10-11:25. J. Confrey.
Current research in mathematics education will be examined in order to develop a picture of the mathematics classroom that integrates subject matter, student conceptions, affective variables, and issues in the social context of learning mathematics. Special topics will include research on problem solving, women and mathematics, misconceptions, and research on teaching.]

## [EDUC 606 Seminar in Science and Mathematics Education

Fall. 1 credit. S-U grades only. Not offered 1994-95.

R 4:30. Staff.
Explores topics in science and mathematics education. The focus of the seminar changes each year.]

## EDUC 609 Educational Ethnography

Spring. 3 credits. Prerequisite: course in research methods or measurement or permission of instructor.

M W 2:30-4. D. J. Trumbull.
The course will study educational ethnography as a form of interpretive research, a perspective that attends to the complex interactions between researcher, researched, and context and accepts the centrality of meaning-making in the conduct of human affairs. Students will examine some of the philosophical debates about research approaches and will discuss research methods as they relate to the aims and assumptions of interpretive research. Students will conduct a joint research project during the course of the semester.

## EDUC 611 Educational Psychology

Fall. 3 credits. Prerequisite: introductory psychology. S-U grades optional.

M W F 11:15. R. E. Ripple.
A basic survey course for graduate students. Emphasis on psychological factors involved in human learning and the educational process. Set in a broad-hased conceptual model of any behavioral setting for learning. A life span developmental approach is used, appropriate for those seeking an introduction to educational psychology or a refresher course in contemporary educational psychology.

## [EDUC 613 Theory and Methods for Education

Fall. 3 credits. Prerequisite: EDUC 311 or 611 or permission of instructor. Not offered 1994-95.

T R 9:05. J. D. Novak.
Presents a coherent theory of education combining concepts from philosophy, psychology of learning, curriculum, and instruction. New educational methods, including concept mapping and clinical interviews, will be presented. Students will gain competence by applying concepts and methods in projects related to their interests. Classes include discussion of student-initiated questions and use of videotape to analyze educational techniques.!

EDUC 614 Epistemological Development and Reflective Thought
Fall. 3 credits. S-U grades optional.
M 12:20-2:15; 1 hour to be arranged.
D. E. Schrader.

Insight into how individuals make sense of knowledge is essential to teaching and learning. This course examines theories of intellectual development and their implications for educating students of various age groups, particularly college students. The role of reflection on thinking (metacognition) and its impact on development of thought is explored

## 【EDUC 615 Self and Interpersonal

 Development and EducationSpring. 3 credits. S-U grades optional. Not offered 1994-95.

Lec, M 12:20-2:15; 1 hour to be arranged. D. E. Schrader.

Interpersonal interactions affect teaching and learning. This course takes a life-span perspective as it explores constructivedevelopmental theories of self and others, and how such theories explain students' understanding of their own and others' actions in educational contexts.]

## EDUC 620 Internship In Education

Fall or spring. $1-6$ credits. S-U grades optional. Each student, before course enrollment, must obtain the approval of a faculty member who will assume responsibility for supervising the work. Staff.
An opportunity for practical experience in educational professions development.

## EDUC 621 Work-Experience Coordinator Certification Course I

Summer. 3 credits. S-U grades optional.
2 -week course. Hours to be arranged.
A. L. Berkey.

The first of a two-course sequence designed to develop the competencies needed for certification as a coordinator of diversified cooperative work experience programs. The course focuses on the history and philosophy, types, operation, and evaluation of workexperience programs including articulation with JPTA and VESID. Field interviews are required. A prerequisite for Course II, EDUC 622.

## EDUC 622 Work-Experience Coordinator

 Certification Course IISummer. 3 credits. Prerequisite: EDUC 621 Work-Experience Certification Course I.

1-week M-F 8-5. Hours to be arranged.
Internship-3 wks. A. L. Berkey.
The second course for certification as a diversified cooperative work experience coordinator combines course work and directed field experience leading to the planning, development, and approval of a work-experience program in a local educational agency. Development of a philosophy and policy statement, budget, curriculum for related instruction, annual work plan by function, promotional materials, and all program forms for Board of Education approval required.

## EDUC 630 Special Problems in

 Agricultural and Occupational EducationFall or spring; may also be offered in summer 1-3 credits. S-U grades optional.

Hours to be arranged. A. L. Berkey and staff.
The course provides an opportunity for graduate-level study of individually selected
problems and issues in agricultural and occupational education. Designed for experienced teachers.

## EDUC 632 Teaching Agricultural,

Extension, and Adult Education Spring. 3 credits. Prerequisite: an introductory course in teaching methods or permission of instructor.

M 8-10. Staff.
The focus of the course is on the selection, use, and evaluation of methods and materials for teaching. Methods for group and informal instruction are covered. Opportunity is provided for students to develop teaching competence based on their individual needs and interests. Development of self-evaluation skills is included. A class project on the development of instructional materials is required.

## [EDUC 633 Program Planning in

 Agricultural, Extension, and Adult EducationFall. 3 credits. Field trip. Not offered 1994-95.

Lec, T 2-4:30; lab to be arranged. Staff. Current social and economic conditions affecting agricultural, extension, and adult education are examined. Principles, objectives, strategies, and sources of information are applied to program planning. Participants have an opportunity to observe ongoing programs in agricultural, extension, and adult education, and to pursue individual interests in program development and improvement.]
EDUC 644 Curriculum Theory and Analysis
Spring. 3 credits.
T R 2:30-4. G. J. Posner.
An examination of the basic elements involved in making curriculum decisions and an analysis of current approaches to curriculum. The course focuses on the assumptions underlying any curriculum. The major task of each student is to choose and conduct an indepth analysis of a curriculum. This course is the basic graduate course in curriculum.

EDUC 647 Instructional Technologies: Analysis and Practices
Fall. 2-4 credits. Prerequisite: skills in statistics and research design. Letter grade only.

R 2:30-3:45; lab and seminars to be
arranged. D. Peasley and H. D. Sutphin. Current research and literature on instructional computing and related technologies in the public and private sectors will be examined. Students complete a group research project on educational technologies and meet for five seminar sessions to earn 2 credits. The research experience includes design, data collection, input, analysis, and synthesis. Concurrent attendance in ED 247 Modules A and B is required ( 2 credits); or the modules may be taken as a prerequisite.

## EDUC 650 Methods of Educational Inquiry

Fall. 1 credit.
T 2:30-3:20. J. Millman.
A survey of approaches to inquiry in the social sciences, including experimental and comparative designs, survey research, case study, philosophical and historical inquiry, content analysis, and secondary data analysis. The course is intended to broaden the student's views of appropriate methods of disciplined inquiry.

EDUC 651 Writing a Thesis Proposal
Fall. 1 credit. S-U grades only.
T 3:35. J. Millman.
Procedures for developing and writing a master's or doctoral thesis proposal. Emphasis will be given to identifying a significant topic, conducting and describing a group miniresearch study, recognizing weaknesses in illustrative proposals, and clear and concise writing. Students will be provided ample assistance in constructing a brief thesis proposal of their own.

## EDUC 659 Special Topics in Research Methods

Spring. $2-3$ credits. Prerequisite: permission of instructor. S-U grades only.

Hours to be arranged. J. Millman. Consideration of new techniques and current topics in educational research design, measurement, or evaluation of programs, products, and personnel.

## EDUC 661 Administration of Educational Organizations <br> \section*{Fall. 3 credits.}

W 3:35-6. E. Haller.
Perspectives on the administration of educational organizations. Consideration of social science, legal and ethical theories, and their application to both public schools and higher education. Intended for students who are considering careers as educational administrators, as well as for those who want to further their understanding of schools as organizations.

## EDUC 664 Educational Finance

Fall. 3 credits. S-U grades optional.

> R 3:35-6. D. H. Monk.

An analysis of the distribution and utilization of public and private resources for educational purposes. The discussion will revolve around the issues of equity, efficiency, and freedom of choice. Alternative methods of financing schools will be evaluated, and the perplexing legal and moral issues raised by such questions as "Who pays?" and "Who benefits?" will be discussed. Specific attention will be given to budgeting, accountability, and productivity. An opportunity for individuals to focus on their own areas of interest, such as occupational education, the two-year college, or secondary or higher education.

## EDUC 665 Administrative Decision

 MakingSpring. 3 credits. S-U grades optional. W 3:35-6. D. H. Monk.
An introduction to decision making theory and its relevance to the field of educational administration. Specific applications will be made to the study and improvement of productivity within educational systems. A wide variety of educational settings will be considered, including higher education and non-formal education.

## [EDUC 678 Planning Educational Systems

Spring. 3 credits. S-U grades optional. Not offered 1994-95.

T 2:30-4:25. D. H. Monk.
A seminar focused on a comparative analysis of educational planning as it is practiced in developing nations. Topics will include manpower planning, the social demand approach to educational planning, benefit-cost analysis, and incentive models of planning. The political and economic implications of attempts to plan education will be emphasized.]

## EDUC 679 Policy Issues in Higher

 EducationSpring. 3 credits. S-U grades optional. T 11:15-1:15. J. R. Egner.
Deals with administration of higher educational organizations. Current approaches to planning and analysis of special problems.

## EDUC 680 Foundations of Extension

 Adult EducationFall. 3 credits. Limited to 20 students. S-U grades optional.

F 9:05-12:10. D. Deshler.
An analysis of alternative purposes, nature, and scope of extension, adult, and continuing education programs in the United States and abroad, with emphasis on the relationship of programs to historical, cultural, political, and social settings. Definitions, conceptual controversies, philosophical issues, and current research directions will be examined through a seminar approach.

## [EDUC 681 Designing Extension and

 Continuing Education ProgramsFall. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95.

T 1:25-4. Staff.
Designed to help students understand the concepts, principles, and procedures relevant to developing programs and curricula for the continuing education of adults. Emphasis is on such key areas as the nature and role of programming, situation analysis and needs identification, choosing among alternative courses of action, stating program objectives, and program organization.]

## EDUC 682 Community Education and Development

Fall. 3 credits. For students who have interest or experience in education or development programs in which community is an important concern.

Lec, M 1:25-4. M. Ewert.
An examination of the concept of community; changes in community life; the analysis of community; alternative strategies for community development; patterns of response to community by universities, colleges, schools, cooperative extension, and government service agencies; and such functional dimensions of community education programming as participatory decision making, volunteers, leadership development, council formation and function, interagency coordination, and change-agents roles.

## EDUC 683 Administration of Nonformal

 EducationSpring. 3 credits.
W 1:25-4. J. R. Egner.
An overview of selected theories, principles, and strategies applicable to management of decentralized, professionally staffed, nonformal educational organizations and change agencies. Content includes management functions, managerial leadership and decision-making strategies. Particular attention is given to leadership of organizations with volunteer staff.

EDUC 685 Training and Development: Theory and Practice (also Communication 685, International Agriculture 685 and Industrial and Labor Relations 658)
Spring. 4 credits. S-U grades optional.
Charge for materials, \$45.
F 9:05-12:05; lab/disc, once a week, to be arranged. R. Colle, M. Ewert, W. Frank. Analysis, design, conduct, administration, and evaluation of training programs for the
development of human resources in smallfarm agriculture, rural health and nutrition, literacy and nonformal education, and general community development. Designed for scientists, administrators, educator-trainers, and social organizers in rural and agricultural development programs in the U.S. and abroad.

## EDUC 690 Research Seminar

Fall and/or spring. No credit.
R 12:20. Staff.
Presentation of current research in the field of education by graduate students and staff. Opportunities to discuss methodology, findings, and other aspects of research.

## EDUC 694 Special Topics in Education

Fall, spring, or summer. 1-3 credits.
Prerequisite: permission of instructor.
S-U grades optional.
Hours to be arranged. Staff.
Topics to be announced.
EDUC 711 Contemporary Issues in Educational Psychology
Fall and spring. $2-3$ credits.
M W 11:15. 1 hour to be arranged. J. A. Dunn.

This is a graduate-level seminar dealing with key issues in contemporary psychology having implications for educational practice and research. Topics will vary from year to year. Students may take the course more than once.

## [EDUC 714 Moral Development and Education

Spring. 3 credits. S-U grades optional. Not offered 1994-95.

Lec, M 12:20-2:15; 1 hour to be arranged. D. E. Schrader.

This seminar focuses on current topics in moral development research as related to the educational process. Topics include the question of the development of moral reasoning, gender differences, the relationship between moral judgment and moral action, questions related to moral education in secondary schools and university settings, and professional ethics in educational settings. This course takes a life-span perspective; however, special emphasis will be placed on development from adolescence through adulthood.]

## EDUC 715 Seminar in Psychology and Education

Fall or spring. Variable credit. Prerequisite: permission of instructor.

R 1:25-3:30. D. E. Hedlund.
Selected topics focusing on the interaction of theoretical and research developments in psychology and education.

## EDUC 718 Adult Learning and Development

Fall or spring. 3 credits. Prerequisite;
permission of instructor. S-U grades optional.
W 2:30-5. R. E. Ripple.
Deals with adult development and learning behavior from points of view of educational psychology, and adult education. Inferences are drawn from theory and research to the practice of adult continuing education. Appropriate for graduate students in educational psychology, extension and continuing education, and community service education, and for others interested in adult learning and development.

EDUC 730 Seminar in Agricultural, Extension, and Adult Education
Spring. 2 credits. S-U grades optional.
R 8-9:55. H. D. Sutphin, J. R. Egner, and staff.
Emphasis on current problems and research in agricultural, extension, and adult education. Includes discussion and analysis of student and staff research.

## [EDUC 735 Teacher Preparation in Agriculture

Fall. 3 credits. Prerequisite: teaching experience in agriculture. Not offered 1994-95.

W 1:25-3:20. Staff.
For persons with teaching experience interested in the preparation of occupational teachers. Involvement in the Cornell program of teacher preparation in agriculture is expected.]

## [EDUC 739 Evaluating Programs in

 Agricultural, Extension, and Adult EducationSpring. 3 credits. Field trip. Not offered 199495.

T 2-4:30; labs to be arranged. Staff. This course examines objectives, criteria, and strategies for evaluating programs of agricultural, extension, and adult education Evaluation models, case studies, and evaluation as a function of program planning are considered. Participants examine the roles of supervision in evaluation and have an opportunity to develop and apply evaluation instruments. Field trips and resource persons provide opportunities to observe actual evaluation problems and procedures.]

EDUC 744 Seminar in College Teaching Summer. 2-3 credits.

1-week. Hours to be arranged. J. Novak. This seminar will be specially designed for Latin college and university professors. It will begin with a review of the current status of knowledge on teaching and learning, presenting a theoretical foundation for education, and move to practice in solving specific teaching problems.

## EDUC 745 Seminar in Curriculum Theory

 and ResearchFall. 3 credits. Prerequisite: EDUC 644, or permission of instructor.

T 2:30-5:00. G. Posner.
Theoretical issues in curriculum and appropriate areas for curriculum research are discussed. Two current topics of interest are the hidden curriculum and school reform Both topics serve to uncover the relation between ideology and research.

## EDUC 762 Research in Eddcational

 AdministrationSpring. 3 credits. Prerequisite: one course in elementary statistics or permission of instructor. S-U grades only.

R 3:35-6. E. J. Haller.
For students interested in learning about the process of formulating and carrying out a piece of empirical research. Studies will focus on policy and administrative issues concerning public education. Seminar participants will have access to large, nationally representative data sets that will permit them to conduct high-quality, publishable studies of U.S. schools, students, teachers, and parents. In the process they will learn some of the costs and benefits of secondary data analysis and gain some familiarity with statistical analyses on a Comell mainframe computer.

## [EDUC 772 Seminar in Philosophy of

 EducationSpring. 3 credits. Prerequisite: permission of instructor. S-U grades optional. Not offered 1994-95.

Hours to be arranged. K. A. Strike. Topics to be announced.]

## EDUC 783 Comparative Extension Education Systems

Summer. 3 credits. S-U option.
1-week. Hours to be arranged. M. Ewert Extension education in the developing nations is studied using, as an analytical frame of reference, a hypothetical model comprising such components as community organization, community-based learning, indigenous facilitators and leaders, extension generalists and specialists, training and researchextension linkages. Case materials on alternative extension models and intercountry experiences provide an empirical base.

## [EDUC 784 Educational Technology.

Transfer and Decision Making
Fall. 3 credits. Offered odd years only. Not offered 1994-95.

M 11:15-1:10. H. D. Sutphin,
J. McGonigal, and staff.

The educational and program management decisions involved in the adoption of educational technology in extension, rural development, and nonformal education programs are reviewed, and a variety of decision-making approaches is explored. An overall problem-solving method with case study illustrations is used. Consideration is given to structure and operating style of the educational organization, as well as to the characteristics of the technology under consideration. The course makes use of recent literature and continuously updated files on current developments in technology applications.]

## EDUC 800 Master's-Level Thesis Research

Fall or spring. Credit to be arranged. S-U grades optional. Each student, before course enrollment, must obtain the approval of a faculty member who will assume responsibility for guiding the work.

Staff.

## EDUC 900 Doctoral-Level Thesis Research

Fall or spring. Credit to be arranged. Limited to students working on theses or other research and development projects. S-U grades optional. Each student, before course enrollment, must obtain the approval of a faculty member who will assume responsibility for guiding the work.

Staff.

## Related Course in Another Department

Historical Roots of Modern Psychology (PSYCH 490)

## ENTOMOLOGY

G. C. Eickwort, chair; P. L. Davis, P. P. Feeny,
C. Gilbert, M. P. Hoffmann, J. K. Liebherr,
R. A. Morse, L. A. Patrican, B. L. Peckarsky,
D. Pimentel, R. B. Root, R. T. Roush,
D. A. Rutz, J. P. Sanderson, J. G. Scott,
A. M. Shelton, E. J. Shields, M. J. Tauber,
W. M. Tingey, S. Via, Q. D. Wheeler

## Courses by Subject

Apiculture: 260, 264
Behavior: 471, 662
Ecology: 452, 455, 456, 470, 471, 672
Introductory courses: 200, 212, 215
Medical entomology and veterinary entomol-
ogy: 352, 653
Morphology: 322
Pest management: 241, 342, 441, 444, 472, 640, 677
Physiology and toxicology: 370, 483, 490. 685 Systematics and acarology: 331, 332, 453, 621, 631, 634, 636, 674

## [ENTOM 200 Cultural Entomology

Fall. 2 credits. S-U grades optional. Intended for students in all colleges. Not offered 1994-95.

Lecs, T R 10:10. Staff.
A presentation of the insects, with attention to their roles in nature and in civilization. Biological, historical, social, economic, and

## culcural aspects are discussed.]

## ENTOM 212 Insect Biology

Fall. 4 credits. Prerequisites: BIO G 101-102 (may be taken concurrently) or equivalent.

Lecs, W F 11:15; lab, T W or R 1:25-4:25.
J. K. Liebherr.

Introduces the science of entomology by focusing on basic principles of systematics, morphology, physiology, behavior, and ecology of insects. The laboratory in early fall includes field trips to collect and study insects in the natural environment. A small collection emphasizing ecological and behavioral

## categories is required

## ENTOM 215 Life on a Silken Thread: Biology of Spiders

Fall. 2 credits. Prerequisite: Introductory biology or permission of instructor. S-U grades optional.

Lecs, M W 1:25. L. S. Rayor. An introduction to the fascinating world of spiders. The course will examine the evolution, ecology, behavior, and physiology of spiders from a modern perspective. Topics will include the identification of major spider families, the use of silk, their diverse life-styles in temperate and tropical ecosystems, risky courtship, predatory behavior, social spiders, sensory physiology and communication, development, and potential for use in integrated pest management.
ENTOM 241 Applied Entomology
Spring. 3 credits. Prerequisites: BIO G 101-102 or equivalent.

Lecs, T R 9:05; lab-disc, T W or R
12:20-3:15 R T R 12:20-3:15. R. T. Roush. Introduction to major pest species and tactics for their management. Discussions of insect pest management requirements on farms, gardens, forests, and urban environments, along with descriptions of control methods, materials, and equipment.

## ENTOM 260 Introductory Beekeeping

## Fall. 2 credits.

Lecs, T R 11:15. R. A. Morse.
Introduces the fundamentals of practical beekeeping, including the life history,
physiology, and behavior of honey bees. The classical experiments on the dance language and the role of pheromones are reviewed. Some lectures are devoted to pollination of agricultural crops and the production of honey and beeswax.

## ENTOM 264 Practical Beekeeping

Fall. 1 credit. Limited to 20 students Prerequisite: ENTOM 260 (may be taken concurrently).

Lab, R 2-4:25. R. A. Morse
This course consists of fourteen laboratory sessions to acquaint students with practical methods of colony management. Laboratories involve actual work with honey bee colonies and equipment. Some of the topics covered are management of bees for apple pollination, honey harvesting and processing, and disease identification and control.

## ENTOM 322 Insect Morphology

Spring. 5 credits. Prerequisite: ENTOM 212 or 241 . Offered alternate years. Not offered 1995-96.

Lecs, M W F 9:05; labs, M W 1:25-4:25.
G. C. Eickwort.

An introduction to the external and internal anatomy of insects, with emphasis on the comparative and functional aspects. The laboratory is devoted largely to dissection.

## [ENTOM 331 Introductory Insect

 SystematicsSpring, 4 credits. Prerequisite: ENTOM 212 Offered alternate years. Not offered 1994-95.

Lecs, T R 10:10; labs,T R 1:25-4:25
Q. I. Wheeler.

An introduction to the classification, evolutionary history, and distribution of the insects. Laboratory practice in the identification of orders, families, and representative genera of insects; methods of collection, preservation, and study. Lectures on theory and practice of insect systematics and major features of insect evolution. Insect collections are required.]

## [ENTOM 332 Systematics Discussion

 GroupSpring 1 credit. Prerequisite: concurrent enrollment in ENTOM 331 or permission of instructor. S-U grades only. Offered alternate years. Not offered 1994-95.

Disc, hours to be arranged.
Q. D. Wheeler.

Readings and discussion on topics in
systematics coordinated with the lecture series in Entomology 331.]

## ENTOM 342 Special Topics in Economic

 EntomologyFall or spring. Hours to be arranged. Staff.
Topics to be announced.

## ENTOM 352 Medical and Veterinary Entomology

Fall. 3 credits. Prerequisites: BIO G 101-102 or equivalent. S-U grades optional. Offered alternate years. Not offered 1995-96.

Lec, T R 10:10; lab, R 1:25-4:25.
L. A. Patrican.

The ecology of arthropods of medical and veterinary importance in temperate and tropical regions of the world with emphasis on the role they play in causation or transmission of disease. The laboratory involves 2 field trips, techniques of collection and identification, dissections, methods of transmission, means of identification of a blood pathogen and the source of a blood meal.

ENTOM 370 Pesticides, the Environment, and Human Mealth (also Toxicology 370)

Fall. 2 credits. Prerequisites: B1O G 101-102 or equivalent. Offered alternate years. Not offered 1995-96.

Lecs, T R 9:05. J. G. Scott.
A survey of the different types of pesticides, their uses, properties, and effects on the environment. Discussion of the risks, benefits, regulation, politics, and current controversies associated with pesticide use.

## [ENTOM 441 Seminar in Insect Pest

 ManagementSpring. 1 credit. Limited to 15 students. Prerequisite: ENTOM 241 or 444 or permission of instructor. S-U grades only. Offered alternate years. Not offered 1994-95

Hours to be arranged. M. P. Hoffmann,
A. M. Shelton

Discussion and analysis of current topics in insect pest management.]

## ENTOM 444 Integrated Pest

 Management (also Plant Pathology 444)Fall. 4 credits. Prerequisites: BIOES 261, ENTOM 212 or 241, and PL PA 301 or their equivalents or permission of instructor

Lecs, M W F 9:05; lab, M or W 1:25-4:25. P. A. Arneson.

Lectures integrate the principles of pest control, ecology, and economics in the management of pest-crop systems. Laboratories consist of exercises to reinforce concepts presented in lecture and demonstrate pest monitoring techniques and the application of computer technology to management problems.

## ENTOM 452 Herbivores and Plants:

 Chemical Ecology and Coevolution (also BIOES 452)Spring. 3 credits. Prerequisites: One year of introductory biology; BIOES 261; CHEM 253 or $357 / 358$ and 251 or 301 ; or permission of instructor. Offered "odd" spring semesters.

Lec, M W 11:15-12:05; disc, F 11:15-12:05. P. P. Feeny.

Significance of plant chemistry in mediating interactions between plants and herbivorous animals; mechanisms and strategies of plant finding and exploitation by animals; especially insects, and of defense and escape by plants; evolutionary hypotheses for ecological patterns of resistance and attack; implications for human food and agriculture.

## [ENTOM 453 Principles and Practice of Historical Biogeography (also BIOES 453)

Fall. 3 credits. Prerequisite: A course in systematics or permission of instructors. S-U grades optional. Offered alternate years. Not offered 1994-95.

Lecs, T R 10:10; lab/disc. R 2:30-4:25.
J. K. Liebherr and M. Luckow

A survey of methods and techniques in historical biogeography, and the development of modern biogeographic theory in the context of classical and ecological analytical methods. Summaries of geological and paleontological aspects of biogeography will be presented, and large-scale biogeographic patterns discussed. Laboratories will focus on computer applications and discussion of controversial issues.]
[ENTOM 455 Insect Ecology, Lectures (also BIOES 455)
Fall. 3 credits. Prerequisites: BIOES 261 or equivalent and ENTOM 212 or equivalent knowledge of another taxon. Offered alternate years. Not offered 1994-95.

Lecs, W F 11:15 and 1 hour of discussion weekly to be arranged. R. B. Root. Topics include the nature and consequences of biotic diversity, biogeography, coevolution, adaptive syndromes exhibited by various guilds, population regulation, impact of insects on ecosystems, comparative and functional analysis of communities, and differences in the organization of natural and managed systems. Ecological and evolutionary principles are integrated by thorough study of exemplars.]

## ENTOM 456 Stream Ecology (also BIOES

 456)Spring. 4 credits. Recommended: BIOES 261. S-U grades optional. Offered alternate years. Not offered 1995-96.

Lecs, T R 9:05; labs, T, W, or R 1:25-4:25
(3 sections). B. L. Peckarsky and
M. B. Bain.

Lecture addresses the patterns and processes occurring in stream ecosystems, including channel formation, water chemistry, watershed influences, plant, invertebrate, and fish community structure, nutrient cycling, trophic dynamics, colonization and succession, community dynamics, conservation and the impacts of disturbances. Lab: A field project includes descriptive and experimental techniques and hypotheses testing related environmental assessment.

## ENTOM 470 Ecological Genetics (also

 BIOES 470)Spring. 4 credits. Prerequisite: BIOES 378 or consent of instructor. S-U grades optional Offered altemate years. Not offered 1995-96

Lecs, T R 10:10-11:30; disc, $1 \mathrm{hr} / \mathrm{wk}$ to be arranged. S. Via.
A study of the relationships between genetic and ecological processes in populations
Topics include consequences of genetic variation in age-structured populations, demographic concepts of fitness, evaluation of methods for measuring genetic variation and natural selection on ecologically important traits, genetics of competitive ability and predator avoidance, genetic and ecologic aspects of phenotypic plasticity, character displacement, maintenance of genetic variability, and limits to selection. We will consider how theory can be used to formulate hypotheses about evolutionary mechanisms in natural populations and evaluate experiments designed to test such hypotheses.

## [ENTOM 471 Freshwater Invertebrate

 BiologySpring. 5 credits. Recommended: ENTOM 212. Offered alternate years. Not offered 1994-95.

Lecs, T R 9:05; labs, T R 1:25-4:25. B. L. Peckarsky.

The lecture explores the morphology, physiology, phylogeny, life histories, behavior, feeding ecology, and evolution of macroscopic freshwater invertebrates with an emphasis on contrasting the attributes of aquatic and terrestrial insects. The laboratory involves field collections and laboratory identification of invertebrates and stresses the use of keys. Students prepare a collection of freshwater invertebrates.]

## ENTOM 472 Genetics of Pest

Management
Fall. 4 credits. Prerequisite: BIOGD 281 or equivalent. S-U grades optional. Offered alternate years. Not offered 1995-96.

Lecs, T R 12:20-1:45; lab to be arranged
(3 hours). R. T. Roush.
A detailed survey of the application of genetics to pest management. Includes discussion of host plant resistance, pesticide resistance, insect mass rearing technology, autocidal controls (e.g., sterile males), and the establishment and genetic improvement of biological control agents, with examples from plant pathology, weed science, and entomology.

## ENTOM 483 Insect Physiology

Fall. 5 credits. Prerequisite: ENTOM 212 or permission of instructor. Offered alternate years. Next offered 1995-96.

Lecs, M W F 11:15; lab, W 1:25-4:25, disc
F 1:25-2:15. C. Gilbert.
An introduction to the often unique ways in which insects have met their basic needs. Each organ system is examined with emphasis on basic principles and specific examples. The student will also be introduced to some common methods used in physiological research and to the critical reading of scientific literature

## ENTOM 490 Insect Toxicology and the

 Molecular Basis of Insecticide Toxicity (also Toxicology 490) Spring. 4 credits. Prerequisites: general chemistry and organic chemistry. S-U grades optional. Undergraduate students by permission of instructor. Offered alternate years. Not offered 1995-96.Lecs, M W F 9:05; lab, day to be arranged, 1:25-4:25. J. G. Scott. The history, metabolism, and mechanism of action of synthetic and naturally occurring insecticides. Mechanisms of insecticide resistance, evaluation of insecticide toxicity, and new approaches to insecticidal compounds with biotechnology will be discussed.

## ENTOM 494 Special Topics in Entomology

Fall or spring. 4 credits maximum, S-U grades optional.

Hours to be arranged. Staff. The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## ENTOM 497 Individual Study in

Entomology
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Students must register with an Independent Study form (available in 140 Roberts Hall). Staff.

## ENTOM 498 Undergraduate Teaching

Fall or spring. Credit to be arranged.
Prerequisite: permission of instructor.
Undergraduate teaching assistance in an entomology course by agreement with the instructor. Students must register with an Independent Study form (available in 140 Roberts Hall).

Staff.
Participating students assist in teaching a course allied with their education and experience. Students are expected to meet regularly with a discussion or laboratory
section, to gain teaching experience, and regularly to discuss teaching objectives, techniques, and subject matter with the professor in charge.

## [ENTOM 621 Acarology

Fall. 4 credits. Prerequisites: ENTOM 212 and permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, M W 9:05; lab, M 1:25-4:25.
G. C. Eickwort.

An introduction to the taxonomy, morphology, and bionomics of mites and ticks, with emphasis on taxa of economic importance. A collection is required.]

## [ENTOM 631 Systematics of the Coleoptera

Fall. 4 credits. Prerequisite: ENTOM 331. Offered alternate years. Not offered 1994-95

Lecs, M W 12:20; labs, M W 1:25-4:25.
$S$ field trips. Q. D. Wheeler.
A comprehensive review of the comparative morphology, phylogenetic relationships, classification, natural history, and distribution of the Coleoptera, including adult and immature stages. Laboratory practice in identification and methods for collection and study of beetles. A collection is required.]

## ENTOM 634 Special Topics in

 Systematic EntomologyFall or spring; taught on demand. 2-4 credits. Prerequisite: permission of instructor.

Hours to be arranged. Staff.
Lectures on the classification, evolution, and bionomics of selected taxa, with accompanying laboratory studies on identification and comparative morphology. Collections sometimes required.

## ENTOM 636 Seminar in Systematic

 EntomologyFall or spring. 1 credit. Prerequisite: permission of instructor. S-U grades only. Hours to be arranged. Staff. Discussion of current topics in systematic entomology. Topics to be announced, including current theoretical issues in insect classification, evolution, and biogeography.

## ENTOM 640 Applied Ecology and Pest Management

Spring. 3 credits. Prerequisites: ENTOM 444 and a course in statistics. Recommended: a course in computer science. S-U grades optional. Offered alternate years. Not offered 1995-96.

Lecs,T R 2:30-3:45. P. M. Davis.
Theory and quantitative methods for characterizing arthropod population dynamics for research and pest management purposes. Course evaluates biological and climatic factors influencing population numbers, development, dispersal, and plant response to arthropod pests. Special topics include development of sampling methodology and simulation modeling.
[ENTOM 662 Insect Behavior Seminar Spring. 2 credits. Prerequisites: permission of instructors and ENTOM 212 and BIONB 221 or equivalents. S-U grades optional. Offered alternate years. Not offered 1994-95.

Hours to be arranged. G. C. Eickwort,

## M. J. Tauber.]

## [ENTOM 664 Seminar in Insect-Plant Interactions (also BIOES 664)

Spring. 2 credits. Limited to 15 students. Prerequisites: entomology, ecology, evolution, organic chemistry, and permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

One evening a week, to be arranged. P. P. Feeny.

For graduate students and seniors. Presentations and discussions by students on the evolution of patterns of interaction between plants and insects, emphasizing critical evaluation of concepts and evidence.]
ENTOM 672 Seminar in Aquatic Ecology Spring. 1 credit. Prerequisites: permission of instructor or either ENTOM 456, 471 or BIOES 462, 464. S-U grades optional. Offered altemate years. Not offered 1995-96.

Hours to be arranged. B. L. Peckarsky. Discussion and analysis of current topics in the ecology of streams, lakes and marine ecosystems, including student-generated synthesis of key papers in the literature.

## [ENTOM 674 Principles of Systematics (also BIOES 674)

Spring. 4 credits. Prerequisite: ENTOM 331 or introductory systematics course in another field of biological sciences. Offered altemate years. Not offered 1994-95.

Lecs-disc-labs, M W 1:25-4:25. Staff.
(Q. D. Wheeler, coordinator).

An introduction to modern theory and methods of systematic biology. Lectures readings, and discussions on theoretical systematics, including species concepts, classification, phylogenetics, and biogeography. Laboratories include various methods of analysis of data (e.g., cladistic hand and computer methods, numerical methods). Part of the grade is based on a final paper.]

## [ENTOM 677 Biological Control

Fall. 3 credits. Prerequisites: ENTOM 212, BIOES 261, and permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, T R 9:05; lab, T 2-4:25. M. J. Tauber. Approach and procedures in biological control of arthropod pests and weeds. Laboratory includes studies with living parasitoids and predators.l

## ENTOM 685 Seminar in Insect Physiology

Spring. 1 credit. S-U grades optional. Prerequisite: permission of instructor.

Hours to be arranged. C. Gilbert.

## ENTOM 694 Special Topics in

 EntomologyFall or spring. 4 credits maximum.
S-U grades optional.
Hours to be arranged. Staff.
The deparment teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## ENTOM 707 Individual Study for Graduate Students

Fall or spring. Credit to be arranged.
Prerequisite: permission of instructor. Not for thesis research.

> Staff.

## ENTOM 709 Teaching Entomology

## Credit to be arranged

Staff.
Teaching entomology or for extension training.
ENTOM 800 Master's-Level Thesis Research
Credit to be arranged. Prerequisite: permission of instructor. S-U grades optional. Staff.

## ENTOM 900 Doctoral-Level Thesis

 ResearchCredit to be arranged. Prerequisite: permission of instructor. S-U grades optional. Staff.

## Jugatae Seminar

Fall and spring.

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A seminar conducted by Jugatae, the entomology club of Cornell University, to discuss topics of interest to its members and guests. All interested undergraduate and graduate students are encouraged to attend.

## FLORICULTURE AND ORNAMENTAL HORTICULTURE

Floriculture and Omamental Horticulture courses are listed under Horticultural Sciences on p. 74.

## Freehand Drawing and Scientific Illustration

Freehand Drawing and Scientific Illustration courses are offered through the Department of Floriculture and Ornamental Horticulture.
Courses are described on p. 73.

## Landscape Architecture

The Landscape Architecture Program at Cornell is sponsored by the College of Agriculture and Life Sciences through the Department of Floriculture and Ornamental Horticulture, and the College of Architecture, Art, and Planning. For course descriptions, see Landscape Architecture, p. 78.

## FOOD SCIENCE

R. A. Ledford, chair; T. E. Acree,
D. K. Bandler, D. M. Barbano, C. A. Batt, D. H. Beermann, M. C. Bourne, J. Brady, A. K. Datta, I). C. Graham, R. B. Gravani, T. Henick-Kling, P. F. Hopper, J. H. Hotchkiss, H. T. Lawless, D. D. Miller, S. Mulvaney, J. M. Regenstein, S. S. H. Rizvi, J. W. Sherbon

## FOOD 101 Science and Technology of

 FoodsFall. 1 credit. S-U grades only. Lec and disc, M 12:20. J. Hotchkiss and staff.
This course explores the application of science and technology to foods. Lectures will elucidate the role of engineering, biotechnology, chemistry, biochemistry, nutrition, toxicology, and microbiology in supplying the world with safe and nutritious food. An overview of food science as a discipline and career choice will be given.

## FOOD 102 Contemporary Perspectives in

 Food ScienceSpring. 1 credit. S-U grades only.
F 12:20. Three field trips, 2 on F 1:25-5:00 and 1 on F 7:30 a.m. $-5: 30$ p.m.
R. A. Ledford and J. H. Davidson.

A series of seminars dealing with current technological, regulatory, and international developments in food science. Field trips to four or five commercial food plants will be used to illustrate the application of current technologies.

## FOOD 150 Food Choices and Issues

Spring. 2 credits. S-U grades optional. Lecs, T R 12:20. R. B. Gravani, D. D. Miller, and staff.

This course provides nonmajors with knowledge needed to make appropriate food choices. Emphasis is on principles and concepts necessary for selecting nutritious diets. Topics include: relationships between diet and health, the impact of food science and technology on food choices, the characteristics of the major food commodity groups, and current issues affecting food quality and safety. The course is designed to provide students with practical and useful information about the foods they eat.

## FOOD 200 Introductory Food Science

 Fall. 3 credits.M W F 11:15. J. W. Sherbon.
A comprehensive introduction to food science and technology-its scope, principles, and practices. Topics are constituent properties; methods of preservation; the major food groups, including their handling and processing; and current problems such as chemical additives and world feeding needs. Interrelationships between chemical and physical properties, processing, nutrition, and food quality are stressed. There will be one field trip on a Friday ( 11 a.m. -5 p.m.) in September.

## FOOD 210 Food Analysis

Spring. 3 credits. Prerequisite: CHEM 104 or 208.

Lecs, M W 12:20; lab, F 12:20-3:20.
J. W. Sherbon.

Introduces tests used by food analysts for fats, proteins, carbohydrates, and selected minor nutrients. Emphasis is on understanding and use of good analytical techniques, including gravimetric, volumetric, chromatographic and spectrophotometric methods. A special project for the total analysis of a complex food provides experience in technique selection, work scheduling, and execution.

## FOOD 311 Milk and Frozen Desserts

Fall. 2 credits. Prerequisite: FOOD 322 or permission of instructor. Offered alternate years. Not offered 1995-96.

Lec, R 12:20; lab, R 1:25-4:25.
J. W. Sherbon and D. K. Bandler. Deals with the principles and practices of processing fluid milk products and frozen desserts. The chemical, microbiological, and technological aspects of processing these dairy products are considered. Emphasis will be upon product quality and recognition of factors affecting it.

## FOOD 321 Food Engineering I

Fall. 3 or 4 credits. Prerequisites: FOOD 200 and PHYS 101.

Lecs, M W F 9:05; lab, T 1:25-4:25 (lab
required for 4 credit option).
S. S. H. Rizvi.

Intended to give food science students an introduction to the engineering aspects of food processes and equipment. Emphasis on the fundamental concepts of momentum, heat, and mass-transport processes.

## FOOD 331 Statistical Quality Control of

 Food ProcessingSpring. 1 credit. Prerequisite: AG EC 310 or equivalent.

Lab, R 1:25-4:25. G. Houghton.
An introduction to the statistical tools used to control quality in food processing operations. Topics covered include control charts and
other process control tools as well as acceptance sampling.

## FOOD 351 Milk Quality

Spring. 1 credit. Prerequisite: AN SCl 350 or equivalent or permission of instructor.

F 12:20. D. K. Bandler.
Focuses on the important aspects of farm sanitation and milk handling as they affect milk flavor and quality. The course is an overview of quality control tests, basic microbiology, cleaning and sanitizing, and special problems in manufacturing and marketing fresh and storable dairy products.
FOOD 394 Food Microbiology Lectures
Fall. 2 credits. Prerequisites: BIOMI 290 and 291

M W 12:20. R. A. Ledford.
The major families of microorganisms of importance in foods are studied, with emphasis on the roles of those organisms in food preservation, food fermentations, and public health.

FOOD 395 Food Microbiology Laboratory Fall. 2 credits. Graduate students must have permission of the instructor.

M W 2-4:25. J. M. Brown.
Work includes study of the physiological characteristics of representative food microorganisms, practice in using general and special methods for microbiological testing and control of food products, and practice in the application of a systematic approach to controlling the safety of foods.

FOOD 396 Food Safety Assurance
Spring. 2 credits. Prerequisite: FOOD 200 or permission of instructor. Offered altemate years. Not offered 1995-96.

Lec, T R 9:05. R. B. Gravani. This course provides information on procedures to control biological, chemical, and physical hazards and assure the safety of foods. Topics include discussions on Hazard Analysis Critical Control Point (HACCP) programs, total quality management, and the application of current technologies in reducing the incidence of foodborne illness. Case studies and exercises will be used to demonstrate and apply the key principles that are discussed.

## FOOD 400 Senior Seminar in Food Science and Technology

Fall. 1 credit. Limited to seniors.
Lec, M 4:30. D. K. Bandler.
Students prepare and present a seminar on a topic of current interest in food science and technology.

## [FOOD 401 Concepts of Product

 DevelopmentSpring. 2 credits. Prerequisite: FOOD 200 or equivalent. Offered alternate years. Not offered 1994-95.

M W 9:05-9:55. J. H. Hotchkiss. A discussion of the sequence of events in developing and marketing new food products. Topics include packaging and labeling, food additive and ingredient regulations, taste panels, market testing, market research, and patents.]

## [FOOD 403 International Food Science

 and DevelopmentSpring, 3 credits. Offered alternate years. Not offered 1994-95.

Lecs, T R 8:30-9:55. D. C. Graham. A critical evaluation of humanity's needs for food, especially in the developing world, and of the international food technologies,
organizations, and policies necessary to meet such needs. Traditional methods and fermentation food processes of basic foods for specific developing countries are described.]
[FOOD 405 Food Waste Management
Spring. 2 credits. Prerequisite: FOOD 200 or its equivalent. Offered altemate years. Not offered 1994-95.

Lec, M 12:20-2:15, lab, M 2:30-4:25.
(Note: labs will not meet every week.)
J. M. Regenstein.

Field trips, laboratories, and demonstrations.
Deals with the principles and practices related to managing, reducing, recycling and reclaiming wastes from food plants and other unit operations important to the food industry Some broader areas of waste management impacting the food industry will also be discussed.]

## [FOOD 406 Cheese and Other Fermented

 FoodsFall. 2 credits. Prerequisite: background in microbiology. Offered alternate years. Not offered 1994-95.

Lecs, F 12:20-1:10, lab F 1:25-4:25.
D. K. Bandler.

Principles and practices of fermentation and processing techniques as they apply to cheeses, cultured dairy foods, beers, and related products. Labs will feature unit processes and tastings.]

## FOOD 409 Food Chemistry

Spring. 3 credits. Prerequisite: BIOBM 330 or 331.

Lecs, M W F 9:05. D. D. Miller, J. Brady,
J. M. Regenstein, J. P. VanBuren.

The chemistry of foods and food ingredients. Chemical and physical properties of water, proteins, lipids, carbohydrates, and other food components/additives are discussed in the context of their functional roles in foods. The effects of chemical changes during processing and storage on quality and nutritional aspects of several food commodity groups (milk, meat, fruits and vegetables, cereals and legumes) are described.

## FOOD 410 Sensory Evaluations of Foods

Fall. 3 credits. Prerequisite: statistics.
Lecs, M W F 10:10. H. T. Lawless.
Deals with the sensory techniques used in evaluating the flavor, color, and texture of foods and the evaluation of consumer acceptance. Includes methods for measuring these qualities, underlying psychological principles, statistical methods for analyzing results, and establishing a full-service sensory evaluation program.
FOOD 415 Principles of Food Packaging Fall. 3 credits.

M W F 9:05. J. H. Hotchkiss.
The chemical and physical properties and manufacture of the basic materials used to construct packaging are discussed. The influence of packaging on shelf life is presented. Emphasis is on newer packaging technologies and materials. Economics, design, and regulation of food packaging are briefly presented.
[FOOD 416 Food Packaging Laboratory
Spring. 2 credits. Prerequisite: FOOD 415. Offered alternate years. Not offered 1994-95.

Lec, F 8; lab to be arranged.
J. H. Hotchkiss.

A laboratory course designed to introduce several testing methods used to evaluate adequacy of food packaging. Emphases are on physical testing methods of packaging
materials and the evaluation of total packages. Students will design and build a new food package.]

## [FOOD 417 Sensory Analysis of Dairy

 ProductsSpring. 1 crectit. S-U grades optional. Offered alternate years. Not offered 1994-95. Lec, M 2:30-4:25. H. Lawless. A survey of the traditional quality grading techniques used for sensory evaluation of dairy products, and a comparison of those techniques to alternative sensory evaluation procedures. Students will prepare samples for one or two demonstrations of classical dairy defects such as lipid oxidation or hydrolytic rancidity. Tasting and practice in identifying defects will be given in class. Primary attention will be given to sensory quality factors in fluid milk, cheddar cheese, cottage cheese, and ice cream.]

## FOOD 419 Food Chemistry Laboratory

Spring. 2 credits. Prerequisites: BIOBM 330 or 331 and concurrent registration in FOOD 409.

Lab, W 12:20-4:25. D. D. Miller,
J. M. Brown.

A laboratory course emphasizing fundamental chemical principles and laboratory techniques necessary for an understanding of the chemistry of foods. Relationships between chemical composition and functional, nutritional, and organoleptic properties of foods are stressed. Many of the laboratory techniques involved are common to those used in biochemistry laboratories (e.g., electrophoresis, chromatography, enzyme assays) but are applied to specific foods or beverages.

## FOOD 421 Unit Operations in Food Processing II

Fall. 3 credits. Prerequisite: FOOD 322. Lecs, T R 10:10; lab, R 1:25-4:25.
S. S. H. Rizvi, S. Mulvaney.

Principles and practices of thermal processing of foods, as a preservation technique, with emphasis on kinetics of destruction of microorganisms and quality factors. Fundamentals and applications of extrusion and microwave processes. Laboratory experience in retorting of foods, microwave and extrusion processing.

## [FOOD 422 Food Engineering II

Spring. 3 credits. Prerequisite: FOOD 321 or permission of instructor. Offered alternate years. Not offered 1994-95.
Lecs, M W F 10:10. S. S. H. Rizvi,

## S. Mulvaney

Application of transport phenomena to food processing unit operations. Fundamentals of food process design, scale-up, and control.]

## FOOD 430 Understanding Wine

Spring. 3 credits. Prerequisites: Introductory biology and chemistry or permission of instructor. Students must be 21 years old by the first day of class (Jan. 23, 1995) to enroll. S-U grades optional.

T R 2:30-4:25. T. Henick-Kling,
T. E. Acree, and H. T. Lawless.

An introduction to wine appreciation through the study of fermentation biology, wine composition, and sensory perception. Samples of wines will be used to illustrate the sensory properties, microbiological processes, and chemical components that determine wine quality. Students will learn to recognize the major features of wine that determine sensory quality and know the processes that
produced them. Topics will include the psychology and chemistry of bouquet, taste, and aroma; the microbiology of fermentation and spoilage; and the sensory properties of wines from different grape varieties, viticultural practices, and wine making techniques.

## FOOD 447 International Postharvest

 Food SystemsFall. 2 or 3 credits. Prerequisite: freshman chemistry. S-U grades optional.

T R 10:10. M. C. Bourne and staff. An interdisciplinary course designed for all undergraduate and graduate students in ALS that describes postharvest food losses and methods to reduce the loss. Topics include storage and care of unprocessed and minimally processed foods such as cereal grains, fruits, vegetables, tubers, and fish; biology and control of fungi, insects, and vertebrates in foods; chemical causes of quality loss; effects of climate; and economic and social factors affecting food preservation and storage. Emphasis is given to the problems in developing countries. The third credit requires a written case study of a country or commodity.
FOOD 450 Fundamentals of Food Law Spring. 2 credits. Offered alternate years. Not offered 1995-96.

Lecs, M 1:25-3:20. J. M. Regenstein. Introduction to the complex array of federal and state statutes and regulations that control the processing, packaging, labeling, and distribution of food, including aspects of safety and nutritive value. Emphasis will be on the Food and Drug Administration and U.S. Department of Agriculture regulations, but the course also will refer to other regulatory agencies. Emphasis will be placed on how a food or agricultural professional interacts with this legal system.

## [FOOD 456 Advanced Concepts in

 Sensory EvaluationSpring. 2 credits. Prerequisite: FOOD 410. S-U grades optional. Offered in alternate years. Not offered 1994-95.

Lecs, F 1:25-3:25. H. T. Lawless. Readings and discussions of primary source materials in sensory evaluation, including historical perspectives, psychophysics, perceptual biases, human information processing. Concepts influencing detection of sensory differences, use of rating scales, and characterization of sensory properties will be emphasized.]

## FOOD 494 Special Topics in Food Science

Fall or spring. 4 credits maximum.
S-U grades optional.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## FOOD 497 Individual Study in Food

 ScienceFall or spring. 3 credits maximum. Prerequisite: permission of instructor. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.

Staff.
For the food science student. May include individual tutorial study, a special topic
selected by a professor or a group of students, or selected lectures of a course already offered. As topics may be changed, the course may be repeated for credit.

FOOD 498 Undergraduate Teaching Experience
Fall or spring. 3 credits maximum. Prerequisite: permission of instructor. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades only.

Staff.
Students assist in teaching a course appropriate to their previous training. Students will meet with a discussion or laboratory section and will regularly discuss objectives with the course instructor

## FOOD 499 Undergraduate Research in

 Food SclenceFall or spring. 4 credits maximum. S-U grades optional. Students must register with an Independent Study form (available in 140 Roberts Hall). Except for students enrolled in the honors program, credit will be limited to 4 credits total

Hours to be arranged. Staff.
Independent study.

## FOOD 600 Seminar

Fall or spring. 1 credit. Required of all food science graduate students. S-U grades only T 4:30.

## [FOOD 601 Food Protein Chemistry

Fall. 3 credits, Limited to graduate students and to seniors with permission of instructor. Prerequisite: FOOD 409 or equivalent. Not offered 1994-95.

Lecs, M W F 9:05. Staff
The chemistry and physical chemistry of proteins are discussed critically with respect to current methods of characterizing and purifying proteins. Food protein functionality is emphasized.]

## FOOD 604 Chemistry of Dairy Products

Fall. 2 credits. Limited to 16 students
Prerequisites: organic chemistry, biochemistry, knowledge of dairy-product manufacturing procedures, and permission of instructor Offered alternate years. Not offered 1995-96.

Lecs, F 1:25-3:30. D. M. Barbano.
A detailed study of milk constituents and their properties. Properties of various milk constituents are related to observed physical and chemical changes that occur in dairy products during and after processing. This course will emphasize current research in dairy chemistry.

## FOOD 605 Physical Chemistry of Food

 ComponentsFall. 3 credits. Prerequisite: an undergraduate course in physical chemistry. Offered alternate years. Not offered 1995-96.

Lecs, M W F 10:10. J. W. Brady. This course will cover the physical properties of food molecules. Emphasis will be placed on the molecular basis of structural characteristics; colloidal properties; molecular interactions; foams, gels; and water binding of foods.
[FOOD 607 Advanced Food Microbiology
Spring. 2 credits. Prerequisites: food microbiology, genetics (preferred). Offered alternate years. Not offered 1994-95.

M W 11:15. C. A. Batt.
There have been great advances in applying the modern tools of molecular biology to the detection of microorganisms and their
metabolites. The primary emphasis of this course will be to review the recent developments in the theory and application of nucleic acid and antibody-based detection systems, especially as they concern food safety. In addition, other approaches, including measurement of impedence, ATT, and endotoxins, will be discussed.]

## FOOD 616 Flavors - Analysis and Applications

Spring. 2 credits. S-U grades optional. Offered alternate years. Not offered 1995-96. Lec, F 1:25; disc, F 2:30. H. Lawless, T. Acree.

An advanced course in sensory and instrumental analysis of flavors, flavor chemistry, and flavor applications in foods for food scientists and those in related fields concerned with human food perception and consumption. The course will survey taste, aroma and volatile flavors, and trigeminal stimuli from the perspectives of chemical structures, methods of analysis, uses and interactions in food systems, and consumer acceptance.

## [FOOD 620 Food Carbohydrates (also Nutritional Sciences 620)

Spring. 2 credits. Limited to qualified seniors and graduate students. Prerequisite: BIOBM 330 or equivalent. Offered alternate years. Not offered 1994-95

Lecs, T R 10:10. B. A. Lewis, J. W. Brady. A consideration of the chemistry of carbohydrates, including sugars, starches, pectins, hemicelluloses, gums, and other complex carbohydrates. Emphasis is on the intrinsic chemistry and functionality in food systems and the changes occurring during food processing and storage ]

## FOOD 665 Engineering Properties of Foods (also Agricultural and Biological Engineering 665)

Spring. 2 credits. Prerequisite: course in transport processes or unit operations as applied to foods; or permission of instructor. Offered alternate years Not offered 1995-96. Lecs, T R 12:20. S. S. H. Rizvi, A. K. Datta, S. J. Mulvaney.

Theories and methods of measurement and prediction of rheological, thermal, and mass transport properties of foods and biomaterial systems. Emphasis is on physical-mathematical basis of measurement as well as the prediction processes. Examples of appropriate use of these properties in engineering design and analysis of food processes will also be provided.

## FOOD 694 Special Topics in Food

 ScienceFall or spring. 4 credits maximum.
S-U grades optional
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## FOOD 698 Graduate Teaching

 ExperienceFall or spring. 1 to 3 credits. S-U grades only Hours to be arranged. Staff.
Designed to give graduate students teaching experience through involvement in planning and teaching courses under the supervision of field faculty members. The experience may include leading discussion sections; preparing, assisting in, or teaching lectures and laboratories; and tutoring. There will be assigned
readings and discussion sessions on educational theory and practice throughout the term.

## FOOD 800 Research

Fall or spring. Credit to be arranged. Maximum credit, 10 /semester. Limited to master's and doctoral candidates with permission of the graduate field member concerned. S-U grades only

## Related Courses in Other Departments

Introduction to Computing (ABEN 151)
Food Process Engineering: A Transport
Phenomena Approach (ABEN 466)
Marketing (AG EC 240)
Food Industry Management (AG EC 443)
Meat Science (AN SC 290)
Commercial Meat Processing (AN SC 490)

## FREEHAND DRAWING AND SCIENTIFIC ILLUSTRATION

Freehand Drawing is a program within the Department of Floriculture and Ornamental Horticulture. Other courses offered by the department are listed under Horticultural Sciences and Landscape Architecture

## FR DR 109 Nature Drawing

Fall. 3 credits. Limited to 25 students. S-U grades optional. Permission of instructor required.

M W F 10:10-12:05. R. J. Lambert. A beginning course with emphasis on the drawing of natural forms: plants, animals, and landscapes. Of particular interest to students in floriculture and ornamental horticulture, landscape architecture, biological sciences, nature education, or similar fields. Outside field notebook assignments.

FR DR 210 Sketching in Watercolor Summer. 3 credits. S-U grades optional. M T W R F 11:30-12:45. R. J. Lambert. Practice in outdoor sketching, primarily in watercolor, but including pen and ink, pencil, and colored pencil. Studio will develop working sketches into complete paintings Principles of perspective are taught and applied. For any student who wishes to develop skill in handling watercolor. Outside-of-class sketchbook work required.

## FR DR 211 Freehand Drawing and

 IllustrationFall. 2 credits. Prerequisite: LA 141 or equivalent. S-U grades optional.

6 studio hours scheduled in 2- or 3-hour
units berween 9:05 and 12:05 M T W R F. R. J. Lambert

Progression to the organization of complete illustrations. Subject matter largely from sketchbooks, still life, and imagination. Composition, perspective, and ways of rendering in different media are considered

## FR DR 214 Watercolor

Spring. 2 credits. Prerequisite: LA 141 or equivalent. S-U grades optional.

6 studio hours scheduled in 2- or 3 -hour units between 9:05 and 12:05 M T W R F. R. J. Lambert.

A survey of watercolor techniques. Subject matter largely still life, sketchbook, and on-the-spot outdoor painting.

## FR DR 316 Advanced Drawing

Fall or spring. 2 credits. Prerequisite: FR DR 109,211 or permission of instructor, S-U grades optional.

6 hours to be arranged. R. J. Lambert. For students who want to attain proficiency in a particular type of illustration or technique.

## [FR DR 417 Scientific Illustration

Fall. 2 credits. Prerequisite: FR DR 211 or 316 or equivalent. S-U grades optional for graduate students only. Not offered 1994-95.

6 studio hours scheduled between 9:05
and 12:05 M W F. Staff.
A survey of methods of illustration. Training in techniques of accurate representation in media suitable for reproduction processes, including pen and ink, scratchboard, wash, and mixed media.]

## FRUIT AND VEGETABLE SCIENCE: HORTICULTURAL SCIENCE

See Horticultural Sciences.

## HORTICULTURAL SCIENCES

Horticultural science courses at Cornell are taught by the faculty of the Department of Floriculture and Ornamental Horticulture and the Department of Fruit and Vegetable Science.

## Floriculture and Ornamental Horticulture

G. L. Good, chair; M. I. Adleman,
N. L. Bassuk, C. F. Gortzig, J. Gruttadaurio, N. W. Hummel, Jr., T. H. Johnson, R. E. Kozlowski, D. W. Krall, R. J. Lambert, R. W. Langhans, I. M. Lekstutis, L. J. Mirin, R. G. Mower, K. W. Mudge, J. C. Neal, A. M. Petrovic, D. A. Rakow, D. Tennyson,
R. T. Trancik, P. J. Trowbridge, T. C. Weiler, T. H. Whitlow

## Fruit and Vegetable Science

E. E. Ewing, chair; R. R. Bellinder, L. L. Creasy,
L. A. Ellerbrock, D. E. Halseth, J. R. Hicks,
D. J. Lisk, P. M. Ludford, I. A. Merwin,
P. L. Minotti, M. P. Pritts, J. Sieczka,
W. C. Stiles, L. D. Topoleski, C. B. Watkins, H. C. Wien, D. A. Wilcox, D. W. Wolfe

## Courses by Subject:

General horticulture: 101, 102
Crop production:
Controlled Environment Agriculture: 410,
411, 412, 413
Fruit: 200, 442, 444, 445, 450
Greenhouse: 410, 411, 412, 413
Nursery: 400, 420
Turfgrass: 330
Vegetable: 225, 456, 460
Extension education: 629
Floral design: 205, 210
Horticultural physiology: 400, 405, 450, 455, 456, 460, 462, 615
Independent study, research, and teaching: $470,495,496,497,498,499,500,605,700$, 800,900
Internships: 496
Landscape architecture (professionally
accredited program)
Landscape horticulture: 435, 491, Landscape architecture $142,291,311,312,480,490$

Plant materials: $230,243,300,301,335,430$
Plant propagation: 400
Postharvest physiology: $325,625,630$
Sales and service businesses: 210, 425
Seminars: 495, 600, 602, 630, 636
Special topics: 494
Turfgrass management: 330
Vegetable types and varieties: 220,465

## HORT 101 Introduction to Horticultural

 ScienceFall. 4 credits.
Lecs, M W F 10:10; lab, W 2-4:25.
C. F. Gortzig and I. M. Lekstutis.

An introduction to horticulture in all of its components: floriculture, landscape horticulture, fruit and vegetable science, and related professional and commercial fields. Emphasis is on the history, geography, and literature of the field; the structure and organization of the component industries, institutions, and professions; and the role of science and technology in the continuing development of horticultural practice. Field trips, including one three-day field trip (cost approximately $\$ 100.00$ ), are taken to horticultural firms, institutions, and historic sites.

## HORT 102 General Horticulture

Spring. 4 credits. Each lab limited to 25 students.

Lecs, M W F 10:10; lab, M, T, or W 2-4:25. L. D. Topoleski.

Acquaints the student with applied and basic horticulture. Open to all students who want a general knowledge of the subject or who want to specialize in horticulture but have a limited background in practical experience or training in plant science. Includes flower, fruit, and vegetable growing and gardening techniques.

## HORT 200 Introductory Pomology

Fall. 3 credits. S-U grades optional.
Lecs, T R 10:10; lab, T 1:25-4:25.
I. A. Merwin.

A survey of fruit science, emphasizing the natural history, botany, physiology, and production of edible fruits in temperateclimate areas. Topics include varietal breeding and propagation, environmental and sustainability issues, and practical methods of fruit production. Labs and field trips will provide hands-on experience and tours of regional orchards.

## [HORT 205 Floral Design

Fall or spring. 2 credits. Prerequisite: permission of instructor, with preference given to plant science majors, then to students in education, design, and journalism. Charge to purchase instructional plant materials that the student will keep: $\$ 85$. Not offered 1994-95.

T or R 1:25-4:25. Staff.
A study of the established floral design techniques of this country, presenting the principles and the mechanics of the art to prepare the student to design for varying themes and occasions. Other aspects include selection, preparation, and factors affecting keeping-quality of materials.]
[HORT 210 Floral Design: Intermediate Fall. 2 credits. Prerequisite: HORT 205 or permission of instructor; preference given to students planning a career in retail horticulture. Charge to purchase instructional materials that the student will keep: $\$ 90$. Not offered 1994-95.

Studio W 1:25-4:25. Staff.
Advanced study of the art of floral design.]

HORT 220 Vegetable Types and Identification
Fall. 2 credits.
T 2-4:25. L. D. Topoleski.
Acquaints students with the vegetable species grown in the Northeast and the pests and disorders encountered in their production. Subjects covered include identification of economically destructive weeds, diseases and insects of vegetables, identification of vegetable and weed seeds, seedlings, nutrient deficiencies, vegetable judging, grading, and grade defects.

## HORT 225 Vegetable Production

Fall. 4 credits. Field trip fee, no more than $\$ 20$.

Lecs, M W F 11:15; lab, W 2-4:25; 1 S field
trip and 3 field trips (Sept), w 11:15-6.
L. A. Ellerbrock.

Intended for those interested in the production, processing, and marketing of vegetables. Topics included are techniques, problems, and trends in the culture, harvesting and storage of the major vegetable crops. Field trips to conventional and organic farms and hands-on experience in growing vegetables in the laboratory are included.

## HORT 230 Woody Plant Materials

Spring. 4 credits. Fee for lecture-laboratory manual: $\$ 35$.

Lecs, T R 9:05; lab, T 2-4:25 and W or F 2-4:25. R. G. Mower. A study of the trees, shrubs, ground covers, and vines used in landscape plantings. Emphasis is on winter identification and values for use as landscape material.

## HORT 243 Taxonomy of Cultivated

 Plants (also BIOPL 243)Fall. 4 credits. Prerequisite: One year of introductory biology or written permission of instructor. May not be taken for credit after BIOPL 248. Offered 1994 and alternate years. Lecs, M W 10:10; labs, M W 2-4:25. M. Luckow.

An introduction to the study of ferns and seed plants with an emphasis on cultivated families and genera. Lectures will cover the principles and methods of systematics, basic rules of nomenclature, and relationships between families, all in the context of cultivated plants. Laboratories will teach sight identification of important plant families and identification of unknowns using analytic keys.

## HORT 300 Garden and Interior Plants I

Fall. 3 credits. Fee for lecture-laboratory manual: \$35.

Lecs, T R 10:10; lab, T 2-4:25.
R. G. Mower.

A study of ornamental plants used in garden and interior situations. The first seven weeks cover primarily herbaceous annuals and perennials, with the laboratory devoted to various practical gardening activities. The remainder of the semester covers the major kinds of foliage and flowering plants used in the home and in other interior landscape situations. Emphasis is on identification, use, and general cultural requirements.
HORT 301 Garden and Interior Plants II Spring, 3 credits. Prerequisite: HORT 300 or permission of instructor. Fee for lecture-
laboratory manual: \$35.
Lecs, M W 11:15; lab, M 2-4:25.
R. G. Mower.

A continuation of Horticultural Sciences 300. The first seven weeks are devoted to a further study of interior plants, with emphasis on
specialized groups of interior plants such as orchids, cacti and succulents, gesneriads, ferns, palms, and bromeliads. The second seven weeks are devoted to outdoor herbaceous plants, such as tulips, daffodils, crocuses, and irises, as well as other springblooming bulbs and perennial plants. Outdoor laboratories emphasize practical gardening activities appropriate to the spring season.

## HORT 325 Practical Aspects of Postharvest Handling of Horticultural Crops

Spring. 3 credits. Offered alternate years. Not offered spring 1996.

Lecs, M W 9:05; lab, T 1:25-4:25.
J. R. Hicks.

A study of changes that occur in horticultural crops between harvest and consumer.
Practices that affect the rate of change and the final effect on quality of the commodity are discussed. Maturity/quality indices, preharvest treatments, and harvesting/handling practices and storage/transportation requirements of selected horticulture crops are covered.

## HORT 330 Turfgrass Management

Fall. 3 credits. Prerequisite: SCAS 260
Offered alternate years. Not offered 1995-96 Lec, M W F 11:15; lab, F 1:25-3:20.
A. M. Petrovic

Study of the scientific principles involved in the management of golf courses, athletic fields, parks, industrial grounds, and sod production. Considerations given to principles of establishment, mowing, irrigation, growth and development, species selection, and nutrition in the management of turfgrass sites.

## HORT 335 Woody Plant Materials for

 Landscape UseFall. 3 credits. Limited to 30 students. Primarily for landscape architecture majors. Fee for lecture-laboratory manual, \$35.

Lec, M W 9:05; lab, R 1:25-4:25.
R. G. Mower.

A study of the trees, shrubs, vines, and ground covers used in landscape plantings in the northeastern United States. Emphasis is on leaf identification and on characteristics that determine the usefulness of each as landscape subjects.

## HORT 400 Principles of Plant Propagation

Fall. 3 credits. Prerequisites: BIOPL 242 and 244 or another course in plant physiology Lecs, T R 9; lab, R 1:25-4:25.
K. W. Mudge

Sexual (seed) propagation and vegetative (asexual) propagation including cuttage, graftage, tissue culture, layering and specialized vegetative reproductive structure Physiological, environmental, and anatomical principles are stressed in lecture and hands-on experience in laboratories. Examples include both temperate as well as tropical horticulture, agronomic, and forestry crops.

## [HORT 405 Physiology of Horticultural Plants

Spring. 4 credits. Prerequisites: BIOPL 242 and $244 ; 341$ or permission of instructor. Not offered 1994-95

Lec, M W F 8; lab to be arranged. Staff A study of the physiology of growth and development of horticultural plants in response to their environment.]

## HORT 410 Principles of Crop Production

 in Controlled EnvironmentsSpring. 3 credits. Prerequisites or corequisite: HORT 411. Two afternoon field trips required.

Lecs, W F 8; lab, R 2-4:25. T. C. Weiler. Study of several controlled-environment agriculture (CEA) crops; including cut, pot and bedding ornamentals; vegetables and fruits briefly covered; emphasis on predictive harvesting through environmental, physical, and chemical management of growth and development. Each student will grow one or more crops.

## HORT 411 Principles of Controlled

 Environment Agriculture (CEA)Spring. 3 credits. Prerequisite: permission of instructor. Cost of field trip; $\$ 80+$.

Lecs, T R 10:10-12:05. One 3-day field trip required. T. C. Weiler and staff. Basics and issues related to managing agricultural production in environmentally optimized facilities. Survey of CEA as an agricultural alternative, technology basics, systems and practices; world centers of production, structures, systems and equipment, materials handling, heating and cooling, lighting, fertilizing and irrigation, environmental stewardship, integrated pest management, business management, and human resource management.

HORT 412 Case Studies of Controlled Environment Agriculture (CEA)
Spring. 1 credit. Prerequisite or corequisite: HORT 411

Lab three hours per week as scheduled.
R. W. Langhans, J. D. Novak, and
G. B. White.

Analysis of actual CEA enterprises regarding adoption of technology, crop culture, operations management, and/or marketing.

## HORT 413 Computer-Assisted Management in Controlled Environment Agriculture (CEA)

Spring. 1 credit. Prerequisite or corequisite: HORT 411

Lab three hours per week to be scheduled. R. W. Langhans.

Application of computer software to operations management and environmental management of a CEA facility-including specifications for facilities, optimization of resource inputs (e.g., energy, fertilizer), crop programming, efficient space use, labor efficiency (time and motion), and inventory management.

## HORT 420 Principles of Nursery-Crop Production

Fall. 4 credits. Prerequisite: HORT 400 Lecs, M W F 9:05; lab, M 2-4:25; field trips are included. G. L. Good.
Principles of commercial production of nursery crops to marketable stage, including postharvest handling and storage. Term project required. Field trips are made to commercial nurseries.

## HORT 425 Horticultural Sales and

 Service BusinessesSpring. 4 credits. Prerequisites: AG EC 240 or permission of instructor. Cost of field trip approximately $\$ 100$.

Lecs, M W F 10:10; lab W 1:25-4:25.
C. F. Gortzig and I. M. Lekstutis.

A study of the application of horticultural, marketing, and management principles and practices in the operation of horticultural sales and service firms, e.g., garden centers, retail florist and nursery stores, wholesale marketing
operations, mail-order businesses, mass markets, interior and outdoor landscapeservice and related firms. Weekly field trips to commercial operations and one 3-4-day field trip to a metropolitan area (cost approximately $\$ 150.00$ ) are taken.

HORT 430 Special Topics in Ornamental Plants
Fall or spring. Credit to be arranged. Primarily for upperclass floriculture and ornamental horticulture majors. Prerequisites: HORT $230,300,301,335$, or the equivalent, and permission of instructor.

Hours to be arranged. R. G. Mower. Topical subjects in plant materials. Independent and group study of important groups of woody and herbaceous plant materials not considered in other courses. The topic is given in the supplementary announcement.
[HORT 435 Landscape Management
Fall. 4 credits. Prerequisites: HORT 230 or 335 , and BIO PL 241 or permission of instructor.

Lec, M W F 12:20-1:10; lab T 1:25-4:25.
D. A. Rakow. Not offered 1994-95. A study of the practices involved in the planting and maintenance of woody ornamental plants in the landscape. The major emphases will be on planting and postplanting techniques, water and fertilization management, pruning, and general tree care The lectures will focus on the physiological bases for essential management principles Labs have a hands-on focus.]

## HORT 442 Small Fruits

Fall. 3 credits. Offered even years Lecs, M W 9; lab, M 1:25-4:25. M. P. Pritts. A study of the evolution, breeding history, and physiology of strawberries, raspberries, blackberries, blueberries, and other minor small fruit crops, and of cultural practices that influence productivity, fruit quality, and pest damage. Marketing and economics will be considered, and alternative production practices for both commercial and home gardeners will be discussed

## [HORT 444 Viticulture

Fall. 3 credits. Offered odd years. Not offered fall 1994.

Lecs, T R 9:05; lab, R 2-4:25. L. L. Creasy. Grape growing, with emphasis on the viticulture of the Great lakes region, is presented as a series of decisions on varieties, sites, vine management, and vine protection. Those decisions are based on meteorology, soils, vine and grape anatomy and physiology and protection of the vine and grapes from injury.]

## [HORT 445 Orchard Management

Spring. 3 credits. Prerequisite: HORT 200. S-U grades optional. Offered even years. Not offered 1995.

Lecs, T R 10:10; lab, T 1:25-4:25.
I. A. Merwin

The science of fruit tree production in temperate climates, including site evaluation and improvement, fruit variety and rootstock selection, tree propagation, planting, pruning and training systems, the physiology of flowering and fruit development, dormancy and cold hardiness, tree nutrition and water relations, fruit harvesting and storage, and integrated pest management. Emphasis is on agroecological principles and hands-on practice in orchard lab-sessions and field trips.]

## [HORT 450 Soil Management and

 Nutrition of Perennial CropsFall. 3 credits. Offered odd years. Not offered fall 1994.

Lecs, M W 8; lab, M 1:25-4:25.
W. C. Stiles.

Fundamentals of mineral nutrition and soil management for perennial horticultural crops. Mineral nutrition aspects deal with diagnostic techniques, interpretation of tissue and soil analyses, and nutrient requirements for optimizing crop performance. Soil management effects on crop performance, nutrient relationships, and interaction with other components of crop production systems are emphasized.]

## HORT 455 Fertility Management and Nutrition of Vegetable Crops

Fall. 3 credits. Prerequisite: SCAS 260 or equivalent.

Lecs, M W 10:10; lab and disc, M 2-4:25. P. Minotti.

The course deals with both major and minor elements including fertilization programs, interpretation of tissue and soil analyses, nutrient interactions, induced deficiencies, toxicities as well as the effects of organic matter, crop residues, and specific crop sequences. The course emphasizes hands-on field and greenhouse experiments and small group discussions.

## HORT 460 Plant-Plant Interactions

Spring, weeks 1-6. 2 credits. Prerequisite: any crop production course or permission of instructor

Lecs, M W F 10:10; lab, M 2-4:25; disc,
R or F 1, 2, or 3 ( 1 hr ). H. C. Wien. The manner in which plants interfere or positively interact is examined for the management of cropping systems. Competitive and chemical interactions are considered between weeds and crops, among crops in polyculture, and between individuals in monoculture. Examples will be taken from both temperate and tropical monoculture and intercropping systems
HORT 462 Vegetable Crop Physiology Spring, weeks 7-14. 3 credits. Prerequisites: HORT 225 and BIOPL 242.

Lecs, M W F 10:10; lab, M 2-4:25; disc,
R or $\mathrm{F} 1,2$, or $3(1 \mathrm{hr})$. H. C. Wien. Study of the physiological processes that determine the timing, quantity, and quality of vegetable crop yield. Processes of flower induction, fruit set, fruit growth, and the relations between vegetative and reproductive growth are covered. The course emphasizes practical hands-on greenhouse experiments and weekly small-group discussions.

## HORT 465 Vegetable Varieties and Their

 EvaluationFall, weeks 1-7. 2 credits. Prerequisites: HORT 225 or permission of instructor. S-U grades only.

Lecs, W F 8; lab, F 1:25-4:25. D. Wilcox and H. C. Wien.
Principles of vegetable variety evaluation and selection of techniques in relation to program objectives. Morphology, yield, and quality of selected crops will be studied in the field. The seed industry will be briefly discussed.

## HORT 470 Special Topics in Pomology

Spring. 3 credits. Open to undergraduates by permission.

Hours to be arranged. Staff.
Selected topics are considered with respect to the current literature, experimental techniques, or applied technologies. Topics change from
one year to another and reflect the expertise and research interests of the professors who participate. Topics selected for each term will be announced several months before the term begins.

## HORT 491 Design and Plant

## Establishment |also Landscape

## Architecture 491)

Fall. 3 credits. Prerequisite: HORT 230 or permission of instructor.

Lecs, T R 12:20; studio, R 1:25-4:25.
N. L. Bassuk and P. J. Trowbridge. This course will focus on the establishment of woody and herbaceous plants in urban and garden settings. By understanding the special constraints placed on plants, we will be able to critically assess and modify potential planting sites, select appropriate trees, shrubs and ground covers for a given site, and learn the principles and practices of plant establishment both in the ground and in contained environments. Design followed by specifications and graphic details will be produced to implement these practices. Techniques for tree preservation and land reclamation/ revegetation will be discussed.

## HORT 494 Special Topics in Horticulture

## Fall or spring. 4 credits maximum.

S-U grades optional.
Hours to be arranged. Staff. Two sections
will be offered: Sec 01 Floriculture and
Ornamental Horticulture; Sec 02 Fruit and Vegetable Science.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## HORT 495 Undergraduate Seminar

Fall or spring. May be taken four times for one credit per semester. S-U grades only. Graduate students should enroll in HORT 602 (Fruit and Vegetable Science) or 635 (Floriculture and Ornamental Horticulture). Section 1: Current topics in Floriculture and Ornamental Horticulture.
Fall only. 1 credit.
R 12:20. T. C. Weiler and staff. Each week a staff member will develop a dialogue with students on a topic of current mutual interest. Topics and discussion leaders change by week and semester; topics will encompass planting design, exterior and interior landscape management, turfgrass management, urban horticulture, nursery management, plant materials, stress physiology, weed science, root zone ecology, horticultural sales and service business operation, and controlled environmental agriculture. Brief reading assignments may be distributed for completion by the next class.
Section 2: Current topics in Fruit and
Vegetable Science.
Fall or spring. 1 credit.
Undergraduate participation in fruit and vegetable science departmental weekly seminar series.

## R 4:00. D. Wilcox and I. A. Merwin.

HORT 496 Internship in Horticultural Sciences
Fall or spring. Credit variable. S-U grades optional. Prerequisite: permission of student's adviser in advance of participation in intemship programs. Students must register with an Independent Study form (available in 140 Roberts Hall) signed by the faculty
member who will supervise their study and assign their grade.

Staff.
HORT 497 Independent Study in Horticultural Sciences
Fall or spring. Credit variable. S-U grades optional. Prerequisite: permission of instructor(s). Students must register with an Independent Study form (available in 140 Roberts Hall.) Independent study in horticultural sciences under the direction of one or more faculty members.

Hours to be arranged. Staff.

## HORT 498 Undergraduate Teaching

 ExperienceFall or spring. Credit variable. S-U grades optional. Prerequisites: previous enrollment in course to be taught or equivalent, and written permission of the instructor. Students must register with an Independent Study form (available in 140 Roberts Hall.)

Hours to be arranged. Staff.
Designed to give qualified undergraduate students teaching experience through actual involvement in planning and teaching horticultural sciences courses under the supervision of departmental faculty members This experience may include leading discussion sections; preparing, assisting in, or teaching laboratories; and tutoring.

## HORT 499 Undergraduate Research

 Fall or spring. Credit variable. S-U grades optional. Prerequisite: permission of instructor. Stuclents must register with an Independent Study form (available in 140 Roberts Hall.)Hours to be arranged. Staff.
Undergraduate research projects in horticultural sciences.

## HORT 500 Master of Professional

 Studies (Agriculture) Project Fall or spring. $1-6$ credits. ( 6 credits maximum toward MPS [Agriculture] degree) S-U grades optional.Hours to be arranged. Graduate faculty A comprehensive project emphasizing the application of principles and practices to professional horticultural teaching, extension, and research programs and situations. Required of Masters of Professional Studies (Agriculture) candidates in the respective graduate fields of horticulture.

## HORT 602 Seminar in Fruit and

 Vegetable ScienceFall or spring. 1 credit. Required of graduate students majoring or minoring in pomology or vegetable crops. Limited to graduate students. S-U grades only.

R 4:00. D. Wilcox and I. A. Merwin.

## [HORT 615 Quantitative Methods in

 Horticultural Research Spring. Weeks 1-9. 2 credits. Prerequisite: BTRY 601, BTRY 602 or permission of instructor. S-U grades only. Not offered spring 1995.T R 2:30-4:25. D. W. Wolfe.
Advantages and limitations of conventional experimental designs and analyses of greenhouse and field (including-on-farm) experiments. Use and interpretation of plant growth analysis techniques. Discussions will include critical analysis of published data and research in progress.]

HORT 620 Woody Plant Physiology
Spring. 3 credits. BIOPL, BIOBM 331, CHEM 357, or equivalent, or permission of instructor Offered odd years

T R 8:30-9:55. M. P. Pritts and
I. A. Merwin.

A detailed study of physiological processes in woody plants and how these processes influence crop production practices. Topics will include shoot and root growth, phytohormones, dormancy, photoperiodism, photosynthesis, respiration, carbon and nitrogen metabolism, water relations, and fruiting Several faculty members participate in teaching.
[HORT 625 Advanced Postharvest Physiology of Horticultural Crops Spring. 3 credits. Prerequisite: BIOPL 242 and/or HORT 325. Offered alternate years. Not offered spring 1995

Lecs, T R 10:10. Disc session to be arranged. P. M. Ludford
Physiological and biochemical aspects of growth and maturation, ripening, and senescence of harvested horticultural plant parts. Topics include morphological and compositional changes during ripening and storage life, some physiological disorders, aspects of hormone action and interactions. and a consideration of control.

## HORT 629 Special Topics in Plant Science Extension (also Plant Breeding 629)

Spring, 2 credits. Offered alternate years. F 1:25-4:25. W. D. Pardee.
Designed for graduate students and advanced undergraduates to provide a broader knowledge of cooperative extension philosophy and methods. Developed for students interested in extension and research in public and commercial organizations. Topics relate to extension in other countries as well as in the United States

## HORT 630 Current Topics in Postharvest

 HorticultureFall or spring. 1 credit. Prerequisite permission of instructor.

Hours to be arranged. G. D. Blanpied. Graduate students and staff report and discuss current topics in postharvest biology and technology of horticultural crops.

## HORT 635 Floriculture and Ornamental Horticulture: Current Topics in Horticultural Research

Fall or spring. 1 credit. Limit: 15 students. Undergraduates should enroll in HORT 495. S-U grades only.

1 hour per week, to be arranged.
T. H. Whitlow and staff.

Weekly graduate seminar to discuss current research in horticulture and related, often overlooked, disciplines. Format is weekly readings, informal presentations, and discussions.

HORT 636 Current Topics in Horticulture
Fall or spring. 1 credit. S-U grades only
1 hour per week, to be arranged.
I. A. Merwin

A seminar series on current topics chosen by participating students and faculty, on a rotating basis. Format consists of weekly discussion groups, with each participant presenting at least one oral report based on independent reading and/or experimentation relating to the chosen topic. Interested students should contact the designated instructor(s) for each term.

HORT 694 Special Topics in Horticulture Fall or spring. 4 credits maximum.
S-U grades optional.
Hours to be arranged. Staff. Two sections will be offered: Sec 01 Floriculture and
Ornamental Horticulture; Sec 02 Fruit and Vegetable Science
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## HORT 700 Graduate Teaching Experience

Fall or spring. Credit variable. Open only to graduate students. Undergraduates should enroll in HORT 498. S-U grades optional. Prerequisite: permission of instructor.

Hours to be arranged. Staff.
Designed to give graduate students teaching experience through involvement in planning and teaching courses under the supervision of departmental faculty members. The experience may include leading discussion sections, preparing, assisting in, or teaching lectures and laboratories; and tutoring.

HORT 800 Thesis Research, Master of Science
Fall or spring. Credit to be arranged.
S-U grades only.
Staff
HORT 900 Thesis Research, Doctor of Philosophy
Fall or spring. Credit to be arranged. S-U grades only. Staff.

## INTERNATIONAL AGRICULTURE

INTAG 300 Perspectives in International Agriculture and Rural Development
Fall. 2 credits.
F 1:25-3:20. E. Erickson
A forum to discuss both contemporary and future world food issues and the need for an integrated, multidisciplinary team approach in helping farmers and rural development planners adjust to the ever-changing food needs of the world.

## INTAG 402 Agriculture in Tropical

 AmericaFall. 2 credits. Prerequisite: Upper class or graduate standing.

F 1:25-3:20. H. D. Thurston and staff. A preparatory course for participation in International Agriculture 602. Physical resources, vegetation, history, crop and animal production, and various social and economic aspects of agriculture in tropical America will be discussed

## INTAG 403 Traditional Agriculture in Developing Countries

Fall. 1 credit. S-U only.
T 8-8:50. H. D. Thurston, D. Bates,
R. Blake, J. Lassoie, A. Power, T. Scott, and T. Steenhuis.

Today, perhaps over half of the world's arable land is farmed by traditional farmers. They developed sustainable agriculture practices which allowed them to produce food and fiber for millennia with few outside inputs. Many of these practices have been forgotten in developed countries but are still used by many traditional, subsistence, or partially
subsistence farmers in developing countries. The course will examine traditional systems from several disciplinary points of view.
INTAG 414 Cultivation and Improvement of Cereal Crops
Spring. 1 credit. Prerequisite: An introductory biology or crops course (BIO G 101, HORT 102, SCAS 311 or equivalent) and SCAS/BIO G 473. Offered alternate years Not offered 1995-96.

M W F 11:15. M. E. Smith and staff. An introduction to characteristics, culture, and improvement of important cereal crops of the tropics and subtropics, including agronomic, economic, and social aspects. Emphasizes maize and rice. Lectures feature slides and other illustrative material based on experiences in the tropics and discussion of current issues relating to tropical cereal crops. This is the first of three 1 -credit modules, including INTAG 416 and INTAG 418, each taught for one-third of the semester.

INTAG 416 Cultivation and Improvement of Root, Tuber, and Plantain Crops Spring. 1 credit. Prerequisite: An introductory biology or crops course (BIO G 101, HORT 102, SCAS 311, or equivalent) and SCAS/BIO G 473. Offered alternate years Not offered 1995-96.

M W F 10:10. H. D. Thurston. An introduction to tropical root, tuber, and plantain crops, their importance, their culture, and their food, feed, and industrial uses. The cultural and socio-economic role of these crops in tropical societies will be considered, as well as the negative and positive aspects of their production and utilization. This is one of three 1 -credit modules, including INTAG 414 and INTAG 418, each taught for one-third of the semester

## INTAG 418 Horticultural Crops in the

 TropicsSpring. 1 credit. Prerequisite: An introductory biology or crops course (BIO G 101, HORT 102, SCAS 311 or equivalent) and SCAS/BIO G 473. Offered alternate years Not offered 1995-96.

M W F 11:15. I. Merwin, E. Figueroa, and
C. Wien.

A survey of fruit and vegetable crops of economic and/or dietary importance in the tropics. The natural history of horticultural crops, major regions and methods of production, domestic and export marketing systems, and various technological, ecological, and social factors that affect tropical fruit and vegetable production will be emphasized. This is one of three 1 -credit modules, including INTAG 414 and INTAG 416, each taught for one-chird of the semester.

INTAG 599 International Agriculture and Rural Development Project Paper Fall and spring. 1-6 credits. Limited to M.P.S. candidates in International Agriculture and Rural Development. S-U grades only. Staff.

## INTAG 602 Agriculture in the Developing Nations

Spring. 3 credits. Prerequisites: INTAG 300 or equivalent, INTAG 402, and permission of instructors. Cost of field-study trip includes air fare and approximately $\$ 400$ for lodging, meals, and personal expenses.

T R 2:30-4:25 until midterm only. R. W. Blake.

Oriented to provide students an opportunity to observe agricultural development in a tropical environment and promote interdisci-
plinary exchange among staff and students. The two-week field-study trip during January to Latin American countries is followed by discussions and assignments clealing with problems in agriculture and livestock production in the context of social and economic conditions.

## INTAG 603 Administration of Agricultural

 and Rural Development (also Government 692)Spring. 4 credits.
M 2:30-5:00. N. T. Uphoff, L. W. Zuidema, and L. Stifel.
An intercollege course designed to provide graduate students with a multidisciplinary perspective on the administration of agricultural and rural development activities in developing countries. The course is oriented to students trained in agricultural and social sciences who are likely to have administrative responsibilities during their professional

## careers.

## INTAG 650 Special Topics in

## International Agricultural and Rural

 DevelopmentFall or spring. 1-3 credits.
Staff.
A seminar for new themes of agricultural and rural development. Offered occasionally. Specific content varies.

INTAG 685 Training and Development: Theory and Practice \{also Communication 685, Education 685 and Industrial and Labor Relations 658)

Spring and summer. 4 credits. S-U grades optional. Charge for materials $\$ 45$.

Lec, F 9:05-12:05; lab, 1 hour per week, to
be arranged. At Communication Graduate
Center. R. Colle, M. Ewert, D. Deshler.
Analysis, design, and administration of training programs for the development of human resources in small-farm agriculture, rural health and nutrition, literacy as nonformal education, and general community development. Designed for scientists, administrators, educator-trainers, and social organizers in rural and agricultural development programs in the U.S. and abroad.

## INTAG 703 Seminar for Special Projects

 in Agricultural and Rural
## Development

Fall and spring. 1 credit. Required for graduate students enrolled in the M.P.S. (Agr.) degree program and majoring in international agricultural and rural development; others with permission of the program director. S-U grades only,

M 12:20-2:15. R. W. Blake and
L. W. Zuidema.

The seminar provides students with the opportunity to develop and present their special projects. It also serves as a forum for discussion of current issues in low-income agricultural and rural development, with particular attention to interdisciplinary complexities.

## Related Courses in Other Departments

Sociotechnical Aspects of Irrigation (ABEN 754 and GOVT 644)
Introduction to Global Economic Issues (AG EC 100)

International Trade Policy (AG EC 430)
Economics of Agricultural Development (AG EC 464)

The World's Food (AG EC 660)
Seminar on Agricultural Trade Policy (AG EC 730)

Macro Policy in Developing Countries (AG EC 763)
Tropical Livestock Production (AN SC 400)
Tropical Forages (AN SC 403)
Southeast Asia Seminar: Country Seminar
(ASIAN 601 and 602)
Plants and Civilization (BIOPL 246)
Food, Agriculture, and Society (BIOES 469)
Seminar in International Planning (CRP 671)
Seminar in Project Planning in Developing Countries (CRP 675)
Intercultural and Development Communication (COMM 612)
Communication in the Developing Nations (COMM 624)
Comparative Studies in Adult Education (EDUC 483)
[Planning Educational Systems (EDUC 678) Not offered 1994-95.]
[Designing Extension and Continuing Education Programs (EDUC 681) Not offered 1994-95.]
[Community Education and Development (EDUC 682) Not offered 1994-95.]
International Postharvest Food Systems (FOOD 447)
[Political Economy of Change: Rural Development in the Third World (GOVT 648) Not offered 1994-95.]
International Environmental Issues (NTRES 400)
Religion, Ethics, and the Environment (NTRES 407)
National and International Food Economics (NS 457)
International Nutrition Problems, Policy, and Programs (NS 680)
International Nutrition Seminar (NS 698)
Special Topics in International Nutrition (NS 699)
Introduction to Plant Breeding (PL BR 201)
Plant Diseases in Tropical Agriculture (PL PA 655)
Rural Sociology and International Development (R SOC 205)
Comparative Issues in Social Stratification (R SOC 370)
[Gender Relations, Gender Ideologies, and Social Change (R SOC 425) Not offered 1994-95.]
Social Demography (R SOC 438)
Population, Environment, and Development in SubSaharan Africa (R SOC 495)
Contemporary Sociological Theories of Development (R SOC 606)
Land Reform, Old and New (R SOC 643)
[Social Movements in Agarian Society (R SOC 723) Not offered 1994-95.]
[The Political Economy of Policy and Planning in Third World States (R SOC 725) Not offered 1994-95.]
[Production of Tropical Crops (SCAS 314) Not offered 1994-95.]
Properties and Appraisal of Soils of the Tropics (SCAS 471)
Ecology of Agricultural Systems (SCAS 473, and BIOES 473)

## LANDSCAPE ARCHITECTURE

P. J. Trowbridge, Program Coordinator;
M. I. Adleman, S. Baugher, H. W. Gottfried,
P. H. Horrigan, T. H. Johnson, D. W. Krall,
L. J. Mirin, R. T. Trancik, K. A. Wolf

## LA 141 Freehand Drawing

Fall. 3 credits. Limited to 25 students.
$\mathrm{S}-\mathrm{U}$ grades optional.
Studios, T R 2:30-4:25. P. H. Horrigan. Developing ability in freehand observation drawing. Freehand still life, landscape, figure, and perspective drawing will be included.
Weekly sketchbook assignments.

## LA 142 Introduction to Landscape Architecture

Spring. 4 credits. Limited to approximately 20 students; freshman landscape architecture majors or permission of instructor. Cost of basic drafting equipment and supplies, about \$200.

Lecs, T R 1:25; studio, T R 2:30-4:25.
D. W. Krall.

Fundamentals of landscape design applied to residential and other small-scale site-planning projects. Work in the studio introduces course participant to the design process, design principles, construction materials, planting design, and graphics.

## LA 201 Design, Composition, and Theory

Fall. 6 credits. Limited to landscape architecture majors. Cost of basic drafting equipment and supplies, about $\$ 200$; expenses for field trip, about $\$ 250$.

Lecs, M W F 1:25; studios, M W F
2:30-4:25. M. I. Adleman.
Basic design principles and processes applied to the design of the outdoor environment. Studio projects focus on the analysis, organization, and form of outdoor space through the use of three-dimensional components including structures, vegetation, and earthform.

## LA 202 Design, Composition and Theory

Spring. 6 credits. Prerequisite: LA 201 with a grade of C or better. Cost of supplies, about $\$ 200$; expenses for field trip, about $\$ 250$.

Lecs, M W F 1:25; studios, M W F
2:30-4:25. T. H. Johnson.
Understanding the role of basic design, design theory, and design languages in landscape architectural projects.

## LA 261 Urban Archaeology (also CRP 261)

## Fall. 3 credits.

Lec, R 1:25-4:25. S. Baugher.
Urban archaeologists study American Indian, colonial, and nineteenth-century sites which now lie within the boundaries of modern cities. This course explores how urban centers evolve; what lies beneath today's cities; and how various cultures have altered the urban landscape. Students will participate in a local archaeological excavation.

## La 301 Site Design and Detailing

Fall. 6 credits. Prerequisite: LA 202 with a grade of C or better. Cost of supplies, about $\$ 200$; expenses for field trip, about $\$ 250$.

Lecs, $M$ W F 1:25; studios, M W F
2:30-4:25. P. H. Horrigan.
Course participants will be engaged in the art and science of site-scaled design. This includes gardens, parks, and residential projects, their design and technical solutions.

## LANAR 302 Site Design and Detailing*

 Spring. 6 credits. Prerequisite: LA 301 with a grade of $C$ or better. Cost of supplies, about $\$ 200$; expenses for field trip, about $\$ 250$.Lecs, M W F 1:25; studios, M W F
2:30-4:25. L. Mirin.
*Offered through the College of Architecture, Art, and Planning.

## LA 310 Site Engineering

Fall. 4 credits. Prerequisite: permission of instructor.

Lecs, studios, M W F 9:05-11
M. I. Adleman.

Lectures and studio projects focusing on the development of a working knowledge of site grading, earthwork, storm-water management, site irrigation, site layout, and road alignment.

## LA 312 Site Construction

Spring. 4 credits. Prerequisite: permission of instructor.

Lecs, M W 9:05; studios, T R 9:05-11.
P. J. Trowbridge.

The design and use of construction materials, also including specifications, cost estimates, and methods used by landscape architects in project implementation. The course includes lectures, studio problems, and development of drawings leading to construction documentation for a selected project. Students will construct detail material prototypes and models.

## LA 360 Pre-Industrial Cities and Towns of North America (also CRP 360)

## Spring. 3 credits

Lec, R 1:25-4:25. S. Baugher.
Various American Indian civilizations as well as diverse European cultures have all exerted their influences on the organization of town and city living. Each culture has altered the landscape in their own unique way as they created their own built environments.

## LA 363/547 American Indians, Planners,

 and Public Policy (also CRP 363/547) Spring. 3 credits.Lec, M 7:00-10:00 p.m. S. Baugher. Decisions made by public agencies and private enterprise too often lead to the floocling, polluting, strip-mining, or other destruction of American Indian reservations, archaeological sites, and burial grounds. The central focus of the course is how to address urban and regional problems without imperiling the cultural survival of minorities.

## LA 382 The American Landscape

## Spring. 3 credits

Lecs, T R 10:10-12:05. H. Gottfried. An interdisciplinary survey of the cultural history of the American landscape, including perceptions of landscape as expressed in paintings, photographs, and literature. Landscape values, the relation of society to landscape, landscape use, and the history of regional and national landscapes are general topics, all seen within the context of interactions between natural and cultural systems.

## LA 401 Urban Design and Planning

Fall. 6 credits. Prerequisites: LA 302 with a grade of $C$ or better. Cost of supplies, about $\$ 200$; basic expenses for field trip, about $\$ 250$.

Lecs, M W F 1:25; studios, M W F 2:30-
4:25. Required field trip. R. T. Trancik. A sequence of projects introducing students to advanced skills in large-scale spatial design, and historic precedent in an urban context.

## LA 402 Advanced Project Studio

Spring 6 credits. Prerequisite: completion of LA 401 or the study abroad option with a grade of C or better. Cost of supplies and reproductions, about $\$ 200$; basic expenses for field trips, about $\$ 200$.

Lecs, M W F 1:25; studios, M W F
2:30-4:25. M. I. Adleman.
Site design and construction projects introduced as an evaluation of each student's professional competency in landscape architecture.

## LA 410 Autocad Autotutorial

Fall or spring. $1-5$ credits. Offered to landscape architecture students only. Limited to 15 students.
P. J. Trowbridge, K. M. Flahive. An introductory course in computer-aided design and drafting. Course participants will work on IBM work stations with instructional guidance. Auto-tutorial format for the course will give participants a demonstrated ability to problem-solve and generate increasingly complex graphic displays.

LA 411 Landcadd Autotutorial
Fall or spring. $1-5$ credits. Prerequisite:
LA 410. Limited to 15 students.
P. J. Trowbridge, K. M. Flahive.

An advanced computer-aided course that focuses upon a wide variety of applications including site design and assessment, irrigation, construction detailing, profile and property boundary calculation, planting plans, and many other applications.

## LA 412 Professional Practice

Spring. 1 credit.
Lec. M 11:15. K. Wolf.
Presents the student with a comprehensive understanding of the role of the professional landscape architect and the problems and opportunities one may encounter in an office or other professional situations. Topics discussed include practice diversity, marketing professional services, office and project management, construction management, computers in the profession, and ethics.

## LA 480 Principles of Spatial Design and Aesthetics (also City and Regional Planning 481/581)

Fall. 3 credits. Course enrollment is restricted to Landscape Architecture and Planning students, or permission of instructor.

Lecs, M W 10:10; disc, F 10:10.
R. T. Trancik.

A lecture course that introduces the spatial and visual design vocabularies of cities. Aesthetic principles and theories of design are investigated for different types of urban spaces drawn from a variety of international examples, historic and modern. Included in the course are design methods and applications in the contemporary urban context of Europe and North America.

## LA 483 Design Criticism

Spring. 2 credits.
Lecs, W F 11:15. H. Gottfried. A practicum in writing environmental design criticism. Emphasis on impressionistic writing, on analytical descriptions and interpretations or works, and on the role of criticism in environmental design discourse.

## LA 491 Design and Plant Establishment

 (also HORT 491)Fall. 3 credits. Prerequisites: FOH 230 or permission of instructor.

Lecs, T R 12:20; studio, R 1:25-4:25.
N. Bassuk and P. Trowbridge.

This course will focus on the establishment of woody and herbaceous plants in urban and garden settings. By understanding the special constraints placed on plants, we will be able to critically assess and modify potential planting sites, select appropriate trees, shrubs, and ground covers for a given site, and learn about the principles and practices of plant establishment both in the ground and in contained environments. Design followed by specifications and graphic details will be produced to implement these practices. Techniques for tree preservation and land reclamation/revegetation will also be discussed. Field work includes chemical and physical analysis of soils, vegetation, and site assessment.

## LA 494 Special Topics in Landscape Architecture

Fall or spring. 1-3 credits; may be repeated for credit. S-U grades optional. Staff.
Topical subjects in landscape architectural design, theory, history, or technology. Group
study of topics not considered in other courses.

## LA 497 Individual Study in Landscape Architecture

Fall or spring. $1-5$ credits; may be repeated for credit. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.

Staff.
Work on special topics by individuals or small groups.

## LA 498 Undergraduate Teaching

Fall or spring. 1-3 credits. Prerequisites: previous enrollment in course to be taught and permission of instructor. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grade optional.

Hours to be arranged. Staff.
Designed to give qualified undergraduates experience through actual involvement in planning and teaching courses under the supervision of department faculty.
LA 501 Theory, Composition, and Design Fall. 6 credits. Limited to graduate students. Cost of drafting supplies about $\$ 200$. Field trip about $\$ 250$.

## L. Mirin.

Basic design principles and processes applied to the design of the outdoor environment. Studio projects focus on the analysis, organization, and form of outdoor space through the use of three-dimensional components including structures, vegetation, and earthform.

LA 502 Design, Composition, and Theory
Spring. 6 credits. Limited to graduate students. Cost of drafting supplies, about $\$ 200$; expenses for field trip, about $\$ 250$.

Lecs, M W F 1:25; studios, M W F
2:30-4:25. P. H. Horrigan.
The studio will focus on the spatial design of project-scale site development. Students will develop their expertise in applying the design theory, vocabulary, and graphic expression introduced in LA 501.

LA 505 Graphic Communication I
Fall. 3 credits. Prerequisites: concurrent enrollment in LA 501 or permission of instructor.

Lecs, T R 9:05; studios, T R 10:10-12:05.
T. Johnson.

Basic skills in graphic presentation, including pencil-and-ink drawing and drafting techniques applicable to landscape architecture projects. Basic design in freehand drawing, orthographic projection, axonometric projection, and lettering are covered in the course.
LA 506 Graphic Communication II
Spring. 3 credits. Prerequisites: LA 505 and concurrent enrollment in LA 502 or permission of instructor.

Lecs, W F 9:05-12:05. P. H. Horrigan. Graphics studio focusing upon observation and freehand drawing, color theory and technique, perspective, and analytical drawing.

## LA 514 Advanced Site Grading

Spring. 3 credits. Limited to 8 students. Prerequisite: LA 310 or LA 610.

Lec, M 10:10; studios, W F 10:10-12:05. M. I. Adleman.

Grading skills and knowledge applied as a design component of site planning projects.

## LANAR 520 Contemporary Issues in

 Landscape Architecture*Fall. 2 credits
L. Mirin.
*Offered through the College of Architecture, Art, and Planning.

## LANAR 524 History of European

 Landscape Architecture*Spring. 3 credits.
L. Mirin.
*Offered through the College of Architecture, Art, and Planning.

## La 525 History of American Landscape Architecture*

Fall. 3 credits.
L. Mirin.
*Offered through the College of Architecture, Art, and Planning.

## LA 569 Archaeology on Preservation

 Planning and Landscape (also CRP 569)Fall. 3 credits.
Lec, M 7:00-10:00 p.m. S. Baugher. In response to federal, state, and local legislation, archaeology now plays an important role in design, planning, and landuse decisions. Students develop the research skills needed to complete environmental review projects and historic landscape plans.

## LA 590 Graduate Seminar in Landscape

 ArchitectureFall. 3 credits.
T R 11:15. H. Gottfried.
For graduate students in their last year of study. Seminar in the development of the discipline and research methods, culminating in a thesis proposal.
LA 601 Project Design and Application
Fall. 6 credits. Limited to graduate students. Cost of supplies, about $\$ 200$; expenses for field trip, about $\$ 250$.

Lecs, M W F 1:25; studios, M W F 2:30-
4:25. Required field trip. T. Johnson. Changes in design theory since 1970 in the form of design language archetypes and the application of this knowledge to the transformation of an American place.

## LA 602 Urban Design and Planning (also CRP 555)

Spring. 6 credits, Limited to graduate students. Cost of supplies, about $\$ 200$; expenses for field trip, about $\$ 250$.

Lecs, M T R 1:25; studios, M T R 2:30-4:25.
R. T. Trancik and staff.

Application of urban-design and townplanning techniques to specific contemporary problems of city environments. Issues of urbanism are investigated and applied to physical design interventions and spatial typologies involving the street, square, block, garden, and park systems. Urban land-use development and public and private implementation of urban-design plans are examined. This is a specially arranged collaborative studio with the Department of City and Regional Planning.

## LA 610 Site Engineering

Fall. 4 credits. Prerequisite: permission of instructor.

Lec, studios, M W F 9:05-11
M. I. Adleman.

Lectures and studio projects focusing on the development of a working knowledge of site grading, earthwork, storm-water management, site irrigation, site layout, and road alignment.

## LA 612 Site Construction

Spring. 4 credits. Prerequisite: permission of instructor.

Lecs, M W 9:05; studios, T R 9:05-11.
P. J. Trowbridge

Construction materials, specifications, cost estimates, and methods used by landscape architects in project implementation. The course includes lectures, studio problems, and development of construction documentation for a selected project. Students will construct prototypes using landscape construction materials.

## LA 666 Pre-Industrial Cities and Towns of North America (also CRP 666) <br> Spring. 3 credits

Lec, R 1:25-4:25. S. Baugher
Various American Indian civilizations as well as diverse European cultures have all exerted their influences on the organization of town and city living. Each culture has altered the landscape in their own unique way as they created their own built environments.

## LA 680 Graduate Seminar in Landscape Architecture

Fall or spring. 1-3 credits. May be repeated for credit. Limited to graduate students. S-U grades optional.

Staff.
Topical subjects in landscape architectural design, theory, history, or technology. Seminar topics and group study not considered in other courses.

## LA 694 Special Topics in Landscape

 ArchitectureFall or spring. 1-3 credits; may be repeated for credit. S-U grades optional.

Staff.
Topical subjects in landscape architectural design, theory, history, or technology. Group study of topics not considered in other courses.

## LA 701 Natural Systems and Site Design Studio

Fall. 6 credits. Limited to graduate students. Cost of drafting supplies, about $\$ 200$;
expenses for field trip, about $\$ 250$.
Lecs, M T R 1:25; studios, M T R 2:30-4:25.
Required field trip. P. J. Trowbridge and

## H. Gottfried.

The studio focuses upon site and regionally based project scales that have as a primary concern natural systems. Projects may have nature-like or garden-like design expressions inherent in the studio exercises. Design knowledge of hydrology soils, plant associations, culture, geography, history, and microclimate are necessary to engage studio projects.

## LA 800 Master's Thesis in Landscape Architecture

Fall or spring. 9 credits.
Hours to be arranged. Staff.
Independent research, under faculty guidance leading to the development of a comprehensive and defensible design or study related to the field of landscape architecture. Work is expected to be completed in final semester of residency.

## NATURAL RESOURCES

D. J. Decker, chair; R. A. Baer, M. B. Bain,
B. L. Bedford, H. Carter, T. J. Fahey,
T. A. Gavin, J. W. Gillett, J. Jacobson,
J. W. Kelley, B. A. Knuth, M. E. Krasny,
C. C. Krueger, J. P. Lassoie, R. A. Malecki,
B. P. May, R. J. McNeil, A. N. Moen,
R. T. Oglesby, M. E. Richmond, J. Schelhas.
C. L. Schofield, S. Sheaffer, R. Slothower.
C. R. Smith, L. H. Weinstein, B. T. Wilkins,
J. B. Yavitt, W. D. Youngs

NTRES 100 Principles of Conservation
Fall. 3 credits. Limited to students specializing in natural resources or with permission of instructor.

Lecs, M W F 9:05; 1-hr disc to be arranged.
R. T. Oglesby.

The nature of natural resources, how they are managed, and their interactions with individuals and societies are considered. Case histories are used to illustrate both principles and practices. Emphasis will be on management of renewable resources based on ecological and cultural perspectives.

## NTRES 101 The Environment

Spring. 2 or 3 credits.
Lec M 7:30-9:30 p.m. Optional 1-hr disc sec to be arranged. R. T. Oglesby.
An overview of Earth's environmental problems. Lectures will be presented by a series of Comell's most distinguished authorities and by visiting experts on issues such as global climate change, loss of biological species, destruction of the stratospheric ozone layer and degradation of our planet's oceans. Students may not receive credit for NTRES 101 and 201 (Environmental Conservation). Students enrolled in NTRES 201 may earn one additional credit by attending lectures and registering for NTRES 494.

## NTRES 107 Introduction to Resource

 ManagementSpring. 4 credits.
Lec, T R 10:10; lab, T or R 2:30-5
B. T. Wilkins.

Management of wildlife, fishery, and forest resources is explored with the assistance of common computer applications. Laboratory sessions enhance writing and analysis of data in DOS and Macintosh Environments. Several hours are required each week outside of class to complete succinct and increasingly complex assignments emphasizing developing results and their implications from data sets.

## NTRES 201 Environmental Conservation

Spring. 3 credits.
Lecs, M W F 12:20; 1-hr disc to be arranged. T. J. Fahey.
As the end of the 20 th century approaches, our lives are increasingly touched by questions about environmental degradation at local, regional, and global scales. Business as usual is being challenged. This course will stimulate you to go beyond the often simplistic portraits of the environmental dilemma offered by the mass media so that you will have a firmer basis for responsible citizenship and action on environmental issues.
NTRES 210 Introductory Field Biology
Fall. 4 credits. Limited to 90 students. Open to sophomores and juniors with an adviser in Natural Resources or by permission of instructor. Prerequisites: BIO G 101 and 102 or equivalent. Cost of field trips, approximately $\$ 10$.

Lec, W 9:05; labs, M W 1:25-4:25 or T R 1:25-4:25. 2 overnight field trips required. T. A. Gavin, C. R. Smith

Introduction to methods of inventorying, identifying, and studying plants and animals. Students are required to learn the taxonomy, natural history, and how to identify approximately 150 species of vertebrates and 75 species of woody plants. Selected aspects of current ecological thinking are stressed. The interaction of students with biological events in the field and accurate recording of these events are emphasized

## NTRES 215 Environmental Disruption

 and RegulationSummer, 6 -week session. 3 credits. Open to high school students.

Lecs, M W 6:15-9:30 p.m. M. Heiman. The physical and social context of humanenvironmental interrelations in advanced industrial societies. Interest-group positions and the United States regulatory response on air and water pollution; toxic, nuclear, and solid waste management; and workplace hazards. The conflicts and compatibility of economic growth, social justice, and environmental quality

## NTRES 230 Environment and Society

Summer, 6 -week session. 3 credits.
Lecs, M-F 11:30-12:45. G. M. Berardi and M. Heiman.

Introduction to societal and environmental factors affecting famine and starvation, "overpopulation," deforestation, water degradation and global warming. Topics include sustainable development, gene banks and biotechnology, nutritional and environmental policy, models for conservation, alternative futures. Case studies from the United States and underdeveloped countries Optional field trips.

## NTRES 253 Integrative Resource and

 Environmental Management Spring. 3 credits. Prerequisites: NTRES 210 and BIOES 261.Lecs, M W 10:10-11:00; Lab, W or F
2:30-4:15 or R 12:20-2:15. J. B. Yavitt.
Analysis of complex interactions within biological systems, as well as human influences through management. Topics from both natural resources and environmental sciences will be addressed at organizational levels ranging from single species populations to a global perspective. Laboratory sessions emphasize use of models on microcomputers to develop strategies for dealing with resource and environmental problems.

## NTRES 270 Conservation of Birds

Spring. 2 credits.
Lec, T R 11:15-12:05. C. R. Smith A course for majors and nonmajors, focusing on bird conservation and management at the organism, population, community and landscape levels. Current resource management issues relevant to birds will be explored in the contexts of agricultural practices, habitat management, tropical deforestation, the design and management of natural preserves, endangered species management, global climate change and the economic importance of bird study as an outdoor recreational activity.
NTRES 271 Conservation of Birds Laboratory
Spring. 1 credit. Concurrent enrollment in NTRES 270 required. Limited to NTRES majors.

At least six required Saturday-morning field
trips plus four indoor labs. C. R. Smith. A field-oriented course designed to teach skills of bird observation and identification based on the integration of field marks, songs and calls, and habitat cues. Topics covered will include the choice and effective use of field guides, binoculars, and other aids to bird identification; procedures for taking and organizing field notes; the relationships of birds to their habitats and to other birds; and methods and procedures for censusing and surveying songhird populations. Students are required to provide their own binoculars for field use.

## NTRES 301 Forest Ecology

Fall. 3 credits. Prerequisite: Introductory Biology

## M W F 11:15. T. J. Fahey

A comprehensive analysis of the distribution, structure, and dynamics of forest ecosystems Topics include paleoecology of forests, ecophysiology of forest trees, disturbance, succession and community analysis, primary productivity, and nutrient cycling.
NTRES 302 Forest Ecology Laboratory Fall. 1 credit. Cost of weekend trip approximately $\$ 30$. Concurrent enrollment in NTRES 301 required.

M 1:25-4:25. Optional weekend trips.
T. J. Fahey

Field trips designed to familiarize students with the nature of regional forests and to provide experience with approaches to quantifying forest composition and its relation to environmental factors. Optional weekend field trips to Adirondacks and White Mountains, New Hampshire. Group research projects in local forests.

## NTRES 303 Woodlot Management

Fall. 3 credits. Letter grades only
Lecs, T R 10:10; lab, R 12:20-4:25.
J. W. Kelley.

A practical, field-oriented course emphasizing multiple purpose management of small nonindustrial private forestland in the northeastern United States

## NTRES 304 Wildlife Species Ecology

Spring. 3 credits. Prerequisites: broad background in biology; this course is intended primarily for juniors, seniors, and graduate students.

Lec, M W F 11:15. Two weekly 2-hour
labs to be arranged. A. Moen.
This course focuses on the physiological, behavioral, and population characteristics of wild species, interactions among species, and their relationships with range characteristics and resources. Short field trips are taken weekly. Computer modeling is an integral part of the course.
[NTRES 305 Maple Syrup Production Spring. 2 credits. Limited to 20 students. Prerequisite: permission of instructor required. Letter grades only. Not offered 1994-95

Lecs, T R 10:10; lab, R 12:30-4:30 (during sap season). J. W. Kelley.
Students work in most phases of the Arnot Forest maple operation and learn modern sap collecting, processing, and quality control in producing maple syrup-]

## NTRES 306 Coastal and Oceanic Law

 and PolicySummer. 2 credits. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $\$ 850$.

Daily lecs and discs for 1 week. SML faculty.
Intended for persons interested in careers in management of marine or coastal resources or in the natural sciences. Subjects include law and policy related to ocean dumping, marine sanctuaries, environmental impact statements, water and air pollution, fisheries management, offshore gas and oil production, and territorial jurisdiction. Lectures on the status and history of law are accompanied by discussion of relevant policy and efficacy of various legal techniques. A case study that requires extensive use of the laboratory's library and personnel is assigned. The week concludes with a mock hearing.

## NTRES 308 Natural Resources Management

Fall. 3 credits. Prerequisite: junior standing; introductory ecology or permission of instructor.

M W F 10:10. B. A. Knuth.
Management of natural resources with a focus on fish, wildlife, forest, and water resources. Emphasis is on concepts necessary to formulate and achieve specific management goals and objectives. Topics include an overview of natural resource planning processes and the management cycle; and organismal, environmental, social, and institutional dimensions of management. Focus includes management in the public domain and public-private partnerships. Students will be assigned one case study issue for the term, on which all written and oral assignments will build. Grades are based on both individual and group performance.

## NTRES 400 International Environmental

 IssuesFall. 4 credits. Limited to about 35 students. Prerequisite: junior standing or above.

Lecs, T R 10:10-12:05. R. J. McNeil. International aspects of the preservation and development of environmental and natural resources. Concepts include development, resource ownership, exploitation, compensation, and preservation. Cultural differences in attitudes and behavior toward environment. Management practices under different cultural, economic, and social systems. Will cover current issues such as acid precipitation; management of migratory whales, fish, and waterfowl; Antarctic development; global climate and energy issues; and preservation of tropical rainforests and endangered species. Lecture and discussion, term paper, and examinations. Priority to: seniors, a few graduate students, others providing best mix of backgrounds, others with special needs, natural resources majors.

## NTRES 401 Environmental and Natural Resources Policies

Fall or spring. 3 or 4 credits. Prerequisites junior standing and participation in Comell-inWashington Program.

Lab to be arranged. R. J. McNeil and staff. Concepts and principles fundamental to the environmental policy process. Biological and ecological principles central to decision making in the natural resources arena,

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particularly at the national and international levels. Role of the legal system in the policy process; roles of citizen organizations, lobbyists, bureaucrats, legislators. Case studies, interviews with Washington officials, several short papers, one exam. A fourth credit available requires a more extensive written assignment and an oral presentation.

## NTRES 402 Natural Resources Policy,

 Planning, and PoliticsSpring. 3 credits. Prerequisites: junior standing and permission of instructor.

Lec, January 2-week intersession; one 2-hr. orientation session in Dec. and four 2-hr. seminars in Jan. and Feb. R. J. McNeil and staff.
An introduction to the environmental policy process and its conceptual framework. Recognition of phenomena identified as natural resources or environmental problems and issues; steps leading to legislation or regulations to solve problems; implementation and evaluation stages; role of the legal system; roles of citizens, lobbyists, govemment actors. Case studies; presentations by and discussions with about twenty prominent Washington policy makers appearing as guest lecturers. Required interviews, term paper, oral reports. Several meetings in Ithaca before and after intensive January session in Washington

## NTRES 404 Wildlife Populations Ecology

Fall. 2 credits. Prerequisites: NTRES 304 recommended; programming skills required. Lec M 12:20-1:10; Lab M 1:25-4:25. A. Moen.

This course focuses on population characteristics, structures, and computer modeling of population dynamics. Interactions among species and their relationships with range characteristics and resources are also evaluated within the concept of carrying capacity.

## NTRES 407 Religion, Ethics, and the Environment

Spring. 4 credits. For juniors, seniors, and graduate students; others by permission only. S-U grades optional.

T R 9:05, 1-hr. disc to be arranged. R. A. Baer.

A study of how religion (mainly Christianity and Judaism), philosophy, and ethics contribute to our understanding and treatment of nature. Terms like religion, value, knowledge, nature, and the public interest are examined in detail. Particular themes include the structure of modern science, the nature of moral claims, character and moral development, and the role of mediating structures in fostering environmentally responsible behavior. Also, animal rights; responsibility to future generations; anthropocentric, biocentric, and theocentric views of human beings and nature.

## NTRES 408 Resource Management and Environmental Law

Fall. 3 credits. For juniors, seniors, and graduate students. S-U grades optional. Lecs, T R 10:10-12. H. Carter, Jr. A senior-level course that introduces the use of legal concepts, doctrines, and remedies in natural resource and environmental management. For a variety of living resources and their habitats, it explores the common law and regulatory processes available for resolving conflicts between exploitation and protection and stresses a practical understanding of how public and private values, economic consider-
ations, and constitutional limitations affect management techniques and objectives.

## NTRES 410 Wildlife Management <br> Concepts and Applications

Spring. 3 credits. Prerequisites: broad background in biology, NTRES 304 (Wildlife Ecology) desirable. This course is open to seniors and graduate students.

M W F 9:05. Weekly labs to be arranged.
A. N. Moen.

In-depth analyses of the ecological basis for decision making in wildlife management, computer simulations of management problems and effects of options, and preparation of management information systems. Local field trips are taken.
NTRES 415 Seminar in Agroforestry
Spring. 2 credits. Prerequisites: senior or graduate standing or permission of instructor. S-U option.

Lec, F 2:30-4:25. J. P. Lassoie.
An interdisciplinary course intended to introduce students to the general principles and types of agroforestry systems. Agronomic, forestry, socioeconomic, and institutional factors are considered through the use of case studies. Conceptual and methodological approaches to agroforestry research design and program development are stressed. Selected readings, class participation, and a library research paper are required of all enrolled.
NTRES 417 Wetland Resources
Summer. 2 credits. Prerequisite: one year of college biology. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$850.

Daily lecs, labs, and fieldwork for 1 weeks.
SML. faculty
An examination of coastal and adjacent freshwater wetlands from historic, destruction, and preservation perspectives, including freshand salt-marsh ecology and management. Field trips to selected examples of the wetlands under discussion and follow-up laboratories emphasize successional features, plant identification and classification, and examination of the dominant insect and vertebrate associations.
NTRES 418 Wetland Ecology and Management-Lecture
Fall. 3 credits. (Students may not receive credit for NTRES 418 and NTRES 417 Wetland Resources, Shoals Marine Laboratory summer course.)

Lec T R 12:20-1:35. B. L. Bedford. Examination of the structure, function, and dynamics of wetland ecosystems with an emphasis on principles required to understand how human activities affect wetlands. Current regulations, protection programs, and management strategies are considered

## NTRES 419 Wetland Ecology and Management-Laboratory

Fall. 1 credit. Optional. Concurrent enrollment in NTRES 418 is required.

Lab F 12:20-4:25. B. L. Bedford. An integrated set of laboratory field exercises designed to expose students to: (a) the diversity of wetland ecosystems; (b) the flora, fauna, soils, and hydrology of wetlands within the region; (c) methods of sampling wetlands vegetation, soils, and water; and (d) methods of wetland identification, delineation, and
evaluation. Some exercises will require written reports.

## NTRES 420 Introduction to Geographic

 Information SystemsFall. 4 credits. For juniors, seniors and graduate students. Limited to 40 students. Prerequisite: familiarity with DOS.

Lecs, T R 9:05; Lab, M or T 1:25-4:30.
R. Slothower.

This course will provide a comprehensive overview of the concepts, technology, and use of GIS as well as provide extensive hands-on experience with GIS for diverse applications. The course conveys the geographic and analytical skills necessary to define and resolve spatial information problems.

## NTRES 438 Fishery Management

Spring. 3 credits.
Lecs, T R 8 plus discs. C. C. Krueger.
Offered alternate odd years.
Introduction to management as an adaptive process that focuses on achievement of goals. Coverage includes sport and commercial fisheries. Topics include setting goals and objectives, regulations, habitat management, population control, stocking, and management of trout, reservoirs, the Great Lakes, and Pacific halibut. Ecological, social, political, and economic aspects of those topics are discussed.

## NTRES 440 Fishery Science

Fall. 3 credits. For juniors and seniors majoring in fishery science; others by permission of instructor. Prerequisites: a year of statistics and calculus. Offered alternate even years.

M W F 12:20. W. D. Youngs. Principles and theories involved in dynamics of fish populations. Methods of obtaining and evaluating statistics of growth, population size, mortality, yield, and production are considered.

## [NTRES 442 Techniques in Fishery Science

Fall. 5 credits. Limited to 15 upperclass and graduate fishery students. Cost of field trips, no more than $\$ 30$. Offered alternate odd years. Not offered 1994-95.

T R 1:25-4:25; 1 or more weekend field
trips. C. C. Krueger.
Emphasis is on methods of collecting data on attributes of fish populations and their habitat. Topics include passive and active fish-capture methods, tagging and marking, and physical and chemical habitat measurements. Assumptions and limitations inherent in data sets, research planning, and scientific report writing are also discussed. Several field trips provide hands-on experience in data collection on streams and lakes.]

## NTRES 450 Conservation Biology

Fall. 3 credits. Prerequisite: a reasonable biology background.

Lec, T 10:10-12:05; disc, R 10:10 or 11:15.
T. A. Gavin.

Biological topics important to the maintenance of biological diversity will be emphasized Examples include population viability analysis, and the analysis of the demography and genetics of small populations as they are affected by habitat fragmentation and isolation. Students will gain thorough familiarity with these concepts and their potential application through lectures, discussion, and use of computer models.

NTRES 471 Management of Terrestrial Habitats
Spring. 2 credits. Prerequisites: NTRES 210, 304; statistics recommended; junior standing or above.

Lec/lab, W 1:25-4:25. C. R. Smith.
A landscape ecological approach will be used to introduce students to habitat concepts and to methods of inventorying, measuring, monitoring, describing, classifying, and restoring terrestrial habitats of variety and temporal spatial scales. Field trips will be taken to areas managed by both public and private land management organizations.
NTRES 493 Research in Policy and Human Studies in Natural Resource Management
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.
R. A. Baer, D. J. Decker, J. W. Gillett, B. A. Knuth, R. J. McNeil, B. T. Wilkins.

## NTRES 494 Special Topics in Natural Resources

Fall or spring. 4 credits maximum. S-U grades optional.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.
NTRES 495 Research in Wildlife Science
Fall or spring. Credit to be arranged.
Prerequisite: permission of instructor Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.
T. A. Gavin, R. A. Malecki, A. N. Moen,
M. E. Richmond, C. R. Smith.

NTRES 496 Research in Forestry
Fall or spring. Credit to be arranged. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades; letter grade by permission of instructor.

Hours to be arranged. B. L. Bedford,
T. J. Fahey, M. E. Krasny, J. P. Lassoie,
J. B. Yavilt.

## NTRES 497 Individual Study in Fishery

 SclenceFall or spring. Credit to be arranged. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.

Hours to be arranged. M. B. Bain, C. C. Krueger, R. T. Oglesby,
C. L. Schofield, W. D. Youngs.

## NTRES 498 Teaching in Natural

 ResourcesFall and spring. 1-4 credits. Prerequisite: permission of instructor. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.
Staff.

Course designed to give students an opportunity to obtain teaching experience by assisting in labs, field trips for designated sections, discussions, and grading. Students will gain insights into the organization, preparation, and execution of course plans through application and discussions with instructor.

## NTRES 500 Professional Projects-

 M.P.S.Fall and spring. Credit to be arranged. Limited to graduate students working on professional master's projects. S-U grades only.

> Staff.

NTRES 601 Seminar on Selected Topics in Fishery Biology
Fall or spring. 1 credit. S-U grades optional. Hours to be arranged. Staff.
NTRES 604 Seminar on Selected Topics in Resource Policy and Management
Fall. 2 credits. S-U grades optional. Hours to be arranged. Staff. Primarily for graduate students with a major or minor in resource policy and management and upper level undergraduates with a strong interest in resource policy analysis. Topics vary with staff involved. Emphasis is placed on discussion, faculty-student interaction, communication skills, and current resource policy issues.

## [NTRES 606 Marine Resource Policies

Spring. 2 credits. Prerequisite: at least one related course such as NTRES 308, 438; or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

W 1:25-3:30. B. T. Wilkins.
A seminar discussing the law and issues concerning current marine policy questions such as coastal zone management, marine fishery management, marine mammal protection, and wetland preservation.]

## NTRES 607 Ecotoxicology (Toxicology

 607)Spring. 3 credits. Prerequisites: graduate or senior status and two 300-level courses in chemistry, biological science, or toxicology. Offered alternate years.

Lecs, M W F 11:15. J. W. Gillett. Lectures, readings, and special guests focus on the principles of effects of toxic chemicals on natural ecosystems, their components, and processes. Major topics include fate and transport of chemicals (chemodynamics), comparative biochemical toxicology, ecosystem process analysis, simulation through mathematical and physical (microcosm) models, and relationships to regulation and environmental management.

## NTRES 608 Resource Policy and Administration

Fall. 3 credits. Prerequisite: graduate standing; juniors and seniors with instructor's permission.

TR 2:30-3:45. B. A. Knuth. An examination, through lectures, readings, and discussions, of policy, decision making, and administration relating to natural resource management. Emphasis is on concepts relevant to policy formulation, implementation, and evaluation with specific applications from fisheries, wildlife, forest and water resource management. Topics include environmental policy makers, bureaucracies and organizational effectiveness, professionalism and ethics, resource policy philosophies, and problem-solving and decision aids including public involvement, conflict resolution, benefit/cost analysis, group decision processes, and program evaluation.

## NTRES 611 Seminar in Environmental

 EthicsFall. 3 credits. For graduate students, seniors, and juniors. S-U grades optional. W 1:25-3:50. R. A. Baer.

Moral concerns relative to agriculture and/or the environment. In successive years, the seminar will focus on such topics as
(1) animal rights and animal welfare (topic for fall 1994), (2) natural resources management and the concept of the public interest, (3) doing environmental ethics in a democratic and pluralistic society, and (4) land use ethics.

## NTRES 612 Wildlife Science Seminar

Fall and spring. 1 credit. Prerequisite:
permission of instructor. S-U grades optional. Hours to be arranged. Wildlife science faculty.
Discussion of individual research or current problems in wildlife science.

NTRES 615 Case Studies in Agroforestry Spring. 1 credit. Prerequisites: concurrent enrollment in NTRES 415 is recommended. S-U only.

Hours to be arranged. J. P. Lassoie. Interdisciplinary groups of students examine case study examples of agroforestry practices in developed and developing countries. Specific topical areas are examined in depth, leading to development of a team-written report and a class presentation. Extensive library research and participation in small group discussions are required.

## NTRES 616 Forest Science and Management Seminar

Fall/spring. 1 credit. Permission of instructor. Hours to be arranged. Forest Science faculty.
Selected readings and discussions of research and/or current problems in forest science and management.

## NTRES 618 Critical Issues in Conservation and Sustainable Development

Fall. 3 credits. Preference to graduate students with minor in conservation and sustainable development; seniors by permission. Limited to 30 students.

Lecs, T R 2:30-4:25. J. Schelhas. Establishes a theoretical foundation for analyzing and addressing conservation and development issues from an interdisciplinary perspective. Engages students in the inherent conflicts between natural resource conservation and the development for human needs. Students will work in interdisciplinary groups to analyze issues and cases from both developing and developed countries.

## NTRES 619 Field Practicum in Conservation and Sustainable Development

Spring. 3 credits. Prerequisites: NTRES 618; preference given to graduate students with minor in conservation and sustainable development; permission of instructor. Limited to 12 students. Includes two-week field study trip to a Latin American country in January.

Lecs, T R 2:30-4:25 until midterm only. J. Schelhas.

An interdisciplinary study of a conservation and development problem in Costa Rica or the Dominican Republic. The course will use an interdisciplinary research methodology that includes group problem identification, individual or small group research projects, and synthesis of group work to identify key conservation issues and research priorities for a selected site.

## AGRICULTURE AND LIFE SCIENCES - 1994-1995

## NTRES 620 Applications of Geographic

 Information SystemsSpring. 3 credits. Limited to 12 students Prerequisite: NTRES 420 or equivalent; permission of instructor. Possible field trip. Lec, W 9:05, Lab, M 1:25-4:30.
R. Slothower.

Students use GIS techniques to resolve issues involving geographic information within diverse disciplines. Students design, complete, and present the spatial analysis of a problem within their field of study. Lectures, readings, and discussions address application areas and advanced topics in spatial analysis, modeling, and databases. Emphasis will include the integration of natural resource information into spatially oriented projects.

## [NTRES 681 Detection of Genetic

 Variation-LectureFall. 1 credit. Prerequisite: Introductory Genetics course. Offered alternate odd years. Not offered fall 1994

Lec M 9:05. B. P. May.
An introduction to the molecular techniques available to detect genomic variation. The overall emphasis is on providing the student with the theoretical variation basis behind and the practical knowledge of these molecular methods. An optional companion laboratory course (NTRES 682) is also available.]

## [NTRES 682 Detection of Genomic Variation-Laboratory

Fall. 2 credits. Concurrent registration in NTRES 681 and permission of instructor required. Offered alternate odd years. Not offered fall 1994.

Two 3-hr labs per week to be arranged. B. P. May

This laboratory course will present protocols and procedures common to many methods used to detect genomic variation as well as illustrating procedures limited to specific techniques.]

## NTRES 694 Special Topics in Natural

 ResourcesFall or spring. 4 credits maximum. S-U grades optional.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## NTRES 698 Current Topics: Environmental Toxicology (Toxicology 698)

Fall, spring. $1-3$ credits. Prerequisites: graduate or senior standing in scientific discipline and permission of instructor. Time, date to be announced. Staff. A student-faculty colloquium on subjects of current interest, usually focusing on multidisciplinary aspects of topical problems (e.g., Superfund, oil spills).
NTRES 800 Master's Thesis Research
Fall and spring. Credit to be arranged. Limited to graduate students working on master's thesis research. S-U grades only. Staff.

## NTRES 900 Ph.D. Thesis Research

Fall and spring. Credit to be arranged. Limited to graduate students working on Ph.D. thesis research. S-U grades only. Staff

## Related Courses in Other Departments

See department advisers and curriculum materials for information about other related courses.
Environmental Policy (ALS 661, BIOES 661, and B\&SOC 461)
Resource Economics (AG EC 100, 252, 332, $452,631,651,652,750$ )
Functional Ecology: How Animals Work (BIOES 272)
Function and Comparative Morphology of Vertebrates (BIOES 274)
Limnology: Ecology of Lakes (BIOES 457)
Mammalogy (BIOES 471)
Ornithology (BIOES 475)
Biology of Fishes (BIOES 476)
Insect Biology (ENTOM 212)
Public Administration (CRP 643)
Policy Analysis (CRP 720)
Soil Science (SCAS 260, 361)
International Development (CRP 777, GOVT 648)

Environmental Planning Law (Law 660, CRP 653, 656)
Political Economy and Political Theory (CRP 719, GOVT 428)
Philosophy of Science (PHIL 381)

## PLANT BREEDING

E. D. Earle, chair; D. W. Altman,
W. R. Coffman, M. M. Kyle, S. R. McCouch,
M. A. Mutschler, W. D. Pardee, R. L. Plaisted,
K. V. Raman, N. N. Roy, M. E. Smith,
M. E. Sorrells, J. C. Steffens, S. D. Tanksley,
D. R. Viands, K. N. Watanabe, R. W. Zobel

Emeritus Professors: R. E. Anderson,
H. L. Everett, C. C. Lowe, H. M. Munger, and D. 11. Wallace

Biometry courses are listed under "Biometry and Statistics.

## PL BR 201 Introduction to Plant

 BreedingSpring. 2 credits. Prerequisite: one year of introductory biology.

Lecs, T R 11:15. Staff.
This course describes how plant breeders use genetics to alter crop plants. Emphasis is on activities and accomplishments with important impacts on society. Topics to be discussed include the Green Revolution, hybrid crops, sustainable agriculture, biodiversity, pestresistant lines, prospects for tastier winter tomatoes, and gene transfer techniques. Class periods include hands-on exercises and a field trip.

## PL BR 225 Plant Genetics

Spring. 4 credits. Prerequisite: one year of introductory biology or permission of instructor. Limited to 50 students. Will be offered 1995-96.

Lecs, M W F 9:05; lab, T or W 1:25; lab section assignments at first lecture. Labs start first week. M. A. Mutschler.
An overview of genetic principles as related to the plant sciences. Topics covered include mitosis and meiosis, gamete production, Mendelian inheritance, linkage and mapping, gene interaction, DNA as genetic material, genetic fine structure and gene regulation, gene recombination, extranuclear inheritance, environmental effect on phenotypic expression, gene mutation and chromosomal aberrations, variation in chromosome numbers or structure, tissue culture, and genetic
engineering of higher plants. Students conduct an independent inheritance project with Brassica campestris. The course may not be used to fulfill the genetics requirement for students in the Division of Biological Sciences.
PL BR 401 Plant Cell and Tissue Culture
Fall. 3 credits. Prerequisites: a course in plant biology, cell biology, or genetics, or permission of instructor

Lecs, T R 10:10. E. D. Earle
Lectures and demonstrations dealing with the techniques of plant tissue, cell, protoplast, embryo, and anther culture and the applications of those techniques to biological and agricultural studies. Methods for plant improvement via manipulations of cultured cells will be discussed. Five written assignments and a term paper are required.
PL BR 402 Plant Tissue Culture Laboratory
Fall. 1 credit. Enrollment limited. Prerequisites: PL BR 401 (may be taken concurrently) and written permission of instructor.

Alternate weeks. W 1:25-4:25 plus 1 hr .
to be arranged. E. D. Earle.
Laboratory exercises complementing Plant Breeding 401. Techniques for establishing, evaluating, and utilizing plant organ, tissue and cell cultures will be covered. Experiments will use a broad range of plant materials.

## PL BR 446 Plant Cytogenetics

## Laboratory

Spring. 2 credits. Prerequisites: BIOGD 281 and/or PL BR 225

Lab, M 1:25-4:30. K. N. Watanabe.
This course aims to provide fundamental knowledge and techniques in plant cytogenetics. Emphasis will be on applications to research on plant genetics and plant breeding. Plant materials involve a wide range of crop species. Specific topics will be covered by invited lecturers.

## PL BR 494 Special Topics in Plant Breeding

Fall or spring. 4 credits maximum. S-U grades optional.

Hours to be arranged. Staff. The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## PL BR 496 Internship in Plant Breeding

 Fall or spring. Credits variable, may be repeated to a maximum of 6 . Minimum of 60 on-the-job hours per credit granted. Prerequisites: permission of adviser and enrollment during the pre-enrollment period of the semester before the internship. Student must be a plant breeding junior or senior with a minimum 3.0 average in plant breeding courses. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their study and assign their credits and grade. S-U grades only.
## Staff.

On-the-job learning experience under the supervision of professionals in a cooperating organization. A learning contract is written between the faculty supervisor and student, stating the conditions of the work assignment, supervision, and reporting.

## PL BR 497 Individual Study in Plant Breeding

Fall or spring. Credits variable, may be repeated to a maximum of 6 . S-U optional. Prerequisite: permission of instructor. Students must register with an Independent Study form (available in 140 Roberts Hall). Staff.

PL BR 498 Undergraduate Teaching
Fall or spring. Credits variable, may be repeated to a maximum of 6 . S-U optional. Prerequisites: permission of instructor, and previous enrollment in course to be taught or equivalent. Students must register with an Independent Study form (available in 140 Roberts Hall).

Staff.
Undergraduate teaching assistance in a plant breeding course. Teaching experience may include leading a discussion section, preparing and teaching laboratories, and tutoring.

PL BR 499 Undergraduate Research Fall or spring. Credits variable, may be repeated to a maximum of 6 . S-U optional. Prerequisite: permission of instructor. Students must register with an Independent Study form (available in 140 Roberts Hall). Staff.
Undergraduate research projects in plant breeding.

## PL BR 603 Methods of Plant Breeding

Fall. 3 credits. Prerequisites: BIOGD 281 or PL BR 225 or equivalent and an introductory course in crop production.

M W F 9:05. M. E. Smith.
A comprehensive examination of plant breeding methods, including inbreeding and population improvement methods. Operational details and practical limitations for each method will be considered, as will suitability for major breeding objectives (agronomic characterstics, quality, and biotic and abiotic stress tolerance). The goal is to familiarize students with tools available to plant breeders, criteria for choosing among them, and options for creatively modifying them for specific situations.

## PL BR 604 Methods of Plant Breeding Laboratory

Fall. 2 credits. Prerequisite: PL BR 603 or equivalent (may be taken concurrently). T R 1:25-4:15. M. E. Sorrells and R. E. Anderson.

Field trips to plant breeding programs involve discussion of breeding methods used, overall goals, selection and screening techniques, and variety and germ plasm release. Additional labs include use of computers in plant breeding research and selection techniques for disease resistance. For a term project each student designs a comprehensive breeding program on a chosen crop.

## PL BR 606 Advanced Plant Genetics

Spring. 3 credits. S-U grades optional.
Prerequisites: BIOGD 281, PL BR 225, or equivalent.

Lecs, T R 10:10-11:25. M. M. Kyle. This course provides an advanced survey of genetics in higher plants. Topics include genetic analysis of developmental and metabolic processes, cytogenetics, mating behavior and barriers, and aspects of population and quantitative genetics.

## PL BR 608 Biochemical Approaches in Plant Breeding

Fall. 3 credits. Prerequisite: BIOBM 330, 331, or permission of instructor. Lecs, M W 11:15; lab, W 7:30-10:30 p.m. J. C. Steffens.

A review of biochemical, spectroscopic, and immunological techniques used in the analysis, selection, and generation of crop plants. Examples from current literature and possible applications of new technologies will be discussed. Laboratory will emphasize biochemical techniques used in plant breeding programs. Students should expect to spend more hours in laboratory than suggested by the formal meeting times.

## PL BR 622 Seminar

Fall or spring. 1 credit. S-U grades only. T 12:20. Staff and graduate students and visitors.

PL BR 629 Special Topics in Plant Science Extension
Spring. 2 credits.
F 1:25-4:25. W. D. Pardee.
Designed for graduate students and advanced undergraduates to provide a broader knowledge of cooperative extension philosophy and methods. Developed for students interested in extension and research in public and commercial organizations. Topics relate to extension in other countries as well as in the United States.

## PL BR 650 Special Problems in Research and Teaching

Fall or spring. 1 or more credits. Prerequisite: permission of instructor supervising the research or teaching. Staff

## PL BR 653.2 Plant Biotechnology (also BIOPL 653.2 and Plant Pathology 663)

Fall. 1 credit. S-U grades optional. Prerequisite: BIOPL 653.1 or permission of instructor. Lecs, M W F 10:10 ( 12 lecs)
Aug. 31-Sept. 26. M. Zaitlin, E. D. Earle Applications of molecular biology and tissue culture to plant biotechnology are studied. Topics covered include gene introduction and tissue culture technologies, as well as use of cultured plant materials and transgenic plants to obtain resistance to insects, plant diseases, and herbicides and to improve nutritional and food processing qualities. Regulatory and social issues relating to plant biotechnology are discussed.
PL BR 653.3 Plant Genome Organization Fall. 1 credit. Prerequisite: BIOPL 653.1.

Lecs, M W F 10:10-11 (12 lecs),
Oct. 3-Oct. 31, S. D. Tanksley. Module 3 in Plant Molecular Biology series. Molecular structure and evolution of plant nuclear genomes are explored. Topics covered include mechanisms for packaging DNA into chromosomes, molecular structure of telomeres and centromeres, DNA replication and methylation, and molecular biology of plant transposons. Methods for genetic and physical mapping of plant genomes are discussed as well as applications of mapping tools for gene isolation and plant breeding.

## PL BR 694 Special Topics in Plant Breeding

Fall or spring. 4 credits maximum.
S-U grades optional.
Hours to be arranged. Staff.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## PL BR 716 Perspectives in Plant

 Breeding StrategiesSpring. 3 credits. S-U grades optional. Prerequisite: PL BR 603. Offered alternate years. Not offered 1995-96.

T 1:25-2:15, R 12:20-2:15. M. E. Sorrells Emphasis is on discussion and evaluation of selected benchmark papers and current literature. Selection techniques and breeding objectives, methods, and strategies for both self- and cross-pollinated crops are reviewed and discussed. Extensive outside reading is required.

## [PL BR 717 Quantitative Genetics in Plant Breeding

Spring. 3 credits. S-U grades only. Prerequisites: PL BR 603 and BTRY 601. Offered 1995-96.

T R 8:30-9:55. D. R. Viands.
Discussion of quantitative genetics to help make decisions for more efficient plant breeding. Specific topics include components of variance (estimated from mating designs), gene pool development, linkage, heritability, phenotypic and genotypic correlation coefficients, and theoretical gain from selection. During one period, plants in the greenhouse will be evaluated to provide data for computing quantitative genetic parameters.]
[PL BR 718 Breeding for Pest Resistance Spring. 3 credits. Prerequisites: BIOGI) 281 or PL BR 225, and PL BR 603 required. An introductory course in Plant Pathology and/or Entomology also highly recommended. Not offered 1994-95.

Lec, T R 10:10-11:30. M. A. Mutschler. A multidisciplinary examination of the challenge of incorporating disease and insect resistance into crop plants. Topics covered include national and international germplasm collections, identification of sources of resistance, resistance mechanisms in plants, monogenic and polygenic control of resistance, approaches to breeding for resistance stability of genetic resistance mechanisms, and the use of biochemical/ physiological/molecular tools in breeding for pest resistance.]

## PL BR 800 Thesis Research, Master of

 ScienceFall or spring. Credit to be arranged. S-U grade only. Staff.

## PL BR 900 Thesis Research, Doctor of Philosophy

Fall or spring. Credit to be arranged $\mathrm{S}-\mathrm{U}$ grade only.

Staff.

## PLANT PATHOLOGY

W. E. Fry, chair; J. R. Aist, P. A. Arneson, S. V. Beer, G. C. Bergstrom, B. B. Brodie, A. R. Collmer, S. M. Gray, R. K. Horst, G. W. Hudler, H. W. Israel, R. P. Korf, J. W. Lorbeer, R. Loria, M. T. McGrath, M. G. Milgroom, E. B. Nelson, P. F. Palukaitis, W. A. Sinclair, S. A. Slack, H. D. Thurston,
O. C. Yoder, M. Zaitlin, T. A. Zitter
[PL PA 101 Freshman Writing Seminar: Pests, Pesticides, People, and Politics
Fall. 3 credits. Limited to 17 students. Not offered 1994-95.

Lecs, M W F 8:00. P. A. Arneson.
This seminar will examine the use of pesticides, their impact on human health and the environment, and their regulation. Beginning with Rachael Carson's classic Silent Spring, we will examine many facets of the pesticide controversy through readings in current popular literature, technical journals, government documents, industry propaganda, and publications of various so-called "public interest groups." We will emphasize the need for critical thinking as we explore the power of the written word to persuade.]

## PL PA 201 Magical Mushrooms, Mischievous Molds

Spring. 2 credits. S-U optional. Lecs, T R 11:15. G. W. Hudler. A presentation of the fungi and their roles in nature and in shaping past and present civilizations. The historical and practical significance of fungi as decayers of organic matter, as pathogens of plants and animals, as food, and as sources of mind-altering chemicals will be emphasized.

## PL PA 301 Introductory Plant Pathology

Fall. 4 credits. Prerequisites: BIO G 101-102 and 103-104, or 105-106 or 109-110, and BIOPL 241 or equivalent. Lecs, T R 11:15; lab, T W 1:25-4:25 and one period weekly, scheduled at the convenience of the student. W. A. Sinclair.
An introduction to the theory and practice of plant pathology with emphasis in lectures on principles that govern interactions of plants and pathogens and in laboratories on diagnostic criteria, life cycles of pathogens, and epidemiological phenomena and control. Specific aspects considered in detail include fungi, bacteria, nematodes, vinuses, and mycoplasmas as plant pathogens; attack and resistance mechanisms; environmental influences; disease forecasting and loss assessment; development of resistant plants; and chemical and biological control.

## PL PA 309 Introductory Mycology

Fall. 3 credits. Prerequisite: a year of biology or equivalent. Concurrent registration in PL PA 319 is recommended.

Lecs, T R 9:05-9:55; labs, R 1:25-4:25. J. R. Aist.

An introduction to fungi, emphasizing biology, comparative morphology, and taxonomy.

## PL PA 319 Field Mycology

Fall. 1 credit. Prerequisite: permission of instructor.
Lab, W 1:25-4:25 and 7:30-9:30 p.m. R. P. Korf.

Study of mushrooms and other fungi on 7 field excursions followed by 7 evening labs devoted to identification and study of collections under the microscope. Emphasis on ecology, biology, and means of identifica-
tion. There are no lectures; grades will be determined on basis of laboratory final.

## PL PA 402 Plant Disease Control

Spring. 3 credits. Prerequisite: PL PA 301 or equivalent.

Lecs, T R 11:15; lab and rec, T or W
1:25-4:25. P. A. Arneson.
This course complements Plant Pathology 301 with an in-depth presentation of the principles and practices of plant disease control that builds on students' knowledge of diseases and their causal agents. General principles and concepts, illustrated by specific examples, are presented. Students write a term paper applying those principles to a specific diseasecontrol problem. The laboratories provide practical experience in diagnosis and diseasecontrol techniques.
[PL PA 411 Plant Disease Diagnosis Fall. 3 credits. For senior undergraduates specializing in plant pathology or pest management and for graduate students with a major or minor in plant pathology or plant protection. Limited to 20 students. Prerequisites: PLPA 301 or equivalent and permission of instructor. Not offered 1994-95.

Lec, M 11:15; lab, M W 1:25-4:25. G. W. Hudler.

A method for diagnosis of plant disease is presented with emphasis on contemporary laboratory techniques and effective use of the literature.]

## PL PA 443 Pathology of Trees and Shrubs

Fall. 3 credits. Prerequisites: PL PA 301 or equivalents.

Lecs, M W 11:15; labs, F 1:25-4:25. Evening prelims. G. W. Hudler. For students preparing for careers in horticulture, urban forestry, and pest management. Deals with the nature, diagnosis, assessment, and treatment of diseases of trees and shrubs. Forest, shade, and ornamental plants are considered.
PL PA 444 Integrated Pest Management (also Entomology 444)
Fall. 4 credits. Prerequisites: BIOES 261, ENTOM 212 or 241, and PL PA 301 or their equivalents or permission of instructor. Lecs, M W F 9:05; lab, M 1:25-4:25. P. A. Arneson.

Lectures integrate the principles of pest control, ecology, and economics in the management of pest crop systems. Laboratories consist of exercises to reinforce concepts presented in lecture and demonstrate pest monitoring techniques and the application of computer technology to management problems.

## PL PA 494 Special Topics in Plant Pathology

Fall or spring. 4 credits maximum. S-U grades optional.

Hours to be arranged. Staff.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offfered more than twice under this number.

## PL PA 497 Independent Study

Fall or spring. $1-5$ credits. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.

Hours to be arranged. Staff.

An opportunity for independent study of a special topic in mycology or plant pathology under the direction of a faculty member.

## PL PA 498 Teaching Experience

Fall or spring. $1-5$ credits. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.

Hours to be arranged. Staff,
Undergraduate teaching assistance in a mycology or plant pathology course by mutual agreement with the instructor.

## PL PA 499 Undergraduate Research

Fall or spring. $3-5$ credits. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.

Hours to be arranged. Staff. An opportunity for research experience under the direction of a faculty member.

## PL PA 642-661 Special Topics Series

Unless otherwise indicated, the following description applies to courses 642-661. Fall or spring. 1 credit. Prerequisite: permission of instructor. S-U grades only.

Hours to be arranged.
Weekly discussions of current topics in special areas of plant pathology and mycology. Students are required to do extensive reading of current literature and to present oral and written reports.

## PL PA 642 Plant Disease Epidemiology

## Fall.

T 12:20. M. G. Milgroom.
PL PA 644 Ecology of Soil-Borne Pathogens
Fall. Meets with PL PA 646. E. B. Nelson.

## PL PA 645 Plant Virology <br> Fall. <br> F 12:20. S. M. Gray

## PL PA 646 Plant Nematology

Spring. Meets with PL PA 644. B. B. Brodie

PL PA 647 Bacterial Plant Diseases
Fall and spring.
M 9:05. S. V. Beer.
Emphasizes current research in phytobacteriology undertaken in laboratories at Cornell.
[PL PA 648 Molecular Plant Pathology
Fall. Not offered fall 1994.
R 12:20. A. R. Collmer and O. C. Yoder.]
PL PA 649 Mycology Conferences
Fall. 1 credit.
R. P. Korf

PL PA 650 Diseases of Vegetable Crops Fall.

W, hours to be arranged. J. W. Lorbeer, T. A. Zitter.

## PL PA 652 Field Crop Pathology <br> Spring. <br> W 8. G. C. Bergstrom.

PL PA 654 Diseases of Florist Crops Spring.

F 12:20. R. K. Horst.
PL PA 655 Plant Diseases in Tropical Agriculture
Spring
T 12:20. H. D. Thurston.

PL PA 661 Diagnostic Lab Experience
Summer and fall. 2 credits. S-U grades only. Hours to be arranged. T. A. Zitter. For graduate students and advanced undergraduates with a special interest in diagnosing plant diseases. Students will work in the Diagnostic Laboratory (Plant Pathology Department) under supervision of the diagnostician. Students may choose to work on a wide array of plant material or to concentrate on a particular commodity. Priority will be given to graduate students in plant pathology and plant protection.

## PL PA 662 Molecular Plant-Pathogen

 Interactions (also BIOMI 652.1)Spring. 1 credit. Prerequisites: BIOGD 281, BIOBM 330 or 331, and BIOMI 653.1. Lecs, M W F 10:10 (12 lecs) Jan. 25-Feb. 20. P. F. Palukaitis, O. C. Yoder. An examination of the molecular properties that control the development of host-parasitic interactions in both microorganisms (viruses, bacteria, and fungi) and higher plants. Contemporary theories describing the genetic mechanisms of pathogenesis and resistance are discussed.

## PL PA 663 Plant Biotechnology (also BIOMI 653.2 and PL BR 653.2]

Fall. 1 credit. Prerequisites: BIOGD 281, BIOBM 330 or 331 , and BIOMI 653.1 Lecs, M W F 10:10 (12 lecs) Aug. 31Sept. 26. M. Zaitlin, E. D. Earle. Applications of molecular biology and tissue culture to plant biotechnology are studied. Topics covered include gene introduction and tissue culture technologies, use of somaclonal variation, use of cultured plant materials and transgenic plants to obtain resistance to insects, plant diseases, and herbicides and improve nutritional and food processing qualities. Regulatory and social issues related to plant biotechnology are discussed.

PL PA 681 Plant Pathology Seminar Fall and spring. 1 credit. Required of all plant pathology majors. S-U grades only. W 12:20-1:20. Staff.

## PL PA 694 Special Topics in Plant

 PathologyFall or spring. 4 credits maximum.
S-U grades optional.
Hours to be arranged. Staff.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## PL PA 701 Concepts of Plant Pathology:

 Organismal AspectsSpring. 3 credits. For graduate students with majors or minors in plant pathology; others by permission. Prerequisites: PL PA 301 or equivalent and permission of instructor. Lecs, T R 9:05; lab-disc, R 2-4:25. A. R. Collmer.

Concepts in host-pathogen relationships with emphasis on roles of molecules and cells in determining the outcome of an interaction. Genetic, molecular biological, physiological, and cell biological approaches to experimental analysis of exemplary host-pathogen systems will be considered. Historical perspectives and recent research will be reviewed and analyzed. Students prepare and review mock grant proposals.

PL PA 702 Concepts of Plant Pathology: Population Aspects
Fall. 3 credits. For graduate students with a major or minor in plant pathology; others by permission. Prerequisite: PL PA 301 and permission of instructor.

Lec, T R 10:10; lab, T 2-4:25.
M. G. Milgroom.

Theory and concepts in epidemiology and population biology of plant diseases. Topics include: population dynamics of pathogens in time and space, interactions of pathogen and plant populations, disease in natural communities, and applications of theory and modeling to disease management. The laboratory period will be for discussions and exercises that illustrate concepts introduced in lectures.

## PL PA 705 Phytovirology

Spring. 2 credits. For graduate students with a major or minor in plant pathology; others by permission. Prerequisite: PL PA 301 or equivalent.

Lec, T R 10:10. M. Zaitlin.
This course considers plant viruses and the diseases they cause. Consideration is given to virus structure and composition, classification, replication, effects on hosts, modes of transmission, and the relationships of these aspects to principles of diagnosis and control.

## PL PA 706 Phytonematology

Fall. 2 credits. For graduate students with a major or minor in plant pathology; others by permission. Prerequisite: PL PA 301 or equivalent or permission of instructor.

Lec, R 11:15; lab, R 1:25-4:25. Staff. Deals with morphology, anatomy, biology, physiology, ecology, detection and identification of plant pathogenic nematodes, evaluation of population data, interactions between nematodes and other plant pathogens, and methods of assessment of pathogenicity and plant damage.

## PL PA 707 Phytobacteriology

Fall. 2 credits. Prerequisites: general microbiology, lectures and laboratory; Introductory Plant Pathology. Offered alternate years.

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\begin{aligned}
& \text { Lec, W 9:05; lab, W 1:25-4:25. } \\
& \text { S. V. Beer. }
\end{aligned}
$$

A consideration of the prokaryotes that cause disease in plants and examples of the diseases they cause. The course emphasizes properties of bacterial pathogens that affect disease, methods for manipulation of the pathogens, and recent developments in
phytobacteriology. The current state of knowledge of important phytopathogenic genera including their genetics and mechanisms of pathogenesis will be reviewed. Laboratory practice in isolation, inoculation, identification, genetics, and physiology is included.

## PL PA 709 Phytomycology

Spring. 2 credits. For graduate students with a major or minor in mycology or plant pathology; others by permission. Prerequisites: PL PA 301 and 309 or equivalents, and permission of instructor.

Lec, F 1:25-2:30; lab, 2:30-4:30.
J. W. Lorbeer.

Provides basic information on the biology of plant pathogenic fungi with selected emphasis on the structure, ecology, genetics, life cycles, and disease cycles of representative genera and species.

PL PA 715 Phytovirology Laboratory
Spring. 2 credits. Limited to 12 students. Prerequisite: permission of instructor. S-U grades only

Two 3-hour lab sessions, R, F.
P. Palukaitis.
[PL PA 735 Advanced Plant Virology
Spring. 3 credits. Prerequisite: permission of instructors. Not offered 1994-95.

3 lecs, hours to be arranged.
P. Palukaitis, M. Zaitlin.

Topics in plant virology, with an emphasis placed on student discussion of current literature. Topics included are viral infection process, viral and viroid replication, viral recombination, viral movement, viral genes and their products, cross protection, detection of viruses, molecular approaches to resistance and the use of viruses as vectors for introducing genetic material into plants.]
PL PA 738 Genetics and Development of Filamentous Fungi
Fall. 2 credits. Prerequisite: BIOGI) 281 or equivalent.

Hours to be arranged. O. C. Yoder and B. G. Turgeon.

Classical and molecular approaches to the study of fungal genetics are discussed. Recently developed molecular technology is highlighted, with emphasis on transformation systems, gene disruption and replacement, gene over-expression, stability of transforming DNA, native transposons and plasmids, karyotyping by chromosome separation, and secretion of heterologous proteins. Application of contemporary methodology to genetic dissection of developmental processes, such as plant pathogenesis (including host and tissue specificity), the mitotic and meiotic cell cycles, and conidium formation is described. Experimental evidence supporting various hypotheses to explain fungal pathogenicity is evaluated. Examples are chosen from investigations of recently developed plant pathogenic fungi such as Cochliobolus beterostrophus and Magnaporthe grisea and from well known genetic models such as Aspergillus nidulans and Neurospora crassa.

## PL PA 739 Advanced Mycology

Fall. 4 credits. Prerequisites: PL PA 309 or equivalent, a course in genetics, and permission of instructor. Offered alternate years. Not offered 1995-96.

Lec, M 10:10; labs, M W 1:25-4:25, and an additional 3-hr. period to be arranged. R. P. Korf.
A detailed study of the taxonomy, nomenclature, and biology of four major groups of fungi (rusts, smuts, peronosporales, and fungi imperfecti).
[PL PA 756 Advanced Plant Nematology Spring. 3 credits. For graduate students with a major in plant pathology and special interest in Nematology. Prerequisite: permission of instructor. Offered alternate years. Not offered 1994-95.

Hours to be arranged. Staff.]

## PL PA 788 Research in Molecular Plant

 PathologyFall and spring. 2, 4 , or 6 credits. Prerequisite: permission of instructor. S-U grades only.

Lab, hours to be arranged. S. V. Beer and staff.
Guided research experiences in laboratories addressing questions concerning the interaction of pathogens (bacteria, fungi, viruses) and

## AGRICULTURE AND LIFE SCIENCES - 1994-1995

plants at the molecular level. Intended for beginning graduate students with a concentration in Molecular Plant Pathology and sufficient theoretical background and practical laboratory experience. Students submit plans and reports on each research experience.

## PL PA 797 Special Topics

Fall or spring. $1-5$ credits. S-U grades optional.

Hours to be arranged. Staff. An opportunity for independent study of a special topic.

## PL PA 799 Graduate Research

Fall or spring. $1-5$ credits. S-U grades optional.

Hours to be arranged. Staff.

## POMOLOGY (FRUIT SCIENCE)

See Horticultural Sciences.

## RURAL SOCIOLOGY

D. L. Brown, chair; P. R. Ebers,
E. C. Erickson, S. Feldman, J. D. Francis,
C. G. Geisler, N. Glasgow, D. T. Gurak,
M. M. Kritz, T. A. Hirschl. T. A. Lyson,
P. D. McMichael, M. J. Pfeffer, J. M. Stycos,
R. W. Venables, L. B. Williams, F. W. Young

R SOC 100 American Indian Studies: An introduction
Fall. 3 credits. S-U grades optional. Lec, W 7-10 p.m. R. W. Venables.
This course provides a foundation for the study of American Indians. Emphasis will be placed on social, cultural, historical, educational, and human development. Guest lecturers from Cornell's staff and the Indian communities and media presentations
R SOC 101 Introduction to Sociology
Fall or spring. 3 credits.
Fall: Lecs, T R 10:10; disc and sec, M 10:10, 11:15, 12:20, 1:25, 2:30; T 9:05, 11:15; W 11:15, 12:20; R 11:15, 12:20; F 10:10. E. Erickson and staff. Spring: Lecs, T R 10:10; disc and sec: M 10:10, 11:15, 12:20, 1:25, 2:30; T 9:05, 11:15; W 11:15, 12:20; R 11:15, 12:20; F 10:10. E. C. Erickson and staff. A survey of major concepts and theories in sociology and an examination of major social forces and institutions shaping modern societies. The major topics include culture and socialization, social stratification and social class, age and gender inequality, economy and society, politics and the state, urbanization and demographic change, social change and international development, the rural-urban transition, and war and peace.

R SOC 175 Issues in Contemporary American Indian Societies
Spring. 3 credits. S-U grades optional. W 7-10 p.m. R. W. Venables. Early American Indian history and the postcontact period will be reviewed with an emphasis given to developments since 1789. Topics such as land claims, treaties, education, mineral and water rights, social problems, militant organizations, and civil rights will be covered, with guest lecturers and media presentations.

## R SOC 200 Social Problems

Fall. 3 credits. S-U grades optional. Lecs, M W F 9:05. T. A. Hirschl.
This course investigates a variety of current social problems from a sociological perspective. The course begins with an overview of sociological theories that may account for social problems and identifies common as well as competing elements of these theories. The theoretical framework is then applied to analyses of a variety of social problems, and these may vary semester to semester.
Examples of social problems are
homelessness, teenage pregnancy,
deindustrialization, and homicide, among others. Emphasis in the course will be given to how social problems are measured, and students will be given an opportunity to test theories with data analysis.

## R SOC 201 Population Dynamics

Spring. 3 credits. S-U grades optional. ALS students must register for this course as R SOC 201.

TR 2:30-3:45. J. M. Stycos.
An introduction to population studies, which includes the determinants and consequences of population change. The primary focus is on the influences of demographic dynamics on society and the economy, with emphasis on marriage, family formation, mortality, crime and deviance, migration, and marketing behavior.

## R SOC 205 International Development

 Spring. 3 credits.M W F 10:10. P. D. McMichael. New questions concerning development models in the post-Cold War era are examined from a comparative and global perspective on North-South relations. While the focus is the "Third World," the issues confronting it are often global, even when they concern the most basic issue of food security. Using films and various theoretical perspectives, we examine Southern societies (economies, ecologies, class/gender relations) and the impact of global forces on Southern resources. Such forces include new social diets, new forms of export production, development agencies, multilateral institutions, local bureaucracies, transnational corporations, the current debt crisis, and new technologies.

## R SOC 206 Gender and Society

 Spring. 3 credits.Lec M W 11:15; Sec W 7:30-8:20 p.m.;
R 12:20-1:10; 1:25-2:15; 2:30-3:20.
N. L. Glasgow.

Course will familiarize students with origin of gender hierarchies, social and behavioral similarities/differences between females and males, and degree that biological, psychoanalytic, social psychological, and sociological perspectives help to understand the differences. Objectives will be met through lectures, readings, films, participant observations, and personal experiences. Crosscultural comparisons of gender role behavior will be made.

## R SOC 208 Technology and Society

 Fall. 3 credits.M W F 10:10. C. C. Geisler.
The relationship between technology and society is among the most pervasive concerns of our time. Ultimately, what makes a technology useful or "appropriate" is a sociological question. Lectures and readings review classical dehates regarding technology and society. Herein, students compare high technologies and appropriate technologies,
identify problems associated with technology transfer to other societies, and create a list of important criteria by which technologies are judged appropriate or inappropriate using numerous case studies.
R SOC 213 Social Indicators, Data Management, and Analysis
Fall. 3 credits
Lecs, T R 2:30-3:45. P. R. Eberts. A survey of definitions of social indicators and general principles of social indicators research will be illustrated from data on both developed and less-developed countries. Data management and analysis of measures of poverty, level of living, inequality, quality of life, etc., based on census data, household surveys, and key-informant and other low-cost techniques, will be examined, using personal computers.

## R SOC 301 Theories of Society

Fall. 3 credits. Prerequisites: rural sociology or sociology course. S-U grades optional. M W F 11:15. F. W. Young.
An introduction to the "classical" sociological theorists for juniors, seniors, and beginning graduate students. Emphasis on (1) the central concepts of the sociological tradition, (2) major classical theorists (Marx, Durkheim, Weber) and contemporary counterparts. The relevance of these theories of society to current events and social problems will be stressed.

## R SOC 318 Ethnohistory of the Northern

 IroquoisFall. 3 credits. S-U grades optional. Lec, T 1:25-4:25. R. W. Venables.
The development of Iroquois
(Houdenosaunee) history and culture is traced to the present day
R SOC 324 Environment and Society Fall. 3 credits.

> M W F 1:25. M. J. Pfeffer.

The main objective of the course is to develop a critical understanding of the dominant trends in modern U.S. environmental thought; preservationism, conservationism, deep ecology, ecofeminism, social ecology, NIMBYism, risk assessment, and environmental equity. Another objective is to familiarize students with some major contemporary substantive environmental problems and policies. These topics include air and water quality, public lands management, biodiversity, deforestation, climate change, and ozone depletion.

## R SOC 331 Applied Demography in

 Business and Government Spring. 3 credits. S-U with permission of instructor. Prerequisite: R SOC 213 or a statistics course.M W F 1:25. W. A. Brown.
An overview of the way demographic analysis is used in business and government. Through the use of case study and problem solving methods of learning, students come to understand how demographic concepts, methods, and data are used by demographers to solve problems in business and government. The course is designed for upper-level undergraduates from a variety of academic disciplines and career orientations. The course deals with the use of demographic analysis in politics and public administration, health services, recreation, marketing, housing, transportation, human resources, city and regional planning, and social services.

## R SOC 336 Rural Areas in Metropolitan

 SocietyFall. 3 credits. S-U grades optional. Prerequisite: a social science course. Offered alternate years.

T' R 12:20-1:35. D). L. Brown.
This course analyzes the changing structure and role of small towns and rural areas in developed nations. The focus is on rural adaptation to major trends including increased societal differentiation and complexity; increased societal interdependence, and rapid social, economic, technological, and ecological change. Alternative policies to ameliorate rural problems and/or enhance rural contributions to national development are considered.

## [R SOC 367 American Indian Tribal

 GovernmentsFall. 3 credits. Not offered 1994-95 W 7:30-9:55 p.m. Staff.]

R SOC 370 Comparative Issues in Social Stratification
Fall. 3 credits. Prerequisite: an introductory social science course

T R 1:25-2:40. T. A. Lyson or S. Feldman.

This course reviews both classicial and contemporary issues in the social stratification literature. Particular attention is given to two main themes: the changing configuration of the labor market and the contemporary debates on the "under class," the "middle class," and the "new class." Throughout the course attention is drawn to the importance of conceptual clarity, questions of measurement, and the changing salience of popular topics such as new social movements, the role of ideology and consciousness, and the role of gender, race, and ethnicity in assessments of inequality and hierarchy.

## R SOC 380 Independent Honors Research in Social Science

 Fall and spring. 1-6 credits. Limited to students who have met the requirements for the honors program. A maximum of 6 credits may be earned in the honors program. Staff.Students must submit written proposals by the third week of the semester of their senior year to the departmental honors committee representative, M. Pfeffer.

## R SOC 408 Human Fertility in Developing

 NationsSpring. 3 credits. S-U grades optional.
Offered alternate years
W 7:30-10:30 p.m. J. M. Stycos
A review of the major literature dealing with the social causation of variation in human fertility. Emphasis will be on international comparisons and on the methodology of field research.

## [R SOC 418 Population Policy

Spring. 3 credits. Prerequisite: R SOC 201 or permission of instructor. Offered alternate years. Not offered 1994-95.

T R 10:10-11:25. J. M. Stycos.]

## [R SOC 425 Gender Relations, Gender

 Ideologies, and Social Change Fall. 3 credits. Offered alternate years. Not offered 1994-95.R 1:55-4:25. S. Feldman.\}

## [R SOC 430 Migration and Population

 RedistributionFall. 3 credits. Offered alternate years. Not offered 1994-95

T R 8-9:55. D. L. Brown.]

## R SOC 431 Social Demography of

 MinoritiesSpring. 3 credits. S-U option
T R 12:20-1:35. D. T. Gurak.
Ethnic conflict and accomodation is examined in diverse settings (societies and historical periods). Demographic indicators (such as residential segregation, marital patterns, mortality and fertility differentials, and occupational mobility) of underlying social conditions serve as the principal vehicle for evaluating the status of ethnic relations

## R SOC 437 Aging: Issues and Social

 Policy in the 1990sFall. 3 credits. Prerequisite: R SOC 101 or its equivalent

T R 10:50-12:05. N. L. Glasgow
An analysis of the "graying" of America and the responses of the public and private sectors to this demographic revolution. Examines the interplay between basic and applied knowledge in social gerontology. Explores the formal and informal networks of services, in both rural and urban environments, that help maintain independent living arrangements by the elderly

## R SOC 438 Social Demography

Fall. 3 credits
T R 10:50-12:05. M. M. Kritz or D. T. Gurak

This course surveys the methods, theories, and problems of population studies. Attention is directed to the social, economic, and cultural determinants and consequences of population growth, distribution, and change The core areas of demography, fertility, mortality, and migration are studied. Comparisons are made between developed and developing areas and between Africa, Asia, and Latin America.

## [R SOC 439 Social and Demographic

 Changes in AsiaSpring. 3 credits. Prerequisite: R SOC 201 Offered alternate years. Not offered 1994-95 W 7:30 p.m. Staff.]

## R SOC 440 The Social Impact of

 Resource DevelopmentSpring. 3 credits. S-U grades optional. Offered alternate years.

W 7:00-10 p.m. C. G. Geisler. Social impact assessment (SIA) is a method of anticipating unwanted side-effects of projects, policies, and new technologies before they happen and a decision tool for mitigation. The seminar explores SIA applications in different parts of the world and pays particular attention to impacts on native and indigenous peoples. Students learn practical SIA skills and related theoretical/conceptual debates.

## R SOC 442 American Indian

Philosophies: Selected Topics
Spring. 3 credits. S-U grades optional Prerequisite: Permission of instructor.

Lec. T 1:25-4:25. R. W. Venables This course provides an opportunity for students to read and discuss a wide range of American Indian philosophies.

## IR SOC 475 Global Patterns of

 International MigrationFall. 3 credits. Prerequisite: R SOC 101
Offered alternate years. Not offered 1994-95 M W F 9:05-9:55. M. M. Kritz.]
[R SOC 490 Society and Survival
Fall. 3 credits. Prerequisite: introductory sociology course or permission of instructor Not offered 1994-95.

T R 2:30-3:45. D. T. Gurak.]
[R SOC 492 Contemporary Issues Seminars: Developments in the Pacific Rim
Spring. 1-2 credits. Not offered 1994-95 M 1:25-2:15. P. D. McMichael.]

R SOC 494 Special Topics in Rural Sociology
Fall or spring. 4 credits maximum.
S-U grades optional.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than wice under this number.

R SOC 495 Population, Environment, and Development in Sub-Saharan Africa
Fall. 3 credits
T R 2:30-4:00. M. M. Kritz.
The 47 countries of sub-Saharan Africa are experiencing rapid social change but serious economic, environmental, and social problems. This course will examine these trends by looking at their interrelations to demographic change. Both the traditional structures and the modernizing forces shaping sub-Saharan African development will be examined, and variations stemming from ethnic and colonial influences assessed. Family, and gender systems, education, urbanization, and demographic processes will be reviewed, as well as the role of state policy in affecting population, ecological and development change.

## R SOC 497 Individual Study in Rural Sociology

Fall or spring. 3 credits variable (may be repeated for credit). Students must register with an Independent Study form (available at 140 Roberts Hall). S-U grades optional. Staff.
Informal study may include a reading course, research experience, or public service experience

## [R SOC 603 Classical Sociological

 TheorySpring. 4 credits. S-U grades optional. Prerequisites: open to graduate students and undergraduates with permission of instructor. Not offered 1994-95.

TR 3:35-5:15. Staff.]
[R SOC 604 Theories of Social Change Spring. 3 credits. S-U grades optional. Not offered 1994-95

> T R 3:35-4:50. P. D. McMichael and S. Feldman.]

R SOC 606 Contemporary Sociological Theories of Development
Fall. 3 credits.
T R 3:35-5:20. F. W. Young
A survey of theory, empirical studies, and policy prescriptions as applied to communities and regions, especially those in lessdeveloped countries. The basic question of this survey is whether sociology can make an independent contribution to development theory. The several institutional-oriented answers to this question are critically examined against the currently dominant perspectives, fundamental and derived

## [R SOC 610 Population and

Development: Developed Nations
Fall. 3 credits. Open to graduate students, and undergraduates with permission of instructor. Not offered 1994-95.

W 1:25-4:25. D. L. Brown.]

## R SOC 618 Research Design I

Fall. 4 credits. Prerequisite: a statistics course. Offered alternate years.

T R 12:20-2:15. J. D. Francis. First of a two-semester sequence (may be taken individually) in introductory graduate methods. Discusses problems of measurement, the design of instruments, and problems of reliability and validity. Common forms of measuring instruments are discussed. Concludes with an introduction to factor analysis. Students apply principles to development of several common types of scales. Computers will be used extensively.

## R SOC 619 Research Design II

Spring. 4 credits. Prerequisite: an introductory methods course and a statistics course. Offered alternate years.

T R 12;20-2:25. J. D. Francis.
The second part of the two-semester sequence in introductory graduate methods deals with principles of design, especially non-experimental designs, with emphasis on an intermediate-level treatment of the following topics: regression, analysis of variance, analysis of covariance. Special emphasis is given to use of categorical variables in regression. Students develop and examine several analytical models using actual data to familiarize themselves with data handling and processing. Extensive use of computers.
[R SOC 625 State, Economy, and Society
Fall. 3 credits. Offered alternate years. Not
offered 1994-95.
W 1:25-3:55. P. D. McMichael.]

## R SOC 630 Field Research Methods and Strategies

Fall. 3 credits.
T R 8:30-9:55 a.m. L. B. Williams. Course will cover a variety of methods: structured surveys, focus groups, in-depth interviews, participant observation, archival record analysis, among others. Frameworks by which research questions can be matched with appropriate field methodologies, choice of sample, data collection, etc., will be discussed. Assessment of strengths and weakness of various strategies of field research. Discussion of practical matters such as fieldworker recruitment and training, and data processing issues and ethnics of field work.

## [R SOC 640 Community and Changing

 Property InstitutionsFall. 3 credits. Not offered 1994-95. R 2:30-5:00. C. C. Geisler.]
[R SOC 641 Politics and Economics of Rural and Regional Development
Fall. 3 credits. Limited to upperclass or graduate students. S-U grades optional. Offered alternate years. Not offered 1994-95. M 12:20-2:50. T. A. Lyson.]

## [R SOC 642 Regional Systems and Policy

 AnalysisSpring. 3 credits. Prerequisites: a social or economic theory course and statistics, or permission of instructor. S-U grades optional. Not offered 1994-95.

F 2:20-4:30; disc to be arranged. P. R. Eberts.]

R SOC 643 Land Reform Old and New
Spring. 3 credits. Offered alternate years. S-U grades optional.

R 2:30-5. C. C. Geisler.
Land reform continues to be a major cornerstone of development planning. Between 1980 and 2000 the number of landless and near-landless in the Third World will approach one billion. Though land reform is a principal source of hope for the landless, its meanings are many and its models are controversial. The seminar acquaints students with land reform in antiquity as well as in contemporary settings (among others, Japan, the Philippines, Israel, India, Brazil, Mexico, Russia, and the United States). Perennial issues of equity, efficiency, and sustainability will be discussed in each of these case study areas.

## [R SOC 645 Rural Economy and Society

Fall. 3 credits. Offered alternate years. Not offered 1994-95.

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\text { W } 7: 30-10 \text { p.m. S. Feldman.] }
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## R SOC 655 Advanced Techniques of

 Demographic AnalysisSpring. 3 credits. Prerequisites: R SOC 481 or CEH 438, graduate standing or permission of instructor.

T R 4:00-5:30. D. T. Gurak.
An examination of analytical techniques that assumes a basic knowledge of demographic data and research methodology. Life tables, demographic estimates with incomplete data, survey techniques to supplement inadequate vital registration systems, data management, multi-level models, and other multivariate procedures are among the topics to be covered.
[R SOC 660 Social Analysis of Ecological Change
Fall. 3 credits. Prerequisite: graduate standing. Not offered 1994-95.

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\mathrm{T} 7-10: 20 \text { p.m. P. Taylor.] }
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## [R SOC 661 Sustainable Agriculture and

 DevelopmentFall. 3 credits. S-U grades optional. Prerequisites: graduate standing or instructor's permission. Not offered 1994-95. W 1:25-4:25. T. A. Lyson.]

## R SOC 694 Special Topics in Rural

 SociologyFall or spring. 4 credits maximum. S-U grades optional.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number will be approved by the department curriculum committee, and the same course will not be offered more than twice under this number.

## R SOC 715 Comparative Research

 MethodsFall. 3 credits. Offered alternate years. M 12:20-2:50. T. A. Lyson.
This seminar focuses on the comparative method in the social sciences. The logic of comparative inquiry forms the substantive base of the course. Topics include crossnational and cross-regional research design and an analysis of the comparative case study approach. Illustrations of the comparative research approach will cover a range of data types and problems.

## [R SOC 718 Multidimensional

 Measurement and Classification Fall. 4 credits. Prerequisite: previous course work in scaling and statistics. Offered alternate years. Not offered 1994-95.T R 12:20-2:15. J. D. Francis.]

## [R SOC 719 Advanced Research Topics

Spring. 4 credits. Prerequisites: two courses in statistics and one in methods. Offered alternate years. Not offered 1994-95.

T R 12:20-2:15. J. D. Francis.]
R SOC 721 Sociology of Environment and Development
Spring. 3 credits.
M 12:20-2:50. M. J. Pfeffer.
This course examines society/environment relations in the contemporary environmental discourse and in sociology. Students evaluate such topics as sustainability, science and ethics, and the definition of nature. The central objective is to evaluate sociological theories' treatment of the problems of environmentalism. Subsidiary objectives include the identification of key sociological issues in contemporary environmentalism, and review of environmental themes in sociological theory

## [R SOC 723 Social Movements in

 Agrarian SocietySpring. 3 credits. Offered altemate years. Not offered 1994-95.

W 1:25-4. F. W. Young.]

## [ A SOC 725 The Sociology of "Third

 World" StatesSpring. 3 credits. Offered alternate years. Not offered 1994-95.

W 1:25-3:55. S. Feldman.]
R SOC 730 Sociology of the World Economy
Spring. 3 credits. S-U grades optional Offered alternate years.

W 1:25-3:55. P. D. McMichael. Analyses of social change and development are increasingly sensitive to global context, including the sociology of the world economy as a multi-layered entity, anchored in an evolving division of world labor and interstate system. The analysis of transnational economic and cultural processes (such as food regimes, commodity chains, and international labor complexes), has substantive and methodological dimensions, considering a variety of levels and kinds of analysis of global processes. This includes global theories (and their limits), and methods of situating local processes within their worldhistorical context.

## [R SOC 741 Community Development

 and Local ControlSpring. 3 credits. Offered alternate years. Not offered 1994-95.

W 1:25-3:55. C. C. Geisler.]
[R SOC 751 Applications of Sociology to Development Programs
Spring. 3 credits. Offered alternate years. Not offered 1994-95.

W F 10:10. E. C. Erickson.]

## R SOC 771 Special Seminar

Fall or spring. Credit to be arranged. Limited to graduate students; others by permission of instructor.

## R SOC 791 Teaching Experience

Fall or spring. 1-3 credits. Limited to graduate students. S-U grades only Staff.
Participation in the ongoing teaching program of the department.

## R SOC 792 Public Service Experience

Fall or spring. Credit to be arranged. Limited to graduate students. S-U grades optional. Staff.
Participation in the ongoing public service activities of the department.

## R SOC 871-874 Informal Study

Fall or spring. Credit to be arranged. Limited to master's and doctoral degree candidates with permission of the graduate field member concerned. S-U grades optional.

## R SOC 871 Rural Sociology

R SOC 872 Development Sociology
R SOC 873 Organization Behavior and Social Action

R SOC 874 Methods of Sociological Research

## R SOC 881 Research

Fall or spring. Credit to be arranged. Limited to master's and doctoral degree candidates with permission of the graduate field member concerned. S-U grades optional.

## Related Courses in Other Departments

Introduction to Sociology (SOC 101)
Population Dynamics (SOC 205)
Gender and Society (WOMNS 206)
Environment and Society (S\&TS 324)
Social Analysis of Ecological Change (S\&TS 660)

Sociology of Environment and Development (S\&TS 721)

## SOIL, CROP, AND ATMOSPHERIC SCIENCES

R. J. Wagenet, chair; M. Alexander,
P. C. Baveye, D. R. Bouldin, R. B. Bryant,
J. H. Cherney, S. J. Colucci, K. H. Cook,
W. J. Cox, S. D. DeGloria, J. D. DiTomaso,
J. M. Duxbury, G. W. Fick, D. L. Grunes, R. R. Hahn, J. L. Hutson, S. D. Klausner, W. W. Knapp, L. V. Kochian, T. A. LaRue, R. F. Lucey, M. B. McBride, J. Mt. Pleasant, R. L. Obendorf, W. D. Pardee, J. H. Peverly, W. S. Reid, S. J. Riha, T. W. Scott, T. L. Setter, P. L. Steponkus, H. M. van Es,
A. Van Wambeke, R. M. Welch, D. S. Wilks,
M. W. Wysocki, R. W. Zobel

## Courses by Subject

Atmospheric Science: 131, 231, 250, 334, 342, $343,352,353,357,435,444,446,448,451$, 456, 652, 692, 791, 859, 959
Crop Science: $311,312,314,315,317,608$, $610,612,613,614,642,690,691,829,929$
Remote Sensing: 461, 660
Soil Science: $260,321,362,363,364,365,371$, $372,373,385,471,473,483,663,666,667$, $669,671,675,681,693,889,989$

## General Courses

SCAS 190 Sustainable Agriculture
Fall. 2 credits. Limited to 60 students. S-U grades optional.

Lec, R 9:05; labs, M 2:00-4:25,
T 10:10-12:35. T. W. Scott, G. W. Fick This course is designed to be an enjoyable introduction to basic food production resources (soils, crops, and climates), and it emphasizes management concepts that conserve or renew those resources for continuing benefit to society. Presentations are targeted for non-majors and students new to the field and cover information of general value. Laboratories include several field trips and stress hands-on experience with soils, crops, and descriptive climatology. The laboratory is required.

## SCAS 494 Special Topics in Soil, Crop and Atmospheric Sciences <br> (undergraduate level)

Fall or spring. 4 credits maximum.
S-U grades optional.
Hours to be arranged. Staff.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number are approved by the department curriculum committee, and the same course is not offered more than twice under this number.

## SCAS 497 Individual Study in Soil, Crop, and Atmospheric Sciences

Fall or spring. 1-6 credits. S-U grades optional. Students must register with an Independent Study form (available in 140 Roberts Hall).

Hours to be arranged. Staff.
The topics in soil science or crop science or atmospheric science are arranged at the beginning of the term for individual study or for group discussions.

## SCAS 498 Teaching Experience in Soil

 Science, Crop Science, and Atmospheric ScienceFall or spring. $1-5$ credits. Students must register with an Independent Study form (available in 140 Roberts Hall). S-U grades optional.
Teaching experience in soil science, crop science, or atmospheric science is obtained by assisting in the instruction of a departmental course.

## SCAS 499 Undergraduate Research

Fall or spring. Credit to be arranged. Students must register with an Independent Study form (available in 140 Roberts Hall). Hours to be arranged. Staff. Independent research on current problems selected from any phase of crop science, atmospheric science, or soil science.

## SCAS 694 Special Topics in Soil, Crop

 and Atmospheric Sciences (graduate level)Fall or spring. 4 credits maximum. S-U grades optional.

Hours to be arranged. Staff.
The department teaches "trial" courses under this number. Offerings vary by semester, and will be advertised by the department. Courses offered under the number are approved by the department curriculum committee, and the same course is not offered more than twice under this number.

SCAS 695 Planning and Reporting Research
Fall. 2 credits. Prerequisite: graduate student status or permission of the instructor. Limited to 10 students.

Lec to be arranged. G. W. Fick
This course is designed to prepare students in the SCAS Department and closely related fields for planning their graduate research and reporting research results. Emphasis is given to literature reviews, scientific writing and reviewing (either thesis proposals, grant proposals, or manuscripts for publication), and slide and poster presentations. Students are expected to work closely with their major professor as well as the instructor of the course.

## Atmospheric Science

SCAS 131 Basic Principles of Meteorology
Fall. 3 credits.
Lecs, T R 11:15; lab, T W or R 1:25-4:25 and $M$ W 7:00-9:30 p.m.
M. W. Wysocki.

A simplified treatment of the structure of the atmosphere: heat balance of the earth; general and secondary circulations; air masses, fronts, and cyclones; and hurricanes, thunderstorms, tornadoes, and atmospheric condensation. In the laboratory, emphasis is on techniques of analysis of weather systems.

SCAS 231 Climate and Climate Change: Introduction to Climatology
Fall. 3 credits. Prerequisite: SCAS 131 or instructor's approval.

Lecs M W F 11:15. K. H. Cook.
Study of the features of today's climate, including a discussion of the processes that maintain the observed atmospheric circulation, moisture, and temperature distributions.
Investigation of past climates and a survey of current climate change issues.

SCAS 250 Meteorological Observations and Instruments
Spring. 3 credits. Prerequisite: SCAS 131 Lecs, M W 12:20; lab, W 1:25-3:20. M. W. Wysocki.

Methods and principles of meteorological measurements and observations, including surface, free-air, and remote systems. Instrument siting, mounting, and protection. Instrument response characteristics, calibration, and standardization. Recorders and datalogging systems. Laboratory exercises in observation and data analysis. Intended to serve as preparation for Observers Examination. Lab fee, $\$ 45$.

## SCAS 334 Microclimatology

Spring. 3 credits. Recommended: a course in physics.
T R 10:10-11:25. D. S. Wilks.

The relationships of radiant energy, temperature, wind, and moisture in the atmosphere near the ground. The interplay between physical processes of the atmosphere, plant canopies, and soil is examined, with emphasis on the energy balance.
[SCAS 342 Theoretical Meteorology I Fall. 3 credits. Prerequisites: one year of calculus and one semester of physics. Not offered 1994-95.

M W F 10:10. W. W. Knapp.
Introduction to the thermodynamics and hydrostatics of the atmosphere and to the methods of description and quantitative analysis used in meteorology. Topics covered
include thermodynamic processes of dry air. water vapor and moist air, and concepts of hydrostatics and stability.!

## SCAS 343 Theoretical Meteorology II

Spring. 3 credits. Prerequisites; one year each of calculus and physics.

M W F 10:10. W. W. Knapp. Introduction to atmospheric dynamics and to the methods of description and quantitative analysis used in meteorology. Topics considered include equations of atmospheric motion, motion in the free atmosphere, vertical variations of wind and pressure fields, mathematical representation and characteristics of fronts, mechanisms of pressure change, concepts of circulation and vorticity, and effects of friction on atmospheric motion.
SCAS 352 Synoptic Meteorology I
Spring. 3 credits. Prerequisites: SCAS 342 and concurrent enrollment in SCAS 343. Lecs, T R 9:05; lab, M 1:25-3:20. M. W. Wysocki.

Weather map analysis and forecasting techniques are studied by applying the principles of fluid and heat flow. This course will strengthen previously introduced meteorological concepts that will be applied to forecasting mid-latitude synoptic scale weather systems, such as cyclones, anticyclones, jet streams, fronts, and waves.

## SCAS 353 Application of Fortran in

 MeteorologyFall. 3 credits. Prerequisites: SCAS 131 plus one computer programming course. Lec, T R 12:20-1:10; lab, F 1:25-3:20. M. W. Wysocki.

An introduction to numerical techniques using Fortran to solve meteorological problems. No previous experience with Fortran is expected.

## SCAS 357 Atmospheric Air Pollution

Fall. 3 credits. Prerequisites: SCAS 342 and one semester of chemistry or permission of instructor. Offered alternate years.

M W F 11:15-12:05. M. W. Wysocki. Course will examine sources, effects, transport, measurement, and controls of air pollution. The basic principles in each area will be discussed with an emphasis on their local, regional, and global impacts.

## SCAS 435 Statistical Methods in

 MeteorologyFall. 3 credits. Prerequisite: an introductory course in statistics (e g., BTRY 215 or AG EC 310) and calculus.

T R 10:10-11:25. D. S. Wilks.
Statistical methods used in climatology, operational weather forecasting, and selected meteorological research applications. Some statistical characteristics of meteorological data, including probability distributions, intercorrelations, and persistence. Operational forecasts derived from multiple regression models, including the MOS system. Forecast verification techniques and scoring rules. Time series analysis, EOFs, and other research topics as time permits.

## SCAS 444 Tropical Meteorology

Spring. 3 credits. Prerequisites: SCAS 343 or instructor's approval. Offered alternate years. M W F 11:15-12:05. K. H. Cook. Structure and dynamics of the tropical atmosphere on a wide range of time and space scales ranging from meso-scale convective systems to planetary waves. Topics include hurricanes, monsoonal circulation, and El Nino.

## [SCAS 446 Atmospheric Modeling

Spring. 3 credits. Prerequisites: SCAS 343, 451 or instructor's approval. Offered alternate years. Not offered 1994-95.

M W F 11:15-12:05. K. H. Cook. Numerical models of the atmosphere, including simple climate, general circulation, and numerical weather prediction models. We will focus on choosing a set of governing equations for a particular application and translating that system into a diagnostic or predictive model.]

## [SCAS 448 Physical Meteorology

Fall. 3 credits. Prerequisites: a year each of calculus and physics. Offered alternate years. Not offered 1994-95.

M W F 11:15. W. W. Knapp.
Primarily a survey of natural phenomena of the atmosphere, with emphasis on their underlying physical principles. Topics include composition and structure of the atmosphere, atmospheric optics, acoustics and electricity, solar and terrestrial radiation, and principles of radar probing of the atmosphere.]

## SCAS 451 Synoptic Meteorology II

Fall. 3 credits. Prerequisite: SCAS 352 or permission of instructor.

Lecs, T R 9:05; lab, M 1:25-3:20. S. J. Colucci.

Advanced topics in synoptic meteorology, such as behavior of midlatitude weather systems, fronts and jets, and precipitationproducing structures.

## [SCAS 456 Mesoscale Meteorology

Spring. 3 credits. Prerequisite: SCAS 451 or permission of instructor. Offered alternate years. Not offered 1994-95.

M W F 12:20-1:10. S. J. Colucci. Structure and dynamics of mid-latitude mesoscale weather systems such as squall lines, convective complexes, precipitation bands, downslope windstorms, mountain breezes, sea breeze circulations, and lake effect snowstorms.]

## SCAS 652 Atmospheric Dynamics

Spring. 3 credits. Prerequisites: SCAS 451 or permission of instructor. Offered alternate years.

T R 12:20-1:35. S. J. Colucci. Advanced topics in theoretical meteorology such as atmospheric waves, hydrodynamic instability, the general circulation of the atmosphere, and middle atmosphere dynamics.

## SCAS 692 Special Topics in Atmospheric

 SciencesFall or spring. 1-6 credits. S-U grades optional.

Hours to be arranged. Staff
Study of topics in atmospheric science that are more specialized or different from other courses. Special topics to be covered will depend on staff and student interests.

## SCAS 791 Meteorology Seminar

Fall or spring. Prerequisite: permission of instructor.

Hours to be announced. Staff.
Subjects such as weather modification, paleoclimatology, and atmospheric pollution

## SCAS 859 Master's Level Thesis

Research in Meteorology
Fall or spring. Credit by arrangement. Limited to students in the graduate field. S-U grades optional.

Hours by arrangement.

## SCAS 959 Doctoral-Level Thesis

 Research in MeteorologyFall or spring. Credit by arrangement. Limited to students in the graduate field.
S-U grades optional.
Hours by arrangement.

## Crop Science

## SCAS 311 Grain Crops

Fall. 4 credits. Prerequisite: SCAS 260 or BIOPL 241

Lecs, M W F 10:10; lab, M or T 1:25-4:25. 1 or 2 field trips during lab periods (until 5 p.m. or on weekends). R. L. Obendorf

Principles of field-crop growth, development and maturation, species recognition, soil and climatic adaptations, liming and mineral nutrition, weed control, cropping sequences, management systems, and crop improvement are considered. Grain, protein, fiber, and sugar crops are emphasized.

## SCAS 312 Forage Crops

Spring. 4 credits. Prerequisites: SCAS 260 or BIOPL 241 or equivalent. Recommended: AN SC 212.

$$
\begin{aligned}
& \text { Lecs, M W F 11:15; lab, M or T } \\
& 1: 25-4: 25 \text {. G. W. Fick. }
\end{aligned}
$$

The production and management of crops used for livestock feed are considered in terms of establishment, growth, maintenance, harvesting, and preservation. Forage grasses, forage legumes, and corn are emphasized, and consideration is given to their value as livestock feed in terms of energy, protein, and other nutritional components.
[SCAS 314 Production of Tropical Crops
Spring. 3 credits. Prerequisite: a course in tropical crop production. Not offered 1994 95.

Lecs, M W F 10:10. Staff.
An introduction to the characteristics and culture of the principal food staple crops of the tropics and subtropics and of some of the crops grown for export. Vegetables and fruits are not emphasized.)

## SCAS 315 Weed Science

Fall. 3 credits. Prerequisite: introductory course in biology or botany.

Lecs, T R 9:05; lab, M, T, or W 2-4:25.

## J. M. DiTomaso.

Principles of weed science are examined. Emphasis is on (a) weed ecology,
(b) chemistry of herbicides in relation to effects on the environment and plant growth, and (c) control of weeds in crops. Laboratory covers weed identification and ecology, herbicide selectivity, symptomology, and behavior in soil.

## [SCAS 317 Seed Science and

 TechnologyFall. 3 credits. Prerequisite: BIOlL 241 or equivalent. Offered alternate years. Not offered 1994-95.

Lecs, T R 11:15; lab R 1:25-4:25; 2 all-
day field trips will be scheduled during
the semester. A. G. Taylor, Geneva
Experiment Station (Ithaca contact,
R. L. Obendorf).

The principles and practices involved in the production, harvesting, processing, storage, testing, quality management, certification, and use of high-quality seed from improved cultivars. Information is applicable to various kinds of agricultural seeds.]

## SCAS 608 Water Status in Plants and

 SoilsFall. 1 credit. Prerequisite: permission of instructor. S-U grades only. Offered alternate years.

Lec, 1 hour to be arranged; lab, R 1:25-4:25 or as arranged. T. L. Setter Techniques for field appraisal of the status of water in plants and soil, including methods used in physiological studies, such as the psychrometer, pressure chamber, gas exchange analyzer, and abscisic acid analysis with ELISA

## [SCAS 610 Physiology of Environmenta Stresses

Spring. 3 credits. Prerequisite: BIOPL 242 or 341. Offered alternate years. Not offered 1994-95.

Lecs, T R 10:10-11:25. P. L. Steponkus. A study of the responses of plants to environmental stresses, with emphasis on thermal stresses including chilling, freezing, and high temperature injury. Emphasis is on the physiological and biochemical basis of injury and plant resistance mechanisms at the whole-plant, cellular, and molecular levels.]

## SCAS 612 Seed Physiology

Spring. 3 credits. Prerequisite: plant physiology.

T R 8:30-9:55. R. L. Obendorf
Morphology, physiology, and biochemistry of cereal, legume, and oil-seed formation, composition, storage, and germination. Emphasis is on the deposition of seed reserves during seed formation, stabilization of reserves during storage, and mobilization of reserves during germination. Topics range from onfarm problems to molecular mechanisms.

## SCAS 613 Physiology and Ecology of

 YieldSpring. 3 credits. Prerequisite: plant physiology.

M W F 12:20. T. L. Setter
A study of the constraints on crop productivity from a physiological perspective. Influence of environment and genetics on the assimilation, translocation, and partitioning of carbon and nitrogen during crop ontogeny. Emphasis on growth processes of vegetative plant organs.

## SCAS 614 Research Methods in Weed

 PhysiologySpring. 2 credits. Prerequisite: SCAS 315 or equivalent. Offered alternate years.

Labs to be arranged. J. M. DiTomaso Examination of a variety of modern techniques used to study herbicide absorption, translocation, metabolism, mode of action, and mechanism of resistance. Experiments will also be designed to study herbicide behavior and detection in soils. Laboratories will be accompanied by short lectures pertinent to experimental topics.

## SCAS 642 Plant Mineral Nutrition (also BIOPL 642)

Spring. 3 credits. Prerequisite: BIOPL 341 or equivalent. Offered alternate years.

Lecs, M W F 10:10-11. L. V. Kochian, R. M. Welch.

A detailed study of the processes by which plants acquire and utilize mineral nutrients from the soil. Topics will include the uptake, translocation, and compartmentation of mineral elements; root-soil interactions; metabolism of mineral elements; the involvement of mineral nutrients in various physiological processes; and nutrition of plants adapted to extreme environmental stresses (e.g., acid soils). Specific mineral elements
will be emphasized to illustrate the above topics.

SCAS 690 Root-Soil Interactions
Fall or spring. 1-2 credits. S-U grades optional.

Hours to be arranged. R. W. Zobel A topic dealing with root-soil interaction will be selected during the first meeting of the term. Students will prepare one or two seminars based on published work on the topic. Possible topics include root genetics, root morphology, conservation tillage, and soil temperature.

## SCAS 691 Special Topics in Crop

 ScienceFall or spring. $1-6$ credits. S-U grades optional.

Hours to be arranged. Staff.
Study of topics in crop science that are more specialized or different from other courses. Special topics to be offered will depend on staff and student interests

SCAS 829 Master's-Level Thesis Research in Crop Science
Fall or spring. Credit by arrangement Limited to students in the graduate field. S-U grades optional

Hours by arrangement.
SCAS 929 Doctoral-Level Thesis Research in Crop Science
Fall or spring. Credit by arrangement. Limited to students in the graduate field S-U grades optional. Hours by arrangement.

## Remote Sensing

[SCAS 461 Remote Sensing: Environmental Applications (also Civil and Environmental Engineering 411)

Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95. Lees, T R 10:10; lab, T 2:30-4:25 (a second lab sec will be scheduled if more than 15 students register). A survey of how remote sensing is applied in various environmental disciplines. Laboratory emphasis is on using aircraft and satellite imagery for inventorying and monitoring surface features in engineering, planning, agriculture, and natural resource assessments.]

## SCAS 660 Remote Sensing Fundamentals (also Civil and Environmental Engineering 610)

Fall. 3 credits. Prerequisite: permission of instructor.

Lecs, T R 10:10; lab), T 2:30-4:25. W. I). Philpot.

An introduction to equipment and methods used in obtaining information about earth resources and the environment from aircraft or satellite. Coverage includes sensors, sensor and ground-data acquisition, data analysis and interpretation, and project design.

## Soil Science

SCAS 260 Introduction to Soil Science Spring. 4 credits. Prerequisite: CHEM 103, 207 or 215 . S-U grades optional Lecs, M W F 9:05; lab, M T W or R 1:25 R. B. Bryant.

A comprehensive introduction to the field of soil science, with emphasis on scientific principles and their application to solving soil management problems. The laboratory exercises stress quantitative measurement of soil properties.

SCAS 321 Soil and Water Management Spring. 2 credits. Prerequisites: SCAS 190 or 260. Concurrent registration in ABEN 321 required. S-U grades optional.

Lec, M W 9:05; disc, M 1:25-4:25.
T. W. Scott, M. F. Walter.

An interdisciplinary course intended to introduce students to the general principles of soil and water interaction and to the effects of human intervention in these processes. Aspects of soil and water management, including hydrology, soil erosion, irrigation, drainage, and water quality are examined. Case studies from both the United States and the tropics are used to illustrate basic principles

## SCAS 362 Soil Morphology

Fall. 1 credit. Undergraduates only Recommended for sophomores and juniors. R 1:25-4:25; all-day field trip required. R. B. Bryant, J. M. Galloraith.

The principles for field identification of soil properties, profiles, and landscapes are presented. A series of soil pits are examined, described, classified, and interpreted in the field
SCAS 363 Intermediate Soil Science I: Genesis, Classification, and Survey Fall, weeks 1-7. 2 credits. I'rerequisite: SCAS 260.

Lecs, M W F 10:10; lab, W 1:25-4:25 One all-day field trip is required. R. B. Bryant.

Factors and processes of soil formation. Principles of field identification, classification, survey, and interpretation. Laboratory exercises and field trips provide practical training in soil morphology and landscape relations. Course ends at mid-semester and is part of a sequence of three Intermediate Soil Science courses.
[SCAS 364 Intermediate Soil Science II: Physics
Fall, weeks 8-14. 2 credits. Prerequisites SCAS 260, one year of calculus and consent of instructor. Not offered 1994-95.

Lecs, M W F 10:10; lab, W 1:25-4:25 P. Baveye.

Description and measurement of the status of water in soils. Theory of water, solute, and heat transport. Infiltration, drainage, and redistribution. Weekly laboratory and problem-solving sessions illustrate the concepts introduced in class. Course starts at mid-semester and is part of a sequence of three intermediate Soil Science courses.]

SCAS 365 Intermediate Soil Science III: Chemistry and Microbiology
Spring. 3 credits. Prerequisite: SCAS 260. T R 10:10-11:30. M. McBride and M. Alexander.

The chemical properties and microorganisms of soil and the chemical reactions and transformations occurring in soil. This course is part of a sequence of three intermediate Soil Science courses.

## SCAS 371 Hydrology and the

 Environment (also Agricultural and Biological Engineering 371, and Geological Sciences 204)Spring. 3 credits. Students enrolled in the statutory colleges must enroll in ABEN 371 or SCAS 371. Prerequisite: 1 course in calculus. Lecs, T R 9:05; lab, F 1:25-3:20. T. S. Steenhuis, J.-Y. Parlange, M. F. Walter, L. M. Cathles.

Introduction to hydrology as a description of the hydrologic cycle and the role of water and
chemicals in the natural environment. Includes precipitation, infiltration, evapotranspiration, groundwater, surface runoff, river meandering floods, and droughts. Case studies, shor field trips, computer programs, and laboratories are used to foster an understanding of concepts and principles of hydrologic processes.
SCAS 372 Soil Fertility Management Fall. 3 credits. Prerequisite: SCAS 260 or permission of instructor.

M W F 9:05. D. R. Bouldin
An integrated discussion of soil crop yield relationships, with emphasis on the soil as a source of mineral nutrients for crops and the role of fertilizers and manure in crop production.

## SCAS 373 Soil, Water, and Aquatic

 PlantsFall. 3 credits. Prerequisites: SCAS 260, BIO G 101-102, and CHEM 103-104 or equivalents.

> Lec, T R 11:15; lab, R 1:25-4:25. J. H. Peverly.

The success or failure of soil and water management is manifested in streams, wetlands, lakes, and aquifers. Chemical and biological changes downstream are studied and related to agricultural management techniques upstream. Basic chemical and physiological processes are presented and used to suggest appropriate responses to water management problems.

## SCAS 385 Biogeochemical Cycles,

 Agriculture, and the Environment Spring. 2 credits. Prerequisites: CHEM 103 or 207 and SCAS 260 or equivalent.Lecs, T R 11:15-12:05. J. M. Duxbury
The impact of agriculture on aspects of the global biogeochemical cycles of carbon, nitrogen, sulfur, and phosphorus is discussed and illustrated with current agricultural and environmental issues. Topics include sustainable agriculture, effects of nitrogen fixation, acid rain, global warming, and land disposal of wastes.

## SCAS 471 Properties and Appraisal of

 Soils of the TropicsSpring. 3 credits. Prerequisite: SCAS 260 or equivalent. S-U grades optional. No audits accepted. Offered altemate years.
Lecs, T R 12:20; disc, W 1:25-3:25.
A. Van Wambeke.

The course examines the conditions in which soils form, and considers ecological, geological and vegetational factors that produce the diversify that exists among them. The major kinds of soils are recognized, their management properties described, and methods to alleviate the constraints to crop production examined. Topics include the identification of soils, and their functions in sustaining traditional farming systems and advanced technological packages. The course pursues these themes reviewing the most recent sources of information generated in tropical countries and published in Latin-American, Francophone, and English journals. The last part of the course gives special attention to salt-affected soils, paddy rice cultivation and the characteristics of acid-sulfate soils.

## SCAS 473 Ecology of Agricultural Systems (also BIOES 473)

Fall. 3 credits. Limited to 45 students. Prerequisite: BIOES 261 or permission of instructor. S-U grades optional. Offered alternate years.

Lec and disc, T R 2:30-3:45. During the first 6 weeks of class the Thursday meetings may run to $5: 00$ because of field trips. A. G. Power and staff. Analysis of the ecological processes operating in agricultural systems, with an emphasis on the interactions between organisms. Topics include nutrient dynamics in agroecosystems, plant competition and facilitation, intercropping, the ecology of species invasions, mutualism in agroecosystems, plant-herbivore relations, plant-pathogen interactions, biological pest control, and evolutionary processes in agriculture. Case studies from both the tropics and the temperate zone are used to illustrate important concepts.
[SCAS 483 Environmental Biophysics Fall. 3 credits. Prerequisite: SCAS 260 or equivalent or permission of instructor. Not offered 1994-95.

Lecs, M W F 11:15. S. J. Riha.
Introduction to basic principles of energy and water transfer and storage in soil-plant systems. Energy budgets, soil heat flow, water movement in saturated and unsaturated soils, evapotranspiration, and water dynamics in the soil-plant-atmosphere continuum will be covered. Applications to agronomic and environmental problems and instrument design and use are considered through discussion and problems sets.)

## SCAS 663 Pedology

Spring. 3 credits. Prerequisite: SCAS 361 or permission of instructor. Textbook recommended, not required. Offered alternate years.

Hours to be arranged. R. B. Bryant. Weathering, reactions, and processes of soil genesis. Principles of soil classification and the rationale and utilization of soil taxonomy. Development and significance of major groups of soils of the world.
SCAS 666 Advanced Soil Microbiology
Fall. 1 credit. Prerequisite: SCAS 476 or permission of instructor. S-U grades only for graduate students.

T 12:20. M. Alexander.
Discussions of current topics in special areas of soil microbiology. Particular attention is given to biochemical problems in microbial ecology.

## [SCAS 667 Advanced Soil Physics

Spring. 3 credits. Prerequisites: One year of college physics and SCAS 483 or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

Hours to be arranged. P. Baveye. A detailed study of measurement processes and of the hydrostatics of aqueous solutions in soils and porous media, with emphasis on fundamental principles. Examination of the molecular aspects of water-solid interactions, including shrink-swell phenomena and the properties of absorbed water. Analysis of equilibrium water adsorption from thermodynamical and mechanistic (molecular) standpoints. Mechanical and thermodynamical analysis of the equilibrium status of aqueous solutions in deformable soils. Formal lectures are complemented by tutorial sessions.]

SCAS 669 Organic Matter-Soils, Sediments, and Waters
Spring. 2 or 3 (with discussion) credits. Prerequisites: SCAS 260 and CHEM 357-358 or equivalent.

T R 9:05; disc W 1:25-2:15.
J. M. Duxbury.

A discussion of current concepts on the chemical nature, dynamics, and properties of natural organics and organo-mineral associations in terrestrial and aquatic environments. Interaction with anthropogenic organics and effects of anthropogenic activities on natural organics are considered.

## [SCAS 671 Soil Chemistry

Fall. 3 credits. Prerequisite: one year of physical chemistry or permission of instructor. Offered alternate years. Not offered 1994-95. Lecs, M W F 11:15. M. B. McBride. A detailed examination of the structure and surface chemistry of minerals common to soils. Ion exchange, mineral-solution equilibria, and adsorption reactions of silicate clays and oxides will be emphasized.)

## SCAS 675 Modeling the Soil-Plant-

 Atmosphere SystemSpring. 3 credits. Prerequisite: SCAS 483 or equivalent and COM S 100 or equivalent. Offered alternate years.

Lecs, T R 1:25-2:45. J. L. Hutson, S. J. Riha.

Derivation of dynamic simulation models of soil-plant-atmosphere systems and their application. Models will include water, plant nutrients, and pesticide transport and their interaction with soil and plants. Students will develop their own models and apply existing models to environmental and plant production problems.

## SCAS 681 Soil Physics Research Seminar

Fall. 1 credit. Open to graduate students. To be arranged. P. Baveye, J. Hutson, H. van Es.

Discussions of current topics in special areas of soil physics and presentation of research carried out by participants.
SCAS 693 Special Topics in Soil Science Fall or spring. $1-6$ credits. S-U grades optional.

Hours to be arranged. Staff.
Study of topics in soil science that are more specialized or different from other courses. Special topics to be covered will depend on staff and student interests.

## SCAS 889 Master's-Level Thesis

 Research in Soil ScienceFall or spring. Credit by arrangement. Limited to students in the graduate field. S-U grades optional.

Hours by arrangement.

## SCAS 989 Doctoral-Level Thesis Research in Soil Science

Fall or spring. Credit by arrangement. Limited to students in the graduate field. S-U grades optional.

Hours by arrangement.
Courses in "Remote Sensing" are also listed under the Department of Civil and Environmental Engineering in the College of Engineering.

## VEGETABLE CROPS

See Horticultural Sciences.

## FACULTY ROSTER

Abawi, George S., Ph_D., Cornell U. Prof., Plant Pathology (Geneva)
Acree, Terry E., Ph.D., Cornell U. Prof., Food Science, and Technology (Geneva)
Adleman, Marvin l., M. L. A., Harvard U. Prof., Landscape Architecture
Agnello, Arthur M., Ph.D., North Carolina State U. Assoc. Prof., Entomology (Geneva)

Aist, James R., Ph.D., U. of Wisconsin. Prof. Plant Pathology
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Thonney, Michael L., Ph.D., U. of Minnesota. Prof., Animal Science
Thurston, H. David, Ph.D., U. of Minnesota. Prof., Plant Pathology
Timmons, Michael B., Ph.D., Comell U. Prof., Agricultural and Biological Engineering
Tingey, Ward M., Ph.D., U. of Arizona. Prof., Entomology
Tomek, William G., Ph.D., U. of Minnesota. Prof., Agricultural, Resource, and Managerial Economics
Topoleski, Leonard D., Ph.D., Purdue U. Prof., Fruit and Vegetable Science
Trancik, Roger T., M.L.A., Harvard U. Prof., Landscape Architecture
Trowbridge, Peter J., M.L.A., Harvard U. Prof., Landscape Architecture
Trumbull, Deborah J., Ph.D., U. of Illinois. Assoc. Prof., Education
VanCampen, Darrell R., Ph.D., North Carolina State U. Assoc. Prof., Animal Science
VanEs, Harold M., Ph.D., North Carolina State U. Assoc. Prof., Soil, Crop, and Atmospheric Sciences
VanEtten, Hans D., Ph.D., Cornell U. Prof., Plant Pathology
VanSoest, Peter J., Ph.D., U. of Wisconsin. Prof., Animal Science
VanWambeke, Armand R., Ph.D., U. of Ghent (Belgium). Prof., Soil, Crop, and Atmospheric Sciences
Via, Sara, Ph.D., Duke U. Assoc. Prof., Entomology
Viands, Donald R., Ph.D., U. of Minnesota. Prof., Plant Breeding and Biometry
Villani, Michael G., Ph.D., North Carolina State U. Assoc. Prof., Entomology (Geneva)

Wagenet, Robert J., Ph.D., U. of California at Davis. Prof., Soil, Crop, and Atmospheric Sciences
Walker, Larry P., Ph.D., Michigan State U. Prof., Agricultural and Biological Engineering
Walter, Michael F., Ph.D., U. of Wisconsin. Prof., Agricultural and Biological Engineering
Walter, Reginald H., Ph.D., U. of Massachusetts. Prof., Food Science and Technology (Geneva)
Watkins, Christopher B., Rutgers U. Assoc. Prof., Fruit and Vegetable Science
Weeden, Norman F., Ph.D., U. of California at Davis. Assoc. Prof., Horticultural Sciences (Geneva)
Weiler, Thomas C., Ph.D., Comell. Prof., Floriculture and Ornamental Horticulture
Welch, Ross M., Ph.D., U. of California at Davis. Prof., Soil, Crop, and Atmospheric Sciences
Wheeler, Quentin D., Ph.D., Ohio State U. Assoc Prof., Entomology
White, Gerald B., Ph.D., Pennsylvania State U. Prof., Agricultural, Resource, and Managerial Economics
White, Shirley A., Ph.D., Michigan State U. Prof., Communication
Whitlow, Thomas H., Ph.D., U. of California at Davis. Asst. Prof., Floriculture and Ornamental Horticulture

Wien, Hans C., Ph.D., Cornell U. Prof., Fruit and Vegetable Science
Wilcox, Wayne F., Ph.D., U. of California at Davis. Assoc. Prof., Plant Pathology (Geneva)
Wilcox-Lee, Darlene, Ph.D., U. of Florida. Assoc. Prof., Fruit and Vegetable Science
Wilkins, Bruce T., PhD, Cornell U. Prof., Natural Resources
Wilks, Daniel S., Ph.D., Oregon State U. Assoc. Prof., Soil, Crop, and Atmospheric Sciences
Willett, Lois S., Ph.D., U. of California at Davis. Asst. Prof., Agricultural, Resource, and Managerial Economics
Williams, Linda, Ph.D., Brown U. Asst. Prof., Rural Sociology
Wolfe, David W., Ph.D., U. of California at Davis. Assoc. Prof., Fruit and Vegetable Science
Yarbrough, J. Paul, Ph.D., Iowa State U. Prof., Communication
Yavitt, Joseph B., Ph.D., U. of Wyoming. Asst. Prof., Natural Resources
Yoder, Olen C., Ph.D., Michigan State U. Prof., Plant Pathology
Young, Frank W., Ph.D., Comell U. Prof., Rural Sociology
Youngs, William D., Ph.D., Comell U. Prof., Natural Resources
Zaitlin, Milton, Ph.D., U. of California at Los Angeles. Prof., Plant Pathology
Zitter, Thomas A., Ph.D., Michigan State U. Prof., Plant Pathology
Zobel, Richard W. Ph.D., U. of California at Davis. Assoc. Prof., Soil, Crop, and Atmospheric Sciences

## COLLEGE OF ARCHITECTURE, ART, AND PLANNING

## ADMINISTRATION

William G. McMinn, dean
Stanley J. Bowman, associate dean
Laurie Roberts, director of public affairs
Cynthia K. Prescott, director of administrative operations
Ray Dalton, director of minority educational affairs
Donna L. Kuhar, registrar
Elizabeth A. Cutter, director of admissions
Margaret Webster, curator of visual resources facility
TBA, director of career office

## FACULTY ADVISERS

Architecture students are assigned faculty advisers for their first year. Upperclass students have one assigned adviser but are encouraged to seek assistance and advice from the most appropriate faculty member or college officer.

First-year students in the fine arts department are assigned faculty advisers for the first year Students may then choose advisers in their major area of concentration
Undergraduate students in the Program of Urban and Regional Studies are assigned faculty advisers.
All students in the college are invited to share their concerns and seek advice from the volunteer student advisers at anytime.

Specific inquiries regarding rules, procedures, or deadlines should be addressed to:
Kent L. Hubbell, chair, Department of Architecture

Richard S. Booth, chair, Department of City and Regional Planning
Jean Locey, chair, Department of Art.

DEGREE PROGRAMS

|  | Degree |
| :--- | :--- |
| Architecture | B.Arch |
|  | B.F.A. |
| Fine Arts | B.F.A. |
| History of Architecture and Urbanism | B.S. |
| Urban and Regional Studies | B.S. |

The college offers programs leading to the bachelor's degree-the five-year program in architecture leads to the Bachelor of Architecture; four-year programs in art and architecture lead to the Bachelor of Fine Arts. In addition, four-year programs with a concentration in either urban and regional studies or history of architecture lead to the Bachelor of Science.

Graduate-level programs are offered in art, architectural design and urban design, architectural sciences, history of architecture and urbanism, historic preservation planning, city and regional planning, regional science, and landscape architecture.

Students in each of these programs work in physical proximity to one another and thus gain a broader understanding of their own special area of interest through contact with the students and faculty in other disciplines.
Early in its development the college set a limit on the number of students it would enroll and devised a selective method of admission. There are now more than 650 students and a full-time teaching staff of over fifty-five, supplemented by visiting professors and critics, part-time lecturers, and assistants. Teachers and students mix freely, and much instruction and criticism is on an individual basis.

The college's courses are integral parts of the professional curricula. Fundamental subjects are taught by faculty members whose experience provides them with professional points of view. The concentration of professional courses within the college is balanced by the breadth of view gained from courses and informal learning in the rest of the university. The college believes that this breadth is an essential element of professional education. This conviction is evident in the form of the curriculum, the methods of teaching, and the extracurricular life of teachers and students.

## FACILITIES

The college occupies Sibley Hall, Olive Tjaden Hall, Rand Hall, and the Foundry. Facilities for architecture, and city and regional planning, as well as college administrative offices, the Visual Resources Facility, and the Fine Arts Library are located in Sibley Hall. The Department of Art is housed in Olive Tjaden Hall. Sculpture and shop facilities are in the Foundry. The Green Dragon Cafe, a student eatery and lounge, is located in the basement of Sibley Dome. The college has three darkrooms that are available for general use by students in the college and serve as laboratories for the photography courses. A darkroom fee must be paid by each user. Information about darkroom rules and regulations, hours, and equipment is available at the darkroom circulation desk.

Through the generosity of the late Lillian P . Heller, the college also owns the Miller-Heller House, home of William H. Miller, the first student to enroll for the study of architecture at Cornell, and later a practicing architect in Ithaca. This building is used to house visiting teachers and guests of the college and for occasional receptions and social events.

## Libraries

The Fine Arts Library, in Sibley Hail, serves the College of Architecture, Art, and Planning
through its collections on architecture, fine arts, city and regional planning and landscape architecture. The library, with more than 150,000 books, is capable of supporting undergraduate, graduate, and research programs. Some 1,900 serials are currently received and maintained.

The Visual Resources Facility, made possible through gifts from George and Adelaide Knight, in Sibley Hall contains the F. M. Wells Memorial Slide Collection, which consists of a large and growing collection of slides of architecture, architectural history, and art. The collection now includes approximately 400,000 slides.

The facilities of the libraries of other schools and departments on campus and the John M. Olin Library, designed primarily as a research library for graduate students, are also available.

## Museums and Galleries

The Herbert F. Johnson Museum of Art was formally opened in May 1973. Although many of its exhibitions and activities relate directly to academic programs of the university, the museum has no administrative affiliation with any department. In this way, its programs freely cross academic boundaries, stimulating interchange among disciplines. With a strong and varied collection and a continuous series of high-quality exhibitions, it fulfills its mission as a center for the visual arts at Comell. Art galleries are also maintained in Willard Straight Hall, where loan exhibitions of paintings and graphic work by contemporary artists are held. Throughout the year, works of students, faculty, and staff in the College of Architecture, Art, and Planning and of guest artists may be viewed in the John Hartell Gallery in Sibley Hall and in the Olive Tjaden Gallery in Olive Tjaden Hall.

## Rome Program

The College of Architecture, Art, and Planning's Rome Program was founded in the fall of 1986 to provide instruction in Italy for students seeking excellence in art, architecture, and other disciplines. The program offers an educational experience that draws upon the rich past of Rome, its resources in museums, its art and architecture, and its wide variety of cultural offerings. The school is located in the famous Palazzo Massimo in the center of the historical city next to such wellknown Roman sights as Piazza Navona, the Pantheon, and Rome's famous outdoor market at the Campo dei Fiori.
The program in Rome offers components for students majoring in liberal arts, architecture, fine arts, and planning. Full course loads are available to all students in a curriculum that stresses the convergence of artistic, cultural, and architectural ideas vital to an understanding of the city. Students are responsible for planning course schedules that ensure their particular requirements can be met, since course offerings in Rome are limited.

## COLLEGE ACADEMIC POLICIES

## Ownership of Student Work

All drawings, models, paintings, graphic art, and sculpture done in the studios and drafting rooms as a part of the instructional program are the property of the college until they have been graded and released by the instructor. Certain works may be selected by the college for retention for academic purposes.

## Exhibitions of Student Work

Exhibitions of student work are held each semester as part of the yearly schedule of the Olive Tjaden Hall gallery and the John Hartell Gallery. These galleries display work from a specific course or exhibit examples of recent work by individual faculty, students, and visitors.

## Scholastic Standards

Term by term, a candidate for an undergraduate degree in the college is required to pass all courses in which the student is registered and have a weighted average for the term of not less than $C(2.0)$. The record of each student who falls below the standard will be reviewed by the Student Records Committee for appropriate action, as described below:

1) Waming means that the student's performance is not up to expectations Unless improvement is shown in the subsequent term, the student may be placed on final warning or required to take a leave of absence from the college.
2) Final Warning indicates that the student's record is unsatisfactory. Unless considerable improvement is shown in the subsequent term, the student shall be required to take a leave of absence from the college.
3) Required leave of absence: Academic Deficiency. The student is dismissed from the college and may not continue studies in the college. A student who has been placed on a required leave of absence may apply for readmission after an absence of at least two semesters. Application for readmission is made by letter, addressed to the department chair. The student must submit evidence that his or her time has been well used, and, if employed, must submit a letter from an immediate superior. If a student chooses to register for courses, either extramurally at Comell or at another institution, he or she should be advised that credit for these courses will not apply toward the degree but will appear on the student's transcript. The grades received for any courses taken while on a required leave of absence will not be counted into the grade point average. Readmission to the college is at the discretion of the Admissions Committee. Application for spring-term readmission must be made by November 15 , and application for fall-term readmission must be made by April 15. Refer to the Architecture, Art \& Planning Handbook (Whitebook) for further information regarding required leave of absence.
4) Required withdrawal: May Not Reregister, College of Architecture, Art, and Planning. The student is dismissed from the college and is permanently prohibited from continuing studies in it. This dismissal does not preclude the possibility of
applying for admission to another division of the university.
The above actions are not necessarily sequential. A student who has received a warning may be placed on a required leave of absence for academic deficiency at the end of the next term if performance during that time is deemed to be grossly deficient.
A cumulative average of at least $C-(1.7)$ is required for graduation.

## ARCHITECTURE

Kent Hubbell, chair; M. Cruvellier, W. Goehner, D. P. Greenberg, G. Hascup, L. F. Hodgden, M. Jarzombek, A. Kira, B. G. MacDougall, A. B. Mackenzie, W. G. McMinn, V. Meyers, J. C. Miller, L. Mirin, V. Mulcahy, J. Ochshorn, C. F. Otto, A. Ovaska, C. W. Pearman, H. W. Richardson, M. L. Schack, J. P. Shaw, A. Simitch, V. K. Warke, J. Wells, M. Woods, J. Zissovici

## Professional Degree Program

The first professional degree in architecture is the Bachelor of Architecture. This degree counts toward the professional registration requirements established by the various states, National Architectural Accrediting Board, and the National Council of Architectural Registration Boards. The professional program is normally five years in length and is designed particularly for people who, before they apply, have established their interest and motivation to enter the field. It therefore incorporates both a general and professional educational base.
The program is oriented toward developing the student's ability to deal creatively with architectural problems on analytical, conceptual, and developmental levels. The sequence courses in design, consisting of studio work augmented by lectures and seminars dealing with theory and method, are the core of the program. Sequences of studies in the history of architecture and cities, culture and society, visual studies, environmental science, structures, and building technology provide a base for the work in design.
In the first three years the student has the opportunity to establish a foundation in the humanities and sciences through electives. During the fourth and fifth years this base may expand through detailed further studies in these areas. Within the professional program a basis for understanding architecture in its contemporary and historical cultural contexts is established.
The structure of the program incorporates considerable flexibility for the individual student to pursue his or her particular interest in the fourth and fifth years. By carefully planning options and electives in the fifth year, it is possible for a qualified student to apply the last year's work for the Bachelor of Architecture degree to one of the graduate programs offered in the department. Some students are then able to complete the requirements for the master's degree in one additional year.

## Rome Program

The program offers the opportunity for students from Cornell and other universities to spend one or two terms of study in Rome.

This option is open to fourth- and fifth-year Cornell architecture students; outstanding third-year students are admitted by petition and a review of their design record. Courses offered by this department include design, thesis, thesis introduction, history, theory, architectural science, and visual studies. In addition, courses are offered by other departments in Italian language, Italian culture, and history of art. The program provides a unique urban and architectural experience drawing from the rich past of the city for sources of instruction and inspiration.

## Overlap Program

For qualified students the department offers an option that combines the fifth year of the undergraduate program with the first year of the Master of Architecture program. In the fall of the fourth undergraduate year interested students petition the department to substitute Arch 601-602 or 603-604 for Arch 501-502. At the same time, they complete graduate school applications and submit them with fee and portfolio to the graduate field secretary for architecture. Students accepted into the program may not normally begin until the fall of their fifth year and, once enrolled, may not transfer back into the 501-502 sequence.
Following admission into the Overlap Program, students may petition to apply toward the requirements of the master's degree a maximum of 30 credits, including Arch 601-602 or 603-604 and other advanced courses taken in excess of distribution requirements for the Bachelor of Architecture degree.

## Curriculum

## First Year

Fall Term
Credits
101 Design I 6
181 History of Architecture I 3
151 Drawing I 2
Math 111 Calculus or Math 106
or out-of-college elective

Out-of-college elective $-3$

Spring Term
102 Design II
6
182 History of Architecture II 3
152 Drawing II
Math 111 or out-of-college elective 3-4
Out-of-college elective (freshman
writing seminar suggested)

$$
17-18
$$

## Second Year

Fall Term
Credits
201 Design III 6
263 Structural Concepts
231 Architectural Analysis I
261 Site Planning


Out-of-college elective 3

## Spring Term

| 202 Design IV | 6 |
| :---: | :---: |
| 232 Architectural Analysis II | 2 |
| 262 Building Technology, Materials, and Methods | 3 |
| 264 Structural Elements | 3 |
| College elective | 3 |
|  | 17 |
| Third Year |  |
| Fall Term |  |
| 301 Design V | 6 |
| 361 Environmental Controls ILighting and Acoustics | 3 |
| 363 Structural Systems | 3 |
| Deparmental elective | 3 |
| Out-of-college elective | 3 |
|  | 18 |
| Spring Term |  |
| 302 Design VI | 6 |
| 342 Architecture as a Cultural System | 3 |
| 362 Environmental Controls IIMechanical and Passive Solar Systems | 3 |
| Departmental elective | 3 |
| College or out-of-college elective | 3 |
|  | 18 |
| Fourth Year |  |
| Fall Term |  |
| 401 Design VII | 6 |
| 411 or 412 Professional Practice or Seminar | 3 |
| Departmental elective | 3 |
| College elective | 3 |
| Out-of-college elective | 3 |
|  | 18 |
| Spring Term |  |
| 402 Design VIII | 6 |
| Departmental elective | 3 |
| Departmental elective | 3 |
| College or out-of-college elective | 3 |
| Out-of-college elective | 3 |

## Fifth Year

Fall Term
501 Design IX or 601 or 603 Overlap Program
Departmental elective
College or out-of-college elective
Out-of-college elective
Out-of-college elective
Spring Term
502 Design X or 602 or 604
Overlap Program
Departmental elective
College or out-of-college elective
College or out-of-college elective

## Required Departmental Courses

| Terms | Course Subject | Numbers | Credits |
| :---: | :---: | :---: | :---: |
| 10 | design | 101-502 | 62 |
| 1 | mathematics | Math 111, Math 106, or approved equivalent | 3-4 |
| 3 | structures | 263, 264, 363 | 10 |
| 4 | technology | $\begin{aligned} & 261,262, \\ & 361,362 \end{aligned}$ | 12 |
| 2 | architectural theory | 231, 232 | 4 |
| 2 | history of architecture | 181, 182 | 6 |
| 1 | architecture, culture and society | 342 | 3 |
| 1 | professional practice or seminar | 411 or 412 | 3 |
| 2 | drawing | 151, 152 | 4 |
|  |  |  | 107-108 |
| Electlves |  |  |  |
| Departmental |  |  |  |

Terms
Credits
3 history of architecture: 300-level 9
1 visual studies or computer graphics 3
$2 \begin{aligned} & \text { architectural theory } \\ & \text { or non-sequence design }\end{aligned} \quad 6$
$1 \begin{aligned} & \text { architectural structures, } \\ & \text { construction, and technology }\end{aligned}$
College
Terms
Credits
2 art: any courses 6
Out-of-College Credits
1

$$
\begin{array}{ll}
1 & \text { computer programming } \\
\text { or applications } \\
1 & \text { freshman seminar } \\
1 & \begin{array}{l}
\text { mathematics, physics, or } \\
\text { biological sciences }
\end{array} \\
1 & \text { humanities }
\end{array}
$$

3

Free
Of the electives, 15 credits are to be taken outside the College of
Architecture, Art, and Planning, and 15 credits may be taken either in or outside the college.
Total credits

## Transfer Students

Although the program leading to the Bachelor of Architecture is specifically directed to those who are strongly motivated to begin professional study when entering college, it is sufficiently flexible to allow transfers for students who have not made this decision until after they have been in another program for one or two years. Individuals who have already completed a nonprofessional undergraduate degree must also apply to transfer to the Bachelor of Architecture degree program, since the graduate program in
architecture requires the Bachelor of Architecture degree or its equivalent for entrance.
Transfer students are responsible for completing that portion of the curriculum that has not been covered by equivalent work. Applicants who have had no previous work in architectural design must complete the tenterm design sequence. Since this sequence may be accelerated by attending summer terms, seven or eight regular terms and two or three summer terms are typically required.
For those who would benefit from an opportunity to explore the field of architecture before deciding on a commitment to professional education, the department offers an introductory summer program that includes an introductory studio in architectural design, lectures, and other experiences designed to acquaint the participants with opportunities, issues, and methods in the field of architecture.
Admission is offered to a limited number of transfer applicants who have completed a portion of their architecture studies in other schools. Each applicant's case is considered individually. Transfer students must complete a minimum of 70 credits and four terms in residence, taking 35 of the 70 credits (including four terms of design) in the Department of Architecture. Placement in the design sequence is based on a review of a representative portfolio of previous work.

## Alternative Programs

## Bachelor of Fine Arts

After completing the first four years of requirements, the student may choose to receive the degree of Bachelor of Fine Arts (B.F.A.) in architecture, which is not a professional degree.

## Bachelor of Science in History of Architecture

The history of architecture major leads to a Bachelor of Science degree, conferred by the College of Architecture, Art, and Planning. The major is intended for transfer students from other programs at Cornell and from colleges and universities outside Cornell. Students in the Department of Architecture and the College of Arts and Sciences may take the major as part of a dual-degree program. The course of study in this major, available to students from a variety of academic backgrounds, offers the opportunity for a vigorous exploration of architecture and its history.
Admission requirements. Two years of undergraduate study; Arch 181 and 182, or the equivalent; and one 6 -credit studio in architecture (or Arch 103, which is available during the fall semester for students with no previous studio work) are required. Students transferring from a B.Arch. program must be in good standing in their design sequence.

## Procedure. Students from Cornell may

 transfer to the program at the beginning of the fall term of their third or fourth year of study. They submit a short application as prospective internal transfer students. It is required that, before applying, all prospective internal transfer students meet with a history of architecture faculty member to discuss procedural matters and program content.Students who wish to transfer to the program from outside Comell must apply to the Department of Architecture by March 15.

Applications may be considered after this date but are given lower priority. Applications for both internal and external transfer students are available from Elizabeth Cutter, Admissions Office, College of Architecture, Art, and Planning, Cornell University, 135 East Sibley Hall, Ithaca, New York 14853-6701.

Curriculum. A student entering the program is assigned an adviser from the history of architecture faculty in the Department of Architecture. Adviser and student together prepare an appropriate two-year course of study according to the following guidelines

1) 24 credits of 300 -level courses in architectural history: Arch 380 through Arch 399
2) $\mathbf{1 2}$ credits in 600-level architectural history seminars: Arch 681 through Arch 699; or 8 credits in a 600 -level seminar plus Arch 499 , offered for honors candidates only
3) One 300-, 400-, or 600 -level course in architectural theory
4) 24 credits in electives selected in consultation with the student's adviser
5) Language requirement, to be met in the manner specified for students enrolled in the College of Arts and Sciences

Honors program. Students will graduate with honors if, during their two years of study in the program, they have a cumulative average of $B$ or better in all courses, have no grade lower than A- in all history of architecture courses taken at the 300 level, and have completed an honors thesis (Arch 499) deemed to be of distinguished quality by the history of architecture faculty.

## Dual Degree Options

Students can earn both the B.S. and B.Arch degrees either simultaneously or sequentially. Students who have transferred into the B.Arch. program at Cornell may find this to be a special opportunity for an enlarged and enriched program of study. Ordinarily this option requires five years of study and assumes the satisfactory fulfillment of requirements in both the B.S. and B.Arch. programs.
Students currently enrolled in the College of Arts and Sciences at Comell can earn a B.A. in an arts college major and a B.S. in the history of architecture in five years. In this option, students complete a minimum of 150 credits, which includes the B.S. prerequisites and curriculum requirements and 100 credits of the usual distribution and major requirements in the College of Arts and Sciences. Further information about this option is available at the Admissions Office, 135 East Sibley Hall, and at the Academic Advising Center of the College of Arts and Sciences, 55 Goldwin Smith Hall.
Students may also elect to continue toward a Master of Arts degree in the history of architecture. The M.A. ordinarily requires a minimum of two years of graduate work beyond the bachelor's degree; with this special sequential degree arrangement that time is shortened to one year.

## Summer Term in Architecture

The summer term offers students the opportunity of a concentrated period of design work. Design is offered at both undergraduate and graduate levels; the term is six to eight weeks in duration.

Undergraduate design sequence courses, including thesis, are offered at first-through fifth-year levels in Ithaca. Normally there is also a design program abroad for third-,
fourth-, and fifth-year students.
Students from schools of architecture other than Cornell are welcome to apply to the college for admission to any summer programs.
At the graduate level the summer term is devoted to problems forming part of the student's program of work. The term may carry residence credit equal to that of a normal academic term. Participation in the program cannot be undertaken without the consent of the student's Special Committee.
Furniture design, architectural structures, and computer-aided design are offered as elective courses, contingent upon student interest and faculty availability
The department offers a Career Discovery Program in Architecture for high school students and undergraduates interested in exploring the possibility of a career in architecture.

## Architectural Design

Courses in brackets are not offered this year. A studio fee of $\$ 65$ is charged each semester for every design course (these fees are subject to change).

## Sequence Courses

ARCH 101 Design I
Fall. 6 credits. Limited to department students.

Studios and lecs, M W F 2-6. Staff. An introduction to design as a conceptual discipline directed at the analysis, interpretation, synthesis, and transformation of the physical environment. Exercises are aimed at developing an understanding of the issues, elements, and processes of environmental design.

## ARCH 102 Design II

Spring. 6 credits. Limited to department students. Prerequisite: Architecture 101 and Architecture 151. A continuation of Architecture 101

Studios and lecs, M W F 2-6. Staff. Human, social, technical, and aesthetic factors related to space and form. Design problems range from those of the immediate environment of the individual to that of small social groups.

## ARCH 201-202 Design III and IV

Fall and spring. 6 creclits each term. Coregistration in Architecture 231-232 and completion of Architecture 151-152 required. Limited to department students. Prerequisite for Architecture 201 is Architecture 102 and Architecture 152. Prerequisite for Architecture 202 is Architecture 201.

Studios and sems, M W F 2-6. Staff.

## ARCH 301-302 Design V and VI

Fall and spring. 6 credits each term. Limited to department students. Prerequisite for Architecture 301 is Architecture 202. Prerequisite for Architecture 302 is Architecture 301.

Studios and sems, M W F 2-6. Staff.

## ARCH 401-402 Design VII and VIII

Fall and spring. 6 credits each term. Limited to department students. Prerequisite for Architecture 401 is Architecture 302. Prerequisite for Architecture 402 is Architecture 401.

Studios and sems, M W F 2-6. Staff. Programs in architectural design, urban design, or architectural technology and environmental science, etc

## ARCH 501 Design IX

Fall or spring. 6 credits. Limited to department students. Prerequisite: Architecture 402.

Studios and sems, M W F 2-6. Staff. Programs in architectural design, building typology investigations, and research leading to complete development of the student's thesis program. General instruction in the definition, programming, and development of a thesis is followed by tutorial work with the student's advisory committee.

## ARCH 502 Design $X$-Thesis

Fall or spring. 8 credits. Prerequisite: Architecture 501 or Architecture 500 and Architecture 510. Required of B.Arch. candidates who must satisfactorily complete a thesis. Students accepted for admission to the Overlap Program are exempt from the thesis requirement.

Studios, M W F 2-6. Staff.

## ARCH 601-602 Special Program in

 Architectural DesignFall and spring. 9 credits each term. Limited to students who have been accepted into the Overlap Program. Registration by petition only.

## ARCH 603-604 Special Program in Urban Design

Fall and spring. 9 credits each term. Limited to students who have been accepted into the Overlap Program. Registration by petition only.

## Graduate Courses

ARCH 701-702 Problems in Architectural Design
Fall and spring. 9 credits each term.
Studio and sem, hours to be arranged. Staff.
Basic first-year design course for graduate students whose major concentration is architectural design.

## ARCH 703-704 Problems in Urban Design

Fall and spring. 9 credits each term.
Studio and sem, hours to be arranged. Staff.
Basic first-year design course for graduate students whose major concentration is urban design.

## ARCH 801 Thesis or Research in Architectural Design

Fall or spring. 9 credits. Prerequisite: Architecture 701 and Architecture 702.

Hours to be arranged. Staff.
Second-year design course for graduate students whose major concentration is architectural design.

## ARCH 802 Thesis or Research in Urban

 DesignFall or spring. 9 credits. Prerequisite: Architecture 703 and Architecture 704. Hours to be arranged. Staff.
Second-year design course for graduate students whose major concentration is regional design.

## Elective Design Courses

ARCH 103-104 Elective Design Studio 103, fall; 104, spring. 6 credits each term. Limited to students from outside the department. Prerequisite for Architecture 103:
permission of instructor required. Prerequisite for Architecture 104: Architecture 103 and permission of instructor M W F 2-6. Staff.

## ARCH 303 Special Problems in Architectural Design

Fall or spring. Variable credit (maximum, 3). Prerequisite: permission of instructor and approved independent study form Hours to be arranged. Staff.
Independent study.
ARCH 200, 300, 400, 500 Elective Design Fall or spring. 6 credits each term. Open by permission to transfer students who have not been assigned to a sequence course.
Prerequisite: permission of department office Each student is assigned to a class of appropriate level. Prerequisite for Architecture 500 is Architecture 402.

M W F 2-6. Staff.

## ARCH 605 Special Problems in Design

 Fall and spring. Variable credit (maximum 3). Prerequisite: permission of instructor.Hours to be arranged. Staff.
Independent study
Related Courses and Seminars
ARCH 110 Introduction to Architecture: Design Studio
Summer session. 3 credits. S-U option. Open to non-architectural majors in college, high school students in 11th and 12th grades, and any individuals with a minimum of a high school diploma interested in exploring the field of architecture. Not offered every year. Studio M T W F 1:30-4:30. Staff. A course designed to introduce students to ideas, principles, and methods of solving architectural problems in a studio setting. Through a graduated sequence of exercises culminating in a major term project, students explore the architectural concepts of space, form, function, and technology. Instruction is via highly personalized critiques of individual student work by assigned department faculty as well as by periodic reviews of group by invited faculty and guest critics. The course grade is based on the overall performance in the studio with special emphasis on the quality of a major studio project

## [ARCH 111 An Introduction to Architectural Design

Fall or spring. 4 credits. Open to out-ofdepartment students only. Not offered 1994 95.

Studio T R 2:30-4:25. Staff.
An introduction to architectural design as a conceptual discipline. Exercises will develop an understanding of architectural space and its elements.]

ARCH 317 Contemporary It alian Culture Fall or spring. Variable credit (maximum, 3). For students in the Rome program only

Staff and visiting faculty.
This course provides a broad view of the culture and social structure of Italy, drawing from Italian literature, history, and current events.

ARCH 411 Professional Practice
Fall or spring. 3 credits each term
T 1:25-4:25. M. Schack and staff.
An examination of organizational and management theories and practices for delivering professional design services. Included is a historic overview of the profession and a review of the architect's
responsibilities from the precontract phase through construction. Application of computer technology in preparing specifications.
[ARCH 412 Professional Seminar
Fall or spring. 3 credits. Washington Program only.]

## ARCH 510 Thesis Introduction

Foreign summer programs and Rome program only. 3 credits. Must be taken in conjunction with Architecture 500. Prerequisite for Architecture 500 is Architecture 402. Architec ture 500 will be considered equivalent to Architecture 501 when taken concurrently with Architecture 510 during a foreign summer program or in Rome

Lecs and sems. Staff.
Lectures, seminars, and independent research leading to complete development of the student's thesis program. General instruction in the definition, programming, and development of a thesis.

## ARCH 610 Graduate Design Seminar

Fall. 3 credits. Intended for but not limited to graduate students in the Architectural Design and Urban Design Program.

Seminar. Hours to be arranged. Staff. Issues in architectural and urban design. Required for first-year graduate students in design.

## ARCH 611-612 Urban Housing

 Developments611, fall; 612, spring. 3 credits each term. Limited to fourth- and fifth-year students in architecture and graduate students. Prerequisite: permission of instructor. Not offered every year.

Staff.

## ARCH 613 Transportation

Fall. 3 credits. Prerequisite: permission of instructor. Not offered every year.

Sem, hours to be arranged. Staff.
The impact of various transportation forms on the environment is considered from the perspectives of architects, engineers, planners, and human ecologists. Readings and discussions of past, current, and future transportation modes focus on aesthetic and physical aspects.

## ARCH 614 Low-Cost Housing

Spring. 3 credits. Prerequisite: permission of instructor. Not offered every year.

T 2-4:30. H. W. Richardson.
Aspects of low-cost housing involving engineering technology, architecture, physical planning, economics, and sociology.
ARCH 618-619 Seminar in Urban and Regional Design
618, fall; 619 , spring. 3 credits each term. Limited to fifth-year and graduate students. Not offered every year.

Hours to be arranged. Staff and guest lecturers.
A broad range of issues and problems of urban and regional development and the context in which the designer functions are surveyed. Selected case studies are presented by the participants and visitors.

## Architectural Theory

ARCH 130 An Introduction to Architecture: Lecture Series Summer. 3 credits. S-U option. Open to non-architectural majors in college, high school students in 11th and 12th grades, and
any individuals with a minimum of a high school diploma interested in exploring the field of architecture. Not offered every year. Lecs M T W F 9:00-12:00. Staff. A survey course that covers the many facets of architecture: history, design principles, preservations, landscape architecture, building technology, and cultural factors. The format of the course comprises lectures, demonstrations, films, and field trips. Course evaluation is based on quizzes and a final examination.

## ARCH 131 An Introduction to Architecture

Fall. 3 credits. Open to out-of-department students only. Architecture 131 is not a prerequisite for Architecture 132.

Lecs T R 1:25-2:15. Disc to be arranged. Staff, guest lecturers. Intended to familiarize non-architecture students with the art and science of architecture. Fundamentals of plan, section, and elevation, the primary elements that comprise an architectural form; basic organizational principles; the ways in which we perceive architectural space; and the various concepts of function in relation to form will be included among the topics to be covered, using examples from numerous times and cultures as well as from the contemporary Cornell campus

## ARCH 132 An Introduction to

 ArchitectureSpring. 3 credits. Open to out-of-department students only. Architecture 131 is not a prerequisite for Architecture 132.

Lecs T R 1:25-2:15. Disc to be arranged. Staff, guest lecturers.
Non-architecture students are initiated into various types of architectural drawings and exposed to a variety of methods whereby architectural forms communicate both simple and complex meanings. Architecture in its relation to fields such as landscape architecture, urban design, structural design, interior design, set design, architectural history, preservation, and computer graphics will be included in the presentations, which will also deal with the various relationships established between an architect and a society. Crosshistorical and cross-cultural examples will be used in developing in the student a degree of fluency in the languages of architectural discourse.

## ARCH 231 Architectural Analysis I

Fall. 2 credits. Architecture students must register concurrently in Architecture 201.

Studios and lecs, T 1:25-3:20. Staff. An introduction to analysis of the object of study in the interest of broadening one's understandings of the ways in which architecture can connote and denote meanings.

## ARCH 232 Architectural Analysis II

Spring. 2 credits. Architecture students must register for this course concurrently with Architecture 202.

Studios and lecs, T 1:25-3:20. Staff. Advanced analytical studies focusing on complex architectural spaces, objects, images, and representations.

## ARCH 335 Theory of Architecture

Fall or spring. 3 credits. Prerequisite: Architecture 231-232 or permission of instructor. Not offered every year.

Lecs, T R 4:40-6:30. L. F. Hodgden.

ARCH 336 Theory of Architecture
Fall or spring. 3 credits. Limited to third-year students and above. Not offered every year. Lecs, T R 4:40-6:30. L. F. Hodgden. Theories of modern architecture: De Stijl, cubist and purist painting, industrialized architecture. Le Corbusier's architecture and urban theories, architectural sequence,
facades, the free plan. "DOM-INO" theory.

## ARCH 337 Special Investigations in the Theory of Architecture I

Fall or spring Variable credit (maximum, 3). Prerequisite: permission of instructor and approved independent study form.

Hours to be arranged. Staff.
Independent study.
ARCH 338 Special Topics in the Theory of Architecture I
Fall or spring. 3 credits. Prerequisite permission of instructor. Not offered every year.

Hours to be arranged. V. Warke and visiting faculty.
Topic to be announced before preregistration.
ARCH 339 Elements, Principles, and Theories in Japanese Architecture Spring. 3 credits. Not offered every year. Seminar. Hours to be arranged. L. Mirin, C. Pearman.

An examination of Japanese architecturebuildings and gardens-and their contextslandscapes, settlements, and cities. The course is addressed to those interested in Japanese architecture as a manifestation of Japanese culture and as a subject for analysis. Emphasis is on underlying concepts, ordering principles, formal typologies, space and its representation, perceptual phenomena, and symbolic content. Readings focus on theoretical treatments of these aspects by Japanese and western writers.

## ARCH 431 Theory of Architecture

Fall. 3 credits. Prerequisite: third-year status. Not offered every year.

Lecs, T R 4:40-6:30. L. F. Hodgden. Gardening and architecture: urban parks; villas and country houses; and Italian, French, and English landscape gardens. Site planning.

## ARCH 432 Theory of Architecture

Spring. 3 credits. Prerequisite: third-year status. Not offered every year.

Lecs, T R 4:40-6:30. L. F. Hodgden. The development of urban form, urban intervention, contextualism, ideal cities, historic new towns, streets, piazzas, fortifications, public buildings and social housing types, site planning, and transportation.

## ARCH 435 Architecture and

 RepresentationFall. 3 credits. Limited to degree candidates in architecture. Prerequisite: successful completion of Architecture 231-232. Not offered every year.

Lecs, disc, and reviews, T R 2:30-4:30. V. Warke.

A study of architecture as it functions as a representational art, referring to its past while inferring its present.

## ARCH 635 Critical Theory in

 ArchitectureSpring. 3 credits. Prerequisite: permission of instructor. Not offered every year

Sem, hours to be arranged. V. Warke. An inquiry into the fundamental principles of architectural criticism in theory and practice, with emphasis on the structures of criticism in the twentieth century.

ARCH 637 Special Investigations in the Theory of Architecture II
Fall or spring. Variable credit (maximum, 4). Prerequisite: permission of instructor and approved independent study form.

Hours to be arranged. Staff.
Independent study.
ARCH 638 Special Topics in the Theory of Architecture II
Fall or spring. 3 credits. Prerequisite: permission of instructor. Not offered every year.

Hours to be arranged. Staff
Topic to be announced before preregistration.
ARCH 639 Principles of Design Process Fall or spring. 3 credits. Limited to third-year architecture students and above; students in other colleges must have permission of instructor. Not offered every year.

Sems, M W 10:10-12:05. A. Mackenzie. Analysis of the major theories and techniques of design developed during the past fifteen years, with special emphasis on application to the solution of whole problems in architectural design.

## Architecture, Culture, and Society <br> ARCH 342 Architecture as a Cultural System

Spring. 3 credits. Architecture 445, 446, 447. or 448 can substitute with permission of instructor.

M W F 10:10-11:00. B. MacDougall. What have been the major issues in the theory and practice of architectural design through time and across cultures, and how is aesthetic judgment related to more general systems of ordering within a particular society or group? This course draws on concepts, methods, and findings from the broad field of cultural anthropology to address these questions. Case studies and examples are drawn from a wide range of architectural traditions around the world for which there is a significant ethnographic literature, with special emphasis on sub-Saharan Africa, India, and the United States. Topics include the ideational and formal relationships between folk and monumental traditions in complex societies, the structure of the ideal social order and its refraction in the material world, cosmological models and architectural form, geomerries of non-Western traditions, and the relationship between indigenization and culture change.

ARCH 349 Undergraduate Investigations In Architecture, Culture, and Society Fall or spring. Variable credit (maximum 3). Prerequisite: permission of instructor and approved independent study form.

Hours to be arranged. B. MacDougall. Independent study.

ARCH 441-442 Special Topics in Architecture, Culture, and Society
Fall and spring. 3 credits each rerm.
Prerequisite: permission of instructor. Hours to be arranged. Topic to be announced. B. MacDougall.
Topic to be announced before preregistration.

## [ARCH 445 Architecture and the Mythic

 ImaginationFall. 3 credits, Prerequisite: Architecture 342 or permission of instructor. Not offered 1994-95.

M W F 10:10-11:00. B. MacDougall. This course focuses on traditional societies in which beliefs about architectural order are borne out of the mythic and religious
imagination. Certain themes that are common to a range of cultures are explored in detail.
They include the model of the human body as a source of architectural knowledge, the sacred center, the cosmic mountain, and architectural rituals as enactments of myths. Such themes are traced across cultures, through time and into contemporary theory.]

## ARCH 446 Topics in Architecture,

 Culture, and SocietyFall or spring. 3 credits. Prerequisite: Architecture 342 or permission of instructor. Hours to be announced. B. MacDougall.
[ARCH 447 Architectural Design and the Utopian Tradition
Fall. 3 credits. Prerequisite: Architecture 342 or permission of instructor. Not offered 1994-95.

> R 2:30-4:30. B. MacDougall.

This course explores the relationship between visionary architecture of the late 19 th and 20 th centuries and the wider utopian literature of the time. It first explores themes in utopian fiction as well as in anti-utopian tracts and then turns to the attempts of architects, planners, and artists to concretize visions of the ideal world. The course will devote special attention to the ways in which ideals grounded in the utopian tradition have emerged in the social criticism of housing and neighborhood design in the urban setting in recent times.]

## [ARCH 448 The Indian Example and the Visual Tradition in Culture

Spring, 3 credits. Prerequisite: Architecture 342 or permission of instructor. Not offered 1994-95.

T R 2:30-4:30. B. MacDougall. This course provides a concise chronological summary of the major building traditions of Hindu India and explores the relationship between form and more general beliefs about the power of vision to reveal and transform. Topics include the sculptural program of the Hindu temple as a vehicle for the preservation and transmission of mythic texts, the oculus as an element and the eye as a motif, darshan, the spiritually transforming vision, and the destructive power of vision as revealed in myth and beliefs about "evil eye."]

## [ARCH 647-648 (667-668) Architecture <br> in Its Cultural Context I and II

647, fall; 648, spring. 4 credits each term Prerequisite: permission of instructor. Not offered 1994-95.

Sem, M W F 10:10. B. MacDougall. Fall term, theory; spring term, problem solving and method. An examination of the relationship between architecture and other aspects of culture. Emphasis on the motivations for particular architectural forms and especially on theories of architecture. Examples from the United States and Asia.]

## ARCH 649 Graduate Investigations in

Architecture, Culture, and Society Fall or spring. Variable credit (maximum 4) Prerequisite: permission of instructor and approved independent study form.

Hours to be arranged. B. MacDougall. Independent study.

## Visual Studies

Darkroom fees charged for all photography courses

## ARCH 151 Drawing I

Fall. 2 credits.
Studios, T R 2:30-4:25. Staff
Freehand drawing with emphasis on line and perspective representation of form and space

## ARCH 152 Drawing II

Spring. 2 credits. Prerequisite: Architecture 151.

Studios, T R 2:30-4:25. Staff
Freehand drawing as a means of conceiving and expressing spatial form; line weight, shades and shadows, and figure drawing.

## ARCH 251 Introductory Photo I (also Art

 161)Fall or spring. 3 credits each term.
Hours to be arranged. Art staff.
For description see Art 161
ARCH 351 Photography II (also Art 261)
Spring. 4 credits. Prerequisites: Architecture 251 or Art 161, or permission of instructor

Hours to be arranged. Art staff.
For description see Art 261

## [ARCH 356 Architectural Simulation Techniques

Fall or spring. 3 credits. Prerequisite Architecture 151 or permission of instructor.
Not offered 1994-95
Lec and studio, hours to be arranged G. Hascup

Two- and three-dimensional simulation techniques in architecture. Emphasis on simulation of environment, space, materials, and lighting as visual tools for architectural design.]

## ARCH 450 Architectural Publications

Fall and spring. Variable credit (maximum 3). May be repeated for credit

Lecture and studio, hours to be arranged. Staff.
Colloquy and practicum on issues related to the production of an architectural journal, as well as other theoretical and practical production related to the exchange of architectural ideas. Exercises will cover both theoretical as well as hands-on aspects of architectural publication.

## ARCH 457 Special Project in Photography

Fall or spring. Variable credit (maximum, 3) Prerequisites: written proposal outlining the special project and permission of instructor. Not offered every year.

Hours to be arranged. Staff.
Independent study.

## ARCH 458 Special Investigations in

 Visual StudiesFall or spring. Variable credit (maximum, 3). Prerequisites: permission of instructor and approved independent study form.

Hours to be arranged. Staff.
Independent study.

## ARCH 459 Special Topics in Visual

 Studies IFall or spring. 3 credits. Prerequisite: permission of instructor.

Hours to be arranged. Staff.
Topics to be announced before preregistration.

## ARCH 658 Special Investigations in

 Visual Studies IIFall or spring. Variable credit (maximum 4) Prerequisites: permission of instructor and approved independent study form.

Hours to be arranged. Staff
Independent study.
ARCH 659 Special Topics in Visual Studies II
Fall or spring. 3 credits. Prerequisite:
permission of instructor
Hours to be arranged. Staff
Topic to be announced before preregistration

## Architectural Science and Technology Structures

## ARCH 263 Structural Concepts

Fall. 4 credits. Prerequisite: Mathematics 111 or approved equivalent.

Lecs and sems, T R 9:05-11. Staff.
Fundamental concepts of structural behavior. Statics and strength of materials. Introduction to and analysis of simple structural systems.

ARCH 264 Structural Elements
Spring. 3 credits. Prerequisite: Architecture 263.

Lecs and sems, T R 9:05-11 M. Cruvellier Concepts and procedures for the design of individual structural components (columns, beams, etc.) in steel, concrete, and timber construction.

## ARCH 363 Structural Systems

Fall. 3 credits. Prerequisite: Architecture 264. Lec and sems, M W 9:05-11:00.
M. Cruvellier.

Concepts and procedures for the design of overall structural framing systems in steel, concrete, and timber construction

ARCH 463 Special Topics in Structures
Fall or spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 263, 264, and 363 or permission of instructor. Not offered every year.

Hours to be arranged. Staff
Topic to be announced by preregistration
ARCH 473 Special Investigations in Structures
Fall or spring. Variable credit (maximum 3). Prerequisite: permission of instructor and approved independent study form.

Hours to be arranged. Staff.
Independent study

## Construction

[ARCH 160 The Mistory of Architectural Technology
Fall or spring. 3 credits. Not for students in the Department of Architecture. Not offered 1994-95.

## Staff.

Architectural technology is a seemingly illogical blend of scientific knowledge and empirical experience. Whereas it may seem chaotic to the nonprofessional, it is a product of logic in the widely differing areas of design, structure, installation, production and erection, material use, law, economics, and historical development. The evolution of this interdependence is treated using examples of architectural and civic engineering works and processes.]

## [ARCH 161 An Introduction to Building

 TechnologyFall. 3 credits. Open to out-of-department students only. Not offered 1994-95.

Lecs T 2:30-4:25. Staff.
An introduction to building technology, materials, and construction systems for nonarchitecture majors. Topics will include structure (why buildings stand up); enclosure (mediation of environmental conditions); mechanical systems (how buildings provide comfort, hygiene, and life safety); and interior surfaces (walls, floors, ceilings, acoustical behavior, and fire safety). The relationship between the principles and practices underlying the construction of buildings ("technology") and what buildings look like ("design") will also be explored. Concepts rather than computation will be emphasized.]

## ARCH 262 Building Technology,

 Materials, and MethodsSpring. 3 credits.
Lecs, M W F 12:20-1:10. J. Ochshorn Properties of materials-their use and application to the design of buildings and building systems. Discussion of various methods of building construction and assembly

## ARCH 465 Special Topics in

 ConstructionFall or spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 262 or permission of instructor. Not offered every year.

Hours to be arranged. Staff
Topic to be announced by preregistration.
ARCH 475 Special Investigations in Construction
Fall or spring. Variable credit (maximum 3) Prerequisite: permission of instructor and approved independent study form.

Hours to be arranged. Staff.
Independent study

## Environmental Controls

ARCH 261 Environmental Controls-site Planning
Fall. 3 credits.
Lecs, M W F 11:15-12:05. J. Ochshorn The basic principles involved in design in the outdoor environment. A brief historical perspective. A development of inventory including grading and drainage. Foundations, surfacing, and construction.

## ARCH 361 Environmental ControlsLighting and Acoustics

Fall. 3 credits.
Lecs, T R 11:15-1:10. Staff
Basic properties and principles of sound and light. Sound phenomena, noise control, absorption, acoustical design. Light, color, and form. Natural lighting possibilities and constraints. Good and bad examples of artificial lighting.

## ARCH 362 Environmental ControlsMechanical and Passive Solar Systems

Spring. 3 credits.
Lecs, T R 11:15-1:10. Staff. Basic thermal analysis of buildings, human comfort criteria, energy conservation, passive solar design, HVAC distribution systems, overview of mechanical conveying systems and plumbing.

## ARCHITECTURE, ART, AND PLANNING - 1994-1995

ARCH 464 Special Topics in Environmental Controls
Fall or spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 261, 361, and 362 or permission of instructor. Not offered every year.

Hours to be arranged. Staff.
Topic to be announced by preregistration.
ARCH 474 Special Investigations in Environmental Controls
Fall or spring. Variable credit (maximum 3) Prerequisite: permission of instructor and approved independent study form.

Hours to be arranged. Staff. Independent study.

## Computer Applications

ARCH 374 Computer Graphics and Visualization (also Computer Science 417)
Spring. 3 credits. Prerequisites: two terms of calculus and Computer Science 211, or equivalent. Not offered every year.

2 lecs, 1 lab. Staff.
Introduction to the principles of interactive computer graphics, including input techniques, display devices, display files, interactive graphic techniques, two- and threedimensional computer graphics, perspective transformations, hidden line and hidden surface algorithms, and color-picture generation.

## ARCH 375 Practicum in Computer Graphics (also Computer Science 418)

Spring. 2 credits. Prerequisite: Computer Science 211. Recommended: Computer Science 314. Corequisite: Architecture 374 Not offered every year

1 lab
Two or three programming assignments dealing with sophisticated interactive vector graphics programs on calligraphic displays and solid-image generation on raster graphics displays.

## ARCH 378 Computers in Architecture

 SeminarFall or spring. 3 credits. Prerequisites Computer Science 100 or permission of instructor. Not offered every year

Hours to be arranged. H. Richardson and staff.
Exploration of the use of computers in a variety of ways encompassing architectural practice and education. Use of the computer is not required for this course

## ARCH 379 Design by Computer

Spring. 3 credits. Prerequisites: Limited to third-year students and above. Not offered every year.

Hours to be arranged. Staff Exploration of the formalization of the design process for compatability with the computer, and the role of computers in design. Lecture with CAD lab.

## ARCH 476 Special Topics in Computer

 ApplicationsFall or spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 374 or 379 or permission of instructor. Not offered every year.

Hours to be arranged. Staff
Topic to be announced by preregistration.

ARCH 477-478 Special Projects in Computer Graphics
477, fall; 478, spring. Variable credit (maximum, 4). Limited to third-year students and above. Prerequisites: Architecture 374 plus concurrent registration in Computer
Science 314 or equivalent, and permission of instructor.

Hours to be arranged. D. P. Greenberg and staff.
Advanced work in computer graphics input and display techniques, including storage tube, dynamic vector and color raster displays

## Graduate Courses

ARCH 761-762 Architectural Science Laboratory
761 , fall; 762 , spring. 6 credits each term. Open to architectural science graduate

## students only.

Hours to be arranged. Staff
Projects, exercises, and research in the architectural sciences.

## ARCH 763-764 Thesis or Research in

 Architectural Science763 , fall; 764 , spring. Variable credit (maximum, 12). Limited to architectural science graduate students.

Hours to be arranged.
Independent study.

## Architectural History

The history of the built domain is an integral part of all aspects of the architecture curriculum, from design and theory to science and technology. Incoming students take Architecture 181-182 in the first year, and three additional courses from the 380-399 series, preferably in the third and fourth years Seminars are intended for advanced undergraduate and graduate students and do not satisfy undergraduate history requirements. Courses with the same number may only be taken once to satisfy history of architecture or in-college requirements.

## Sequence Courses

ARCH 181 History of Architecture I
Fall. 3 credits. Required of all first-year students in architecture; open to all students in other colleges with an interest in the history of the built domain.

T R 11:15-1:10. Staff
The history of the built environment as social and cultural expression from the earliest to more recent times. Themes, theories, and ideas in architecture and urban design are explored, beginning with the earliest written records.

## ARCH 182 History of Architecture II

Spring. 3 credits. Required of all first-year students in architecture. Open to all students in other colleges with an interest in the history of the built domain; may be taken independently of Architecture 181

T R 11:15-1:10. Staff.
The history of the built environment as social and cultural expression from more recent times to the present. Themes, theories, and ideas are addressed in greater detail for architecture and urban design leading to the present.

## Directed Electives

ARCH 380 History of Theory
Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. M. Jarzombek This course, in which classroom discussion and debates play a central role, explores the history of important theoretical issues involving art and architecture. The readings, which span from the Greeks to today, focus on more than just questions of aesthetics and include theories of ethics, origins, imagination, nature, society, and pedagogy
ARCH 381 Greek and Roman Architecture and Urbanism Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. M. Jarzombek. The history of architecture and urban design in ancient Mediterranean civilizations, with emphasis on Greece and Rome. The course considers change and transformation of building types and their elements within the general context of social demands.

## ARCH 382 Architecture of the Middle

 AgesFall. 4 credits. Prerequisites: Architecture 181-182 or permission of instructor. Credit for this course may be obtained by taking History of Art 332. Not offered every year.

Hours to be announced. R. G. Calkins. A survey of medieval architecture from the Early Christian period to the late Gothic (A.D. 300-1500). Emphasis is given to the development of structural systems, form, function, and meaning of important medieval buildings.

## ARCH 383 The City

Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. M. Jarzombek. This course looks at the development of urban form and urban consciousness from the bronze age to the industrial revolution. It studies conceptions of the city, competing urban paradigms, images of cities both real and fictive, as well as the religious and cultural practices associated with city design.

## ARCH 384 The Italian Renaissance:

Architecture, Politics, and Urbanism Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. M. Jarzombek. This course focuses on the leading architects and theorists of the Renaissance from within the context of the political and cultural developments in Italy from 1300 to the midsixteenth century. The course also investigates specific architectural problems faced by designers as well as questions of architectural patronage, practices, and theories

## ARCH 385 Magnificent UtilityArchitecture and the Arts of Persuasion

Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. C. F. Otto. Architects put revolutionary attitudes about form, space, light, and the arts into practice during the course of the seventeenth century. Focusing on the urban centers of Rome and Paris and the cultural landscapes of Spain, England, and Central Europe, this course explores how architecture, urban design, and the arts were employed to promote state and church.

ARCH 387 The Nineteenth CenturyStyle, Technology, and Individuality in the West
Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year

Hours to be announced. M. Woods. An examination of the nineteenth-century efforts to create appropriate stylistic forms and expressions for emerging building technologies and typologies. The preservation of individual artistic expression against the backdrop of inclustrialization, urbanization, and professionalization will be emphasized. The course begins with Rationalist theory and its architectural expression and concludes with considerations of Art Nouveau, Modernismo, and Jugendstil.

## ARCH 388 Modernism

Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. C. F. Otto. Precursors and proponents of the modern movement from the late nineteenth century into the 1940s are considered in this course. The cultural intents of the modern are examined in architectural and urban design for individuals, groups, and institutions, from Mies van der Rohe, Le Corbusier, and Frank Lloyd Wright to de Stijl, the Bauhaus, and design education. Attention is paid to the politics of design in the service of the state during the 1930s.
ARCH 389 Architecture, Revolution and Tradition
Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. C. F. Otto. From early eighteenth to early nineteenth century, European society underwent profound change. Political absolutism-the doctrine of unlimited government controlwas challenged; Enlightenment attitudescommitments to human reason, science and education-gained ascendancy. This course considers architectural and urban design in these times of tumult. It begins with efforts to foment architectural revolution within inherited traditions and ends with attempts to establish design traditions within revolutionary settings.

## ARCH 390 American Architecture and

 Building IFall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. M. Woods. A review of architecture, building, and responses to the landscape from the prehistoric period to the Civil War. Architecture and building as social and collaborative arts will be emphasized and thus the contributions of artisans, clients, and users as well as professional architects and builders will be examined. The architectural expressions of Native Americans, African Americans, women, and others will be treated in addition to those of European colonists and settlers.

## ARCH 391 American Architecture and Building II

Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. M. Woods. A continuation of Architecture 390 but may be taken independently. An account of American
architecture, building, and responses to the environment from the post-Civil War period to the present day. Particular attention will be paid to the processes of industrialization, professionalization, and urbanization as well as to the manifestations of gender, class, race, and ethnicity in the built and architectural environments.

## ARCH 392 Modern Architecture On Film

Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. M. Woods. An exploration of certain themes deemed critical to modem architecture and urbanism through their representation in both commercial and avant-garde films from the medium's birth until the present day. The focus will vary each semester with particular emphases to include the modern house and housing, the modern city, technology and visions of the future, and finally the image of the architect. Representations of these themes in other forms such as painting, photography, theatre. literature, and advertising will also be examined. Selected readings in modern architecture and film, screenings in class, class discussions, presentations, and papers.

## ARCH 393 The Cumulative City

Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. C. F. Otto. Well established cities were transformed by radical and unimagined change in the nineteenth and twentieth centuries. Politics and economies were recast, populations exploded, and new technologies reshaped transportation, communication, and building. This course explores transformation historically in the cumulative city, focusing on specific cities in America and Europe, Africa, and Asia. The cultural context of each city is examined to understand how it changed and how meanings became associated with evolving urban forms.

## ARCH 394 Toward the Millenium

Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. C. F. Otto. Theory and practice in architecture and urbanism are investigated from the 1950s to the present. From the Americanized International Style to the recent internationalism of design attitudes, the immediate past is explored historically to probe the matrix of meanings associated with contemporary form, urbanism, and technology.

## ARCH 395 Contemporary Issues in the Built Environment

Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be announced. M. Woods and

## S. Christopherson.

A consideration of how certain social, cultural, political, ethical, and economic issues are manifest in the architectural and built environments of the United States. Overarching issues will be examined through case studies such as the question of monuments and monumentality in a contemporary, multicultural society through the Vietnam Memorial in Washington, D.C., Holocaust museums and memorials, and the preservation of the Audubon Ballroom as a memorial to Malcolm X. Historical concerns and examples
will be brought to bear on these contemporary manifestations of preservation, monumentality, gender, class, professional responsibility, and ethics and design as a collaborative art. A course for architects, planners, and preservationists but also clients and users of buildings and landscape.

## ARCH 396 Special Topics in the History

 of Architecture and Urbanism Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.Hours to be arranged. M. Jarzombek. Topic to be announced.
ARCH 397 Special Topics in the History of Architecture and Urbanism Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.

Hours to be arranged. C. F. Otto. Topic to be announced.

## ARCH 398 Special Topics in the History

 of Architecture and Urbanism Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.Hours to be arranged. M. Woods. Topic to be announced.

## ARCH 399 Special Topics in the History

 of Architecture and Urbanism Fall or spring. 3 credits. Prerequisites: Architecture 181-182 or permission of instructor. Not offered every year.Hours to be arranged. Staff.
Topic to be announced.

## Courses in Preservation

ARCH 583 Measured Drawing (also City and Regional Planning 567)
Fall. 3 credits. For undergraduate architecture students and graduate students in history and preservation. Prerequisite: permission of instructor.

Hours to be announced. M. A. Tomlan. Combines study of architectural drawings as historical documents with exercises in preparing measured drawings of small buildings. Presents the basic techniques of studying, sketching, and measuring a building and the preparation of a finished drawing for publication.
ARCH 584 Problems in Contemporary Preservation Practice (also City and Regional Planning 563)
Spring. Variable credit (maximum, 3).
Hours to be announced. Staff.
A review and critique of ongoing preservation projects and an investigation of areas of expertise currently being developed,
presented by staff and guest lecturers.
ARCH 585 Perspectives on Preservation (also City and Regional Planning 562)

Fall. 3 credits.
Hours to be announced. J. Cody. Introductory course for preservation planning. The rationale for, and methods of, using existing cultural and aesthetic resources in the planning and design of regions and cities.
ARCH 586 Documentation for Preservation (also City and Regional Planning 560)

## Fall. 3 credits

Hours to be announced. M. A. Tomlan and visiting lecturers.

Methods of collecting, recording, processing, and analyzing historical architectural and planning materials.

## ARCH 587 Building Materials

 Conservation (also City and Regional Planning 564)Spring. 3 credits. Open to juniors, seniors, and graduate students.

Hours to be announced. M. A. Tomlan. A survey of the development of building materials in the United States, chiefly during the nineteenth and early twentieth centuries, and a review of the measures that might be taken to conserve them.

## ARCH 588 Historic Preservation Planning Workshop: Surveys and Analyses (also City and Regional

 Planning 561)Fall. 4 credits.
Hours to be announced. Staff. Techniques for the preparation of surveys of historic structures and districts; identification of American architectural styles, focusing on upstate New York; explorations of local historical resources, funding sources, and organizational structures. Lectures and training sessions. Emphasis on fieldwork with individuals and community organizations.

## Graduate Seminars in the History of Architecture and Urbanism

ARCH 680 Seminar in Historiography
Fall. 4 credits. Prerequisite: permission of instructor.

Hours to be arranged. Staff. Historiographic and methodological issues are examined in relation to the history of architecture and urbanism. Taught by different faculty members in successive years, the seminar is required of all first- and secondyear graduate students in the History of Architecture and Urbanism program.

## ARCH 682 Seminar in Urban History

Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.

Hours to be arranged. M. Jarzombek.
Topic to be announced.

## ARCH 683 Seminar in the History of

 TheoryFall or spring. 4 credits. Prerequisite permission of instructor. Not offered every year.

Hours to be arranged. M. Jarzombek. Topic to be announced.
ARCH 684 Seminar in the Italian Renaissance: Architecture, Politics, and Urbanism
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.

Hours to be arranged. M. Jarzombek.
Topic to be announced.
ARCH 686 Seminar in Seventeenth- and Eighteenth-Century Architecture and Urbanism
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.

Hours to be arranged. C. F. Otto.
Topic to be announced.

[^0]Hours to be arranged. C. F. Otto. Topic to be announced.

## ARCH 689 Seminar in the History of Cities

Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.

Hours to be arranged. C. F. Otto.
Topic to be announced.

## ARCH 690 Seminar in American

 Architecture, Building, and Urbanism Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.Hours to be arranged. M. Woods. Topic to be announced.
ARCH 692 Seminar in NineteenthCentury Architecture, Building, and Urbanism
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.

Hours to be arranged. M. Woods.
Topic to be announced.
ARCH 696 Seminar in Special Topics in the History of Architecture and Urbanism
Fall or spring. 4 credits. Prerequisites: permission of instructor. Not offered every year.

Hours to be arranged. M. Jarzombek. Topic to be announced.
ARCH 697 Seminar in Special Topics in the History of Architecture and Urbanism
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.

Hours to be arranged. C. F. Otto.
Topic to be announced.
ARCH 698 Seminar in Special Topics in the History of Architecture and Urbanism
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.

Hours to be arranged. M. Woods.
Topic to be announced.
ARCH 699 Seminar in Special Topics in the History of Architecture and Urbanism
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.

Hours to be arranged. Staff.
Topic to be announced.

## Independent Study, Thesis, Dissertation

ARCH 299 Undergraduate Independent Study in the History of Architecture and Urbanism
Fall or spring. Variable credit (maximum, 3). Prerequisite: permission of instructor. May not be taken by students in design to satisfy undergraduate history requirements.

Hours to be arranged. Staff.
Independent study for undergraduate students.
ARCH 499 Undergraduate Thesis in the History of Architecture and Urbanism
Fall or spring. 4 credits. For B.S. honors candidates in history only.

Hours to be arranged. Staff.

ARCH 799 Graduate Independent Study in the History of Architecture and Urbanism
Fall or spring. Variable credit. Prerequisite: permission of instructor.

Hours to be arranged. Staff.
Independent study for graduate students.
ARCH 899 M.A. Essay in the History of Architecture and Urbanism
Fall or spring. 4 credits.
Hours to be arranged. Staff.
Independent preparation of the M.A. essay, often developed from topics investigated in Arch 680.

## ARCH 999 Ph.D. Dissertation in the History of Architecture and Urbanism

Fall or spring. Variable credit.
Hours to be arranged. Staff.
Independent study for the doctoral degree.

## ART

J. N. Locey, chair; R. Bertoia, Z. Blum,
S. Bowman, N. D. Daly, V. G. Kord, E. Meyer,
E. Mikus, G. Page, B. Perlus, S. Poleskie,
J. L. Squier, W. S. Taft, K. WalkingStick,
G. S. White, and visiting critics.

## Undergraduate Program

The undergraduate curriculum in art, leading to the degree of Bachelor of Fine Arts, provides an opportunity for the student to combine a general liberal education with the studio concentration required for a professional degree. During the first three semesters all students follow a common course of study designed to provide a broad introduction to the arts and a basis for the intensive studio experience in the last three years. Beginning with the third term, students concentrate on painting, sculpture, photography, or printmak ing. They may elect additional studio work in any of these subjects during the last two years, with the consent of the instructor, providing the courses are taken in sequence and at the hours scheduled. These courses are designed to promote a knowledge and critical understanding of these arts and to develop the individual student's talent. All members of the faculty in the Department of Art are active, practicing artists, whose work represents a broad range of expression.
Studio courses occupy approximately one-half of the student's time during the four years at Cornell; the remainder is devoted to a diversified program of academic subjects with a generous provision for electives.
The curriculum in ant is an independent program of study within the College of Architecture, Art, and Planning. However, the intimate relationships between the fine arts and training in architecture and city planning is a source of special strength in the Cornell program and affords unusual benefits to the students in these three disciplines.
Although the undergraduate curriculum in art is an excellent background for a career in applied art and offers courses in the use of graphics in modern communications, no specific technical courses are offered in such areas as interior design, fashion, or commercial art.
The department discourages accelerated graduation. However, a student may petition
for consideration of early graduation by submission of a petition to the faculty before course enrollment in the spring semester of the student's junior year
A candidate for the B.F.A. degree who also wants to earn a Bachelor of Arts degree from the College of Arts and Sciences can arrange to do so. This decision should be made early in the candidate's career (no later than the third semester), so that he or she can petition to be registered in both colleges simultaneously. Each student is assigned an adviser in the College of Arts and Sciences to provide needed guidance. Those students who are interested primarily in the history rather than in the practice of art should apply for admission to the College of Arts and Sciences with the objective of pursuing a major in the Department of History of Art in that college. Department of Art studio courses may then be taken as electives.

The B.F.A. program is designed so that students may fulfill the degree requirements of 130 credits with a minimum of 66 credits taken in the Department of Art and a minimum of 55 credits taken outside the department. Within these ranges, students may design their own programs subject to the following limitations:

1) Students must plan their programs to complete 31 credits in one of the studio areas (painting, printmaking, sculpture, or photography), or 37 credits in a special concentration in multimedia. This multimedia program will enable students to fulfill concentration requirements by combining several studio disciplines including out-of-department studio courses such as those offered by the departments of music, theatre, and dance, etc. The dualconcentration requirement can be satisfied by taking 23 credits in one of the following studio areas: painting, photography, printmaking, or sculpture and 17 credits in any other area or drawing. Thesis and prethesis must be taken in the same area of concentration (i.e., 23 credits). All B.F.A. students must complete a senior thesis in one area of concentration and are required to participate in the Senior Exhibition.
Students must take four introductory courses in the disciplines of painting, printmaking, sculpture, and photography. They must also take three second-level courses from among the four disciplines. In the area of printmaking, the second-level requirement is fulfilled by taking a second introductory course in lithography, etching, or screen printing.
2) A minimum of 55 electives credits must be taken outside of the department. Students are required to take courses from among three groups which include: Physical and Biological Sciences (minimum of two courses, 6 credits); Social Sciences and History (minimum of three courses, 9 credits); and, Humanities and Expressive Arts (minimum of three courses, 9 credits). The History of Art requirement is 16 credits (four at three credits each and one fourcredit course). One course must be taken in each of the following areas:
Modern: 260, 265, 270, 361, 362, 364, 366, 367, 370, 376.
Non-Western: 280, 380, 381, 383, 384, 385, 386, 389, 396.

Renaissance and Baroque: 245, 341, 342, 343, $344,345,350,351,354,355$.

Classical: 220, 221, 320, 322, 323, 325, 327, 328, 329
Elective: Any art history elective at the 200 level or above or any archirectural history elective.
The university requirement of two terms in physical education must be met.
A candidate for the B.F.A. degree at Cornell is required to spend the last two terms of candidacy in residence at the university, subject to the conditions of the Cornell faculty legislation of November 14, 1962.
Students who transfer into the undergraduate degree program in art must complete a minimum of four terms in residence at Cornell and a minimum of 60 credits at the university, of which 30 credits must be taken in the Department of Art, including four terms of studio work. No student may study in absentia for more than two terms.

## Rome Program

Students in good standing who have completed the requirements of the first two years of the curriculum are eligible for participation in the Rome Program. Students are admitted to the program by application and review of their record. The Rome studio is offered by the Department of Art. Additional courses in art and architectural history, contemporary Italian culture, and Italian language are offered by other departments participating in the program.

## Curriculum

Students are expected to take an average course load of 16 credits per semester during their four years. They must complete a minimum of four introductory courses in painting, sculpture, printmaking, and photography and four in drawing by the end of the third year. All studio courses may be repeated for elective credit.

## First Year

Fall Term
Credits
111 Introductory Art Seminar
121 Introductory Painting
141 Introductory Sculpture

## 151 Drawing I

Art history elective
Elective (freshman writing seminar)

## Spring Term

One of the following:
110 Color, Form, and Space 131 Introductory Etching 132 Introductory Graphics 133 Introductory Lithography
152 Drawing II
161 Introductory Photography
Elective

## Second Year <br> Fall Term

Ant 2nd year studio 7-8
Art history elective
251 Drawing III

Elective(s)
-
3

## Spring Term

Art 2nd year studio 3-4
Art Studio (concentration)
Art history elective
252 Drawing IV
Elective(s)
16-17

## Third Year

Fall Term
Art studio (concentration) 4
311 Issues in Contemporary Art 3
Aft history elective
Electives

Spring Term
Art studio (concentration)
Art history elective
Electives
16-17

## Fourth Year

Fall Term

| Fourth-year studio concentration | 6 |
| :--- | ---: |
| Electives | 11 |
|  | 17 |

## Spring Term

Senior thesis studio concentration
Electives
10-11

## Graduate Program

The Master of Fine Arts program requires four terms of residence and sixty credits; it is intended for those who want to further their education as artists. Candidates must complete eighteen credits of course work in the history of art, either as a graduate or undergraduate student and must eam at least 12 credits for academic work outside the Department of Art.
Every M.F.A. candidate must (1) prepare a written thesis, (2) offer a thesis exhibition of studio work completed during residency, and (3) give an oral defense of the written thesis and exhibition. The written thesis may deal with the major concerns of the student's own work or with the aesthetic or historical issue in art. The oral defense of the written thesis is presented at the time of the thesis exhibition.
The art programs are housed in buildings that are open twenty-four hours a day (for students enrolled in our courses) and are near the Fine Arts Library (about 150,000 volumes) and the university's Herbert F. Johnson Museum of Art.

## ARCHITECTURE, ART, AND PLANNING - 1994-1995

Graduate students in the painting program work in private studios housed in Olive Tjaden Hall.
The sculpture program has its own building, a 45-by-180 foot converted foundry with 14 -foot ceilings and a bronze casting facility. Separate studios, complete gas- and arc-welding facilities, heavy-duty grinders, a drill press, a band saw, and a variety of portable power tools are provided.
In the printmaking program, students study in the various techniques, including relief, intaglio, lithography, serigraphy, and various photographic processes. Experiment and tradition, theory, history, and practice are part of the program. Printmaking program facilities are in Olive Tjaden Hall and include etching presses, lithographic presses, and proof presses.
The photography program involves the study of various photographic processes such as black and white, color, nonsilver, and largeformat, with emphasis on both aesthetics and technique. Photography facilities are located in Sibley Hall.

## Course Information

Most courses in the Department of Art are open to students in any college of the university who have fulfilled the prerequisites and who have permission of the instructor.
Fees are charged for all Department of Art courses. For fine arts majors the fee is $\$ 40$ each semester. Students from outside the department are charged $\$ 20$ a course. In addition, there are darkroom fees for all photography courses.
To take advantage of the special opportunities afforded by summer study, the department has developed several summer-only courses. Students wanting to satisfy Cornell degree requirements may petition to have these courses substituted for fall- or spring-term required courses.

## Courses in Theory and Criticism

## ART 110 Color, Form, and Space

Spring. 3 credits. Fall enrollment limited to B.F.A. candidates.

Hours to be arranged. N. Daly.
A study of traditional and contemporary ways of drawing and painting. An analysis of color theory and pictorial space.
ART 111 Introductory Art Seminar Fall. 1 credit. S-U only. Limited to B.F.A students.

Hours to be arranged.
Students meet each week with a different member of the faculty. The varying artistic interests of the faculty are presented and discussed.
ART 311 Issues in Contemporary Art Fall. 3 credits.

Hours to be arranged. S. Poleskie. A seminar course in issues of contemporary art, including lectures by visiting artists.
ART 317 Art in Rome: Early Christian to the Baroque Age
Fall. 4 credits.
E. Parloto or visiting faculty

General survey of the early Christian period to the fantastic vision of Piranesi in the eighteenth century. Special emphasis will be placed on the developments of the Renais-
sance and Baroque periods. Weekly lecture and field trips.

## ART 318 Art in Rome: Renaissance in Rome and Florence

## Spring. 4 credits.

Hours to be arranged. E. Parloto. A direct knowledge of art in its historical context is the aim of this course. Open both to students interested in history and to those concentrating on the visual impact of art. Included are lectures and field trips.

## ART 610 Seminar in Art Criticism

Fall or spring. 2 credits; may be repeated for credit. Four terms required for M.F.A.

## candidates.

Hours to be arranged. V. Kord. Historical and modern critical opinions and their relation to problems in the theory of art are studied.

## Studio Courses in Painting

## ART 121 Introductory Painting

Fall, spring, or summer. 3 credits.
Hours to be arranged. Staff.
An introduction to the problems of artistic expression through the study of pictorial composition; proportion, space, shapes, and color as applied to abstract and representational design.

## ART 123 Landscape Painting

Summer. 3 credits.
Class meets outdoors at selected sites in the Ithaca area. A different motif is explored each week. Pen, pencil, and water- or oil-based colors (optional) are the materials employed. Analysis and discussion of the landscape work of Corot, Cezanne, van Gogh, Seurat, and others are included.

## ART 124 Painting and Drawing

Variable credit (maximum 5). Summer only A special summer abroad course with emphasis on artistic expression and techniques, for students at all levels of skill. Included will be a mixture of painting and drawing assignments, self-initiated projects, and drawing sessions with a live model.

## ART 221 Painting II

Fall or spring. 4 credits. Prerequisite: Art 121 or permission of instructor.

Hours to be arranged. Staff.
A continuation of Art 121.

## ART 321 Painting III

Fall. 4 credits. Prerequisite: Art 221 or permission of instructor.

Hours to be arranged. Staff. Continued study of the principles of painting and the selection and expressive use of materials and media. Group discussions and individual criticism.

## ART 322 Painting IV

Spring. 4 credits. Prerequisite: Art 321 or permission of instructor.

Hours to be arranged. Staff.
Continued study of the principles of painting and the selection and expressive use of materials and media. Group discussions and individual criticism.

## ART 421 Painting $V$

Fall. 6 credits. Prerequisite: Art 322 or permission of instructor.

Hours to be arranged. Staff. Further study of the art of painting through both assigned and independent projects executed in various media. Instruction
through group discussions and individual criticism.
ART 422 Senior Thesis in Painting
Fall or spring. 6 credits. Prerequisite: Art 321 or 322 or permission of instructor.

Hours to be arranged. Staff. Advanced painting project to demonstrate creative ability and technical proficiency.

## ART 721-722, 821-822 Graduate

## Painting

721 and 821, fall; 722 and 822, spring. Credit as assigned. May be repeated for credit. Limited to M.F.A. students in painting. Staff.
Students are responsible, under staff direction, for planning their own projects and selecting the media in which they are to work. All members of the staff are available for individual consultation.

## Studio Courses in Graphic Arts

## ART 131 Introductory Intaglio

Fall, spring, or summer. 3 credits.
Hours to be arranged. E. Meyer. A basic introduction to etching techniques, with emphasis on engraving, lift ground, relief printing, monotypes, and experimental techniques.
ART 132 Introductory Graphics
Fall, spring, or summer. 3 credits.
Hours to be arranged. S. Poleskie. An introduction to the two-dimensional thought process and the language of vision. Students will explore design projects and the use of graphic materials, including collage, pochoir, and screen printing.
ART 133 Introductory Lithography
Fall, spring, or summer. 3 credits.
Hours to be arranged. G. Page.
The theory and practice of lithographic printing, using limestone block and aluminum plate. Basic lithographic techniques of crayon, wash, and transfer drawing are studied.

## ART 231 Intaglio Printing II

Fall or spring. 4 credits. Prerequisite: Art 131 or permission of instructor.

Hours to be arranged. E. Meyer.
Continuation of the study and practice of methods of intaglio printing, with emphasis on techniques and color.

## ART 232 Advanced Screen Printing (Book Arts)

Spring. 4 credits. Prerequisite: Art 132 and Art 161 or permission of instructor.

Hours to be arranged. S. Poleskie. Students will expand their knowledge of screen printing to include photo stencil and printing on diverse materials such as cloth and plastic with the goal of producing a book or a portfolio of prints by the end of the semester.

## ART 233 Lithography II

Fall or spring. 4 credits. Prerequisite: Art 133 or permission of instructor.

Hours to be arranged. G. Page.
Continuation of the study and practice of lithographic printing, with emphasis on color.

## ART 331 Printmaking IHI

Fall or spring. 4 credits. Prerequisite: Art 231, 232, or 233 or permission of instructor.

Hours to be arranged. Staff. Study of the art of graphics through both assigned and independent projects. Work may concentrate in any one of the graphic media or in a combination of media.

ART 332 Printmaking IV
Fall. 4 credits. Prerequisite: Art 331 or permission of instructor.

Hours to be arranged. Staff.
Continuation and expansion of Art 331.

## ART 431 Printmaking V

Spring. 6 credits. Prerequisites: Art 332 or permission of instructor.

Hours to be arranged. Staff. Further study of the art of graphics through both assigned and independent projects executed in various media. Instruction through group discussions and individual criticism.

## ART 432 Senior Thesis in Printmaking

Fall or spring. 6 credits. Prerequisite: Art 331 or 332 or permission of instructor.

Hours to be arranged. Staff.
Advanced printmaking project to demonstrate creative ability and technical proficiency.

## ART 731-732, 831-832 Graduate Printmaking

731 and 831 , fall; 732 and 832, spring. Credit as assigned; may be repeated for credit. Limited to M.F.A. candidates in graphic arts. Prerequisite: permission of instructor. Staff.
Students are responsible, under staff direction, for planning their own projects and selecting the media in which they will work. Members of the staff are available for consultation; discussion sessions of work in progress are held.

## Studio Courses in Sculpture

ART 141 Introductory Sculpture
Fall, spring, or summer. 3 credits.
Hours to be arranged. Staff.
A series of studio problems introduce the student to the basic considerations of artistic expression through three-dimensional design, i.e., modeling in Plasteline, building directly in plaster, casting in plaster, and constructing in wood and metal.

## ART 141 Introductory Sculpture: Figurative Sculpture

## Summer. 3 credits.

Hours to be arranged. R. Berotia. This course will introduce students to the figure by working directly from observation. Students will learn the basics of modeling in clay, making plaster molds, and casting in plaster. Daily hands-on demonstrations and slide lectures will provide a historical overview. Open enrollment.
ART 141 Introductory Sculpture: Metal Fabrication and Bronze Casting

## Summer. 3 credits.

Hours to be arranged. G. S. White This course will introduce students to materials, techniques, and processes associated with metal fabrication and bronze casting. Through a series of assignments, students will explore the unique character of metals.

## ART 241 Sculpture II

Fall or spring. 4 credits. Prerequisites: Art 141 or permission of instructor.

Hours to be arranged. Staff. Various materials, including clay, plaster, wood, stone, and metal, are used for exercises involving figurative modeling, abstract carving, and other aspects of three-dimensional form and design. Beginning in the second year, students are encouraged to explore the bronze casting process. The sculpture program,
which is housed in its own building, contains a fully equipped bronze casting foundry.

## ART 341 Sculpture III

Fall. 4 credits. Prerequisite: Art 241 or permission of instructor.

Hours to be arranged. Staff.
Continued study of the principles of sculpture and the selection and expressive use of materials and media. Group discussions and individual criticism.

## ART 342 Sculpture IV

Spring. 4 credits. Prerequisite: Art 241 or permission of instructor.

Hours to be arranged. Staff.
Continuation and expansion of Art 341.
ART 441 Sculpture $V$
Fall. 6 credits. Prerequisite: Art 341, 342 or permission of instructor.

Hours to be arranged. Staff.
Further study of the art of sculpture through both assigned and independent projects executed in various media. Instruction through group discussions and individual criticism.

## ART 442 Senior Thesis in Sculpture

Fall or spring. 6 credits. Prerequisite: Art 341 or 342 or permission of instructor.

Hours to be arranged. Staff. Advanced sculpture project to demonstrate creative ability and technical proficiency.

## ART 741-742, 841-842 Graduate Sculpture

741 and 841 , fall; 742 and 842 , spring. Credit as assigned. May be repeated for credit. Limited to M.F.A. students in sculpture. Staff.
Students are responsible, under staff direction for planning their own projects and selecting the media in which they are to work. All members of the staff are available for individual consultation. Weekly discussion sessions of works in progress are held.

## Studio Courses in Photography

Darkroom fees for all photography courses
Fee for $\mathrm{B} \& \mathrm{~W}$ courses: $\$ 70.00$
Fee for color courses: $\$ 150.00$
Fee for an additional B \& W course taken the same term: $\$ 25.00$
Fee for an additional color course taken the same term: $\quad \$ 105.00$
Out-of-college students-\$10 per term course fee.

ART 161 Photography I (also Architecture 251)
Fall, spring, or summer. 3 credits Hours to be arranged. Staff.
A basic lecture-studio course in black and white photography for beginners. Emphasis is on basic camera skills, darkroom techniques, and understanding of photography imagery.

## [ART 166 Introduction to Photography

 for Non-MajorsNot offered 1994-95.]

## ART 167 Photography

Variable credit (maximum 5). Summer only. A special summer-abroad course with emphasis on both the techniques and aesthetics of black-and-white photography, for students at all levels of skill. Initial photographic assignments will be followed by other projects of the student's own choosing.

ART 168 Black-and-White Photography Summer. 3 credits.
Intended for students at all levels, from introductory to advanced. Emphasis on camera skills, darkroom techniques, and the content of black-and-white photographic imagery.

## ART 169 Color Photography

Summer. 3 credits.
Intended for students at all levels, from introductory to advanced. Emphasis on camera skills, darkroom techniques, and the content of color photographic imagery.

## ART 261 Photography II (also

 Architecture 351)Fall, spring, or summer. 4 credits. Prerequisites: Art 161 or Architecture 251, or permission of instructor.

Hours to be arranged. Staff. A continuation of Photography I concentrating on black and white photographic processes, history and theory of creative practice, and individual projects.

## ART 263 Color Photography

FalI, spring, or summer. 4 credits. Prerequisites: Art 161 or permission of instructor.

Hours to be arranged. Staff. A studio course in color photography with emphasis on camera skills, darkroom techniques, and the content of color photography.

## ART 264 Photo Processes

Fall or spring. 4 credits. Prerequisite: Art 161 or permission of instructor.

Hours to be arranged. Staff. A studio course in alternate and nonsilver photographic, processes. Emphasis is on camera skill, basic techniques and processes, image content, and creative use of photo processes.

## ART 265 Studio Photography

Fall or spring. 4 credits. Prerequisite: Art 161 or permission of instructor.

Hours to be arranged. Staff. A course in the use of medium- and largeformat cameras that explores technique, lighting, and the use of larger-format cameras for personal expression both in the studio and outdoors.

## [ART 361 Photography III

Fall, spring, or summer. 4 credits. Prerequisite: Art 161, 261, or permission of instructor. Not offered 1993-94.

Hours to be arranged. Staff. Continued study of creative use of photography, with emphasis on specialized individual projects.]

## [ART 362 Photography IV

Fall, spring, or summer. 4 credits. Prerequisite: Art 161, 261 or permission of instructor. Not offered 1994-95.

Hours to be arranged. Staff. Continued study of creative use of photography, with emphasis on specialized individual projects.]

## ART 379 Independent Studio

Summer. Credit by arrangement.
Hours by arrangement. Staff. Students who have the interest and ability to progress beyond the problems of their particular course may register for additional credits. Students plan courses of study or projects that must meet the approval of the instructors they have selected to guide their progress and criticize the results. A course fee may be charged.

ART 461 Photography V
Fall. 6 credits. Prerequisite: Art 361 or permission of instructor.

Hours to be arranged. Staff. A studio course intended for photography majors and other qualified students.

ART 462 Senior Thesis in Photography Fall or spring. 6 credits. Prerequisite: Art 461 or permission of instructor.

Hours to be arranged. Staff. A studio course intended for photography majors and other qualified students. Advanced photography project to demonstrate creative ability and technical proficiency.

## ART 751-752, 851-852 Graduate Photography

751 and 851 , fall; 752 and 852 , spring. Credit as assigned. May be repeated for credit. Limited to M.F.A. students in photography. Prerequisite: permission of instructor. Staff.
Students are responsible, under staff direction, for planning their own projects and selecting the media in which they will work. Members of the staff are available for consultation. Discussion sessions of work in progress are held.

## Studio Courses in Drawing

ART 151 Drawing I
Fall, spring, or summer. 3 credits.
Hours to be arranged. Staff. A course that is general in nature and introduces students to principles and techniques of representation. Emphasis will be on creating the illusion of space and form through line, the rendering of light and shade, and studies in perspective. In addition, the student will have the opportunity to explore various media such as charcoal, chalk, pencil, pen, ink and wash, etc.

## ART 152 (251) Drawing II

Fall or spring. 3 credits. Prerequisite: Art 151.

Hours to be arranged. Staff. A general course in drawing that will emphasize figure study and life drawing. This course will build on the foundation of Art 151 concentrating on the analytical study of the figure. Students will explore a variety of materials, traditional and contemporary.

## ART 158 Conceptual Drawing

Summer. 3 credits.
Emphasis on drawing from the imagination. The generation of ideas and their development in sketches is stressed. The intent is not to produce finished art but rather to experience a series of problems that require image and design concepts different from those of the artist working directly from nature.

## ART 159 Life and Still-Life Drawing

Summer. 3 credits.
The human figure and still life are studied both as isolated phenomena and in relation to their environment. Focuses on helping the student observe and discover.

ART 251 (351) Drawing III
Fall or spring. 3 credits. Prerequisites: Art 152.

Hours to be arranged. Staff. An intermediate drawing course in which students will study composition, the articulation of form, and the illusion of space in a variety of materials. Expressive content, conceptualization, and the exploration of materials will be stressed.

ART 252 Drawing IV
Fall or spring. 3 credits. Prerequisites: Art 251.

Hours to be arranged. Staff. Advanced drawing with an emphasis on life drawing and figure composition. Individual expression will be encouraged along with creative investigation of materials and processes.

## ART 352 Anatomy for Artists

Spring. 3 credits. Prerequisites: Art 151, 159, and 251 or permission of instructor.

Hours to be arranged. S. Taft.
Develops basic understanding of the structure of the human figure as it is relevant to artists through an in-depth study of the skeleton and muscle-tendon system. Focuses on improving understanding and skill in design and observation, as well as gaining an understanding of how the materials may be relevant to making art through the study of works by the masters.

## Graduate Thesis

ART 712 Graduate Thesis
Spring. Credit as assigned.
Staff.
For graduate students in their last term in the programs in painting, sculpture, printmaking, and photography.

## Special Studio Courses

## ART 171 Computer Art I

[Fall], spring, or summer. 3 credits. Hours to be arranged. S. Bowman. A studio course in the use of the computer as a tool for making art. Introduction to microcomputers and various graphic programs, image grabbing, and 2-d animation.

## ART 172 Computer Art II

Fall, spring, or summer. Prerequisite: Art 171 or permission of instructor.

Hours to be arranged. S. Bowman. A continuation of Art 171, with introduction to graphics programs in multimedia, on Macintosh II systems. Emphasis is on combining graphics, grabbed imagery, with 2d and 3 d animation and sound, with output to video.

## ART 372 Special Topics in Art Studio

 Fall, spring, or summer. Variable credit.Hours to be arranged. Staff.
An exploration of a particular theme or project.

## ART 400 Rome Studio

Fall or spring. 4 credits. Prerequisite: permission of instructor. Staff.
The content for the Rome studio will be determined by the instructor. Emphasis will be divided between work accomplished in the studio and work executed outdoors in the environs of Rome. Media will consist primarily of painting, drawing, sculpture, and photography, or those assigned by the instructor.

## ART 472-476 Independent Studio

Fall, spring, or summer. Variable credit (maximum, 4). Students may register for two studios in a semester. May be repeated for credit. Prerequisite: written permission of instructor.

Department staff.
ART 472 Independent Studio - Painting

ART 473 Independent Studio - Graphics, Lithography, Intaglio
ART 474 Independent Studio - Sculpture
ART 475 Independent Studio - Drawing
ART 476 Independent Studio Photography

## ART 481 Pre-Thesis/Multi Media

Fall or spring. 6 credits. Prerequisite: permission of instructor.

Hours to be arranged. Staff.
Students are responsible, under staff direction, for planning their own projects and selecting the media in which they will work. The projects should reflect experiences gained by exploring and combining various media including those taken in studio courses outside the department.

## ART 482 Senior Thesis/Multi Media

Fall or spring. 6 credits. Prerequisite: 481 or permission of instructor.

Hours to be arranged. Staff. Students are responsible, under staff direction, for planning their own projects and selecting the media in which they will work. The projects should reflect experiences gained by exploring and combining various media including those taken in studio courses outside the department.

## CITY AND REGIONAL PLANNING

R. S. Booth, chair; S. Baugher, L. Beneria, S. Christopherson, P. Clavel, J. Cody, S. Czamanski (emeritus), M. Drennan, J. F. Forester, W. W. Goldsmith, W. Isard, B. G. Jones, B. Kelly (emeritus), D. Lewis, P. Olpadwala, K. C. Parsons, J. W. Reps (emeritus), S. Saltzman, S. W. Stein (emeritus), M. A. Tomlan, R. T. Trancik, T. Vietorisz (visiting), M. Wilder
The department offers several programs of study at both the undergraduate and graduate levels.

## The Undergraduate Program in Urban and Regional Studies

The Program in Urban and Regional Studies (URS) is a four-year academic program aimed at assessing the problems of human communities and regions. Students graduating from the program receive a Bachelor of Science degree. The program is intended to provide both an excellent liberal arts education and a strong concentration of studies respecting urban and regional issues. The urban and regional studies courses in the program are designed to provide students a broad understanding of relevant issues, ability to assess those issues, and technical analysis skills. The URS Program is truly interdisciplinary, requiring students to confront urban and regional problems from a variety of perspectives and through the analytic tools of different disciplines.

## Basic Degree Requirements (Applicable through the Class of 1995)

1) General education (during the first four terms)
a. Freshman writing seminars: 6 credits
b. Foreign language: qualification in one foreign language
c. An approved course sequence (minimum of 6 credits) in each of the five categories below: 30 credits
1. a. Biological sciences or
b. Physical sciences
2. a. Social sciences (other than economics) or
b. History
3. a. Humanities or
b. Expressive arts or design arts
4. Mathematics
5. Economics
2) Major concentration: 50 to 52 credits
a. Specific course requirements ( 38 to 40 credits)

CRP 100, The American City
CRP 101, The Global City
CRP 314, Planning, Power, and Decision Making, or Government 311, Urban Politics
CRP 315, The Progressive City
CRP 320, Introduction to Statistical Reasoning for Urban and Regional Analysis
CRP 321, Introduction to Quantitative Methods for the Analysis of Public Policy
CRP 361, Seminar in American Urban History, or History 332 or 334, The Urbanization of American Society
CRP 400, Introduction to Urban and Regional Theory
CRP 401, Urban Political Economy
CRP 480, Environmental Politics
CRP 481, Principles of Spatial Design and Aesthetics
CRP 482, Urban Land Use Concepts
b. Directed electives (related to urban and regional studies): 12 credits (at least 6 credits to be taken outside CRP)
3) Free electives: 26 to 28 credits
a. 12 credits during first four terms
b. 14 to 16 credits during last four terms

Required courses for graduation: 34
Required Credits: 120
The university requirement of two terms of physical education must be met during the first two terms.

Basic Degree Requirements (beginning with students in the Class of 1996 and thereafter) URS students who enter after the fall 1992 semester have to complete the following requirements for graduation:
Requirements for Graduation: URS requirements include (1) eight semesters of residence, (2) 120 credits, (3) two freshman seminars, (4) qualification in one foreign language, (5) four groups of distribution requirements, (6) required courses for major, (7) area requirements for major, (8) free electives, (9) a minimum of 34 courses. The university requires students to complete two semesters of physical education.

1) General education
a. Freshman writing seminars: 2 courses
b. Foreign language: 3 courses or qualification in one foreign language
c. Distribution Requirements: 9 courses

Students must take a total of nine courses for the distribution requirement: four courses (of three or more credits each) from Groups 1 and 2, at least two of which are from Group 1, and at least one of which is from Group 2; five courses from Groups 3 and 4, with at least two in each group and two in the same department. No single course may satisfy more than one distribution requirement. URS students must utilize the College of Arts and Sciences designation of specific courses that may be taken to meet the requirements for groups 1-4.
Group 1: Physical and biological sciences ( $2-3$ courses required)
Group 2: Quantitative and formal reasoning (1-2 courses required)
Group 3: Social sciences and history (2-3 courses required)
Group 4: Humanities and the arts (2-3 courses required)

## Advanced Placement Credit

Students may apply up to two courses of approved advanced placement credit in calculus, computer science, and science toward satisfaction of the distribution requirement in Groups 1 and 2 above, provided that they complete at least one science course during their undergraduate career. They may apply no advanced placement credit toward satisfaction of the distribution requirement in Groups 3 and 4. Grades of S-U courses applied to distribution requirements are acceptable.
2. Required Courses for Major: 5 courses

CRP 100: The American City
CRP 101: The Global City: People, Production, and Planning in the Third World
CRP 320: Introduction to Statistical Reasoning for Urban and Regional Analysis (statistics course)
Micro Economics course (at least 3 credits, from approved list)
Architecture course (at least 3 credits, from approved list)

## Approved List of Micro Economics and

 Architecture CoursesMicro Economics:
CE\&H 110: Introductory Micro Economics
CE\&H 210: Intermediate Micro Economics
ECON 101: Introduction to Micro Economics
ECON 203: Micro Economics
ECON 313: Intermediate Micro Economics
Architecture:
ARCH 131: An Introduction to Architecture I
ARCH 132: An Introduction to Architecture II
ARCH 181: History of Architecture I
ARCH 182: History of Architecture II
3. Area Requirements for Major: 11 courses
A. Students must take one listed CRP course in each of the following 6 areas: Design, Economics, Environment, History, Politics/Policy, Quantitative Analysis

## a. Design

CRP 415: Gender Issues in Planning and Architecture
CRP 481: Principles of Spatial Design and Aesthetics

CRP 482: Urban Land Use Concepts
b. Economics

CRP 218: Economics of Gender
CRP 400: Introduction to Urban and Regional Theory
CRP 401: Seminar in Urban Political Economy
CRP 404: Urban Economics
CRP 417: Industrial Restructuring;
Implications for State and Local Policy
NOTE: This requirement may not be satisfied with the same course taken to complete the micro-economics course requirement under $B$.
c. Environment

CRP 387: Urbanization and the Environment
CRP 451: Environmental Law
CRP 480: Environmental Politics
d. History

CRP 261: Urban Archaeology
CRP 360: Pre-Industrial Cities and Towns of North America
CRP 361: Seminar in American Urban History
CRP 461: Methods of Archival Research
CRP 462: The American Planning Tradition
e. Politics/Policy

CRP 314: Planning, Power, and Decision Making
CRP 315: The Progressive City
CRP 363: American Indians, Planners, and Public Policy
CRP 382: Urban Housing: Sheltered vs. Unsheltered Society
CRP 413: Planning and Political Economy I
CRP 414: Planning and Political Economy II
CRP 448: Social Policy and Social Welfare
f. Quantitative Analysis

CRP 321: Introduction to Quantitative Methods for the Analysis of Public Policy
CRP 421: Introduction to Computers in Planning
A. Students must take any additional 5 CRP courses (of at least 3 credits each)
4. Free Electives: 6-9 courses
5. Physical Education (2 terms of PE)

Required courses for graduation: 34
Required credits: 120

## Honors Program

Each year a small number of well-qualified junior-year students will be accepted into the honors program. Each honors student will develop and write a thesis under the guidance of his or her faculty adviser. There will be a seventy-five-page limit on each honors thesis.

## Off-Campus Opportunitles

Cornell-in-Washington Program. Students in good standing may be eligible to earn degree credits in the Comell-in-Washington program through course work and an urbanoriented externship in Washington, D.C. Students may work as externs with congressional offices, executive-branch agencies, interest groups, research institutions, and other organizations involved in the political process and public policy. Students also select one or two other seminars from such fields as government, history, economics, human development, architectural history, natural resources, and social policy. All seminars are taught by Cornell faculty members and carry appropriate credit toward fulfillment of major, distribution, and other academic requirements.
Cornell Abroad. Cornell encourages qualified undergraduates to study abroad in the belief that exposure to foreign cultures is an important component of a good education. In an increasingly interdependent world, the experience of living and learning in a foreign country is invaluable. With this in mind, the university is continuing to develop study abroad opportunities. Current programs are available in Great Britain, Spain, and Germany. Opportunities in Asia, the Mideast, and France should be forthcoming. The department encourages its students to explore these opportunities.
Cornell-in-Rome Program. The College of Architecture, Art, and Planning has a teaching facility in Rome located in the sixteenthcentury Palazzo Massimo. Students in good standing are eligible to eam degree credits through course work undertaken with Cornell faculty assigned to Rome and with accredited instructors. Courses are available in areas of urban development, regional development, and architecture and art.
Research and fieldwork. Students are welcome to work with department faculty members on research or other opportunities that are appropriate to their particular interests. Fieldwork and community-service options also exist for students in the Urban and Regional Studies Program.

## Additional Degree Options

Linked degree options. Urban and regional studies students have the opportunity to earn both a Bachelor of Science degree and a Master of Regional Planning (M.R.P.) degree in a fifth year of study. Ordinarily the professional M.R.P. degree requires two years of work beyond that for the bachelor's degree. This arrangement shortens that time by about one year. A minimum of 30 credits and a master's thesis or thesis project are required for the M.R.P. degree. Students apply to the Graduate School, usually in the senior year.
Dual degree option. A student in the Comell College of Arts and Sciences currently can eam both a B.A. in an arts college major, plus a B.S. in urban and regional studies in a total of five years. Special requirements have been established for this dual degree program.

Comell students interested in pursuing the dual degree program should contact either the director of the Urban and Regional Studies Program or the appropriate dean of the College of Arts and Sciences for further information.

## Admissions Requirements and Procedures

Among the most important criteria for admission to the Urban and Regional Studies Program are intellectual potential and commitment-a combination of ability, achievement, motivation, diligence, and use of educational and social opportunities. Nonacademic qualifications are important as well. The department encourages students with outstanding personal qualities, initiative, and leadership ability. Above all, the department seeks students with a high level of enthusiasm and depth of interest in the study of urban and regional issues. Applicants must complete a university admission application.

## Transfer Students

In most cases, transfer applicants should no longer be affiliated with a high school and should have completed no fewer than 12 credits of college or university work at the time of application. A high school student who has completed graduation requirements at midyear and is taking college courses for the rest of the academic year should apply as a freshman. Prospective candidates who believe that their circumstances are exceptional should consult with the director of admissions in the Comell division of interest to them before filing an application.
Forms for transfer application and financial aid are available from the Comell University
Office of Admissions, 410 Thurston Avenue, Ithaca, New York 14850-2488. Official transcripts of all high school and college work must be submitted along with SAT or ACT scores and letters of recommendation.
It is desirable for prospective transfers to have taken at least 6 credits in English. In addition, students should have taken basic college-level courses distributed across the natural and social sciences, humanities, and mathematics. Those applicants whose previous course work closely parallels the general education portion of the urban and regional studies curriculum will have relative ease in transfer. However, as there are no specific requirements for transfer, students with other academic backgrounds, such as engineering, architecture, fine arts, management, and agriculture, are eligible to apply.
Although an interview is not required, applicants are urged to visit the campus. Applicants who want further information regarding urban and regional studies may contact Professor Richard S. Booth, Program Director, Urban and Regional Studies, Cornell University, 106 West Sibley Hall, Ithaca, New York 14853-6701 (telephone: 607-255-4613).

## The Graduate Program in City and Regional Planning

The major concentrations of course work in city and regional planning are in the following areas:
Built environment and urban development planning is concerned with physical facilities; the social, economic, and environmental forces that affect their design; and the process of development, plan making and administration.

History and historic preservation planning is a special program of study preparing students for work in history, analysis, and preservation of buildings, urban environments, and neighborhoods, including downtown business areas.
Regional planning and regional science are concerned with socioeconomic issues and functional planning at the regional level, the forces that generate economic growth and social development, and the ways in which resources can best be used.
Local and regional economic development is concerned with understanding and influencing how economic change may be hamessed to the benefit of communities, counteracting plant closings and more general regional decline and stimulating more equitable programs of socioeconomic change and development.
International planning offers a broad range of courses in international economic development, development planning, and political economy.

Quantitative methods and policy analysis courses are offered to prepare planners and researchers for a variety of situations and problems.
Complementing these concentrations, planning theory and political economy courses examine the organizational and planning processes and the political and economic conditions in which planning and international development operate.
Several graduate degrees are offered: the Ph.D.; the Master of Regional Planning (M.R.P.), for a two-year program; the Master of Arts (M.A.) in historic preservation planning, for a two-year program; and, in special cases, the Master of Professional Studies (International Development) [M.P.S.(I.D.)], for the twelve-month international planning program.

## Off-Campus Opportunities

Rome Program. Graduate students have the opportunity to spend one or two semesters in Rome, studying at Cornell's center at the Palazzo Massimo. Instruction is given by Cornell professors-in-residence and by other faculty. The program is structured to include work assignments in one of the international development organizations headquartered in Rome.

## Course Information

Most courses in the Department of City and Regional Planning are open to students in any college of the university who have fulfilled the prerequisites and have the permission of the instructor.
The department attempts to offer courses according to the information that follows. However, students should check with the department at the beginning of each semester for late changes.

## Undergraduate Program in Urban and Regional Studies

CRP 100 The American City
Fall. 3 credits.
Staff.
An introductory course on the evolution of urban problems and opportunities facing the majority of this country's population as we approach the last decade of the twentieth
century. Readings, discussions, and brief papers exploring topics ranging from suburban development to central city poverty, from environmental threats to downtown revitalization, and from municipal finance to the new position of women in the urban economy.

## CRP 101 The Qlobal City: People, Production, and Planning In the Third World

Spring. 3 credits.
P. Olpadwala

A critical look at the physical and social development of giant cities in the Third World. Their origins, roles, contributions, and shortcomings are examined. Their place in world political economy is evaluated. Policy prescriptions for their principal problems are discussed.

## [CRP 108 FWS: Environment and Soclety:

 The Delicate BalanceFall. 3 credits. Not offered 1994-95. Staff.
This freshman writing seminar addresses the delicate balance that must be maintained between societal needs and demands and environmental quality. It uses several important texts that examine and challenge society's widespread and deep-rooted tendencies to ignore the social, economic, and environmental consequences of degrading the natural environment. Students work
extensively on improving writing skills.]

## [CRP 109 FWS: In Search of American

 CltiesSpring. 3 credits. Not offered 1994-95. Staff.
An unusual course structure is used to give students broad exposure to ongoing changes in the social, political, economic, and physical character of U.S. cities. Each week students will "visit" a different city by way of readings, oral presentations, discussions, and brief papers that touch on major aspects of the city's economic, social, and political history; the city's physical character and regional context; and recent planning or policy issues.]

## CRP 261 Urban Archaeology (also LA

 261)Fall. 3 credits
S. Baugher

Urban archaeologists study both urban development and the pre-urban past that lies within the present boundaries of cities. Thus not all archaeology in a city is of a city. While several centuries of urban development are often found at the upper level of archaeological sites, lower horizons often reveal cultural diversity. This course will examine the methods and unique political and economic problems associated with excavating in urban environments while exploring the commercial, industrial, residential, and transportationrelated sites found in modern cities. An introductory course, designed for undergraduates.

## CRP 271 Introduction to African Development (also ASRC 271)

Fall or spring. 3 credits.
Staff.
A survey of development problems in SubSaharan Africa, including the importance of the natural resource base, the policy and institutional factors affecting development, and the human resource potential in the continent.

## CRP 314 Planning, Power, and Deciaion

 MakingFall. 3 credits
J. Forester.

This seminar examines various bases of political and professional power. We ask, What do professionals who want to serve the public need to know about power and decision-making processes in the institutional settings in which they operate? How and why can professionals make a difference when facing problems characterized by great complexity and severe inequalities among affected groups?

## CRP 315 The Progressive City

Spring. 3 credits
P. Clavel

A review of attempts to incorporate the interest of working-class and poor constituencies through majority control of local governments. Topics to be covered include the role of the city in class formation; historical perspectives on urban political administration; contemporary populist, socialist, and progressive urban governments and the search for an economic basis for progressive reforms.
CRP 320 Introduction to Statistical Reasoning for Urban and Regional Analysis
Fall. 3 credits.
S. Saltzman.

An introduction to the role and use of quantitative methods in the study of urban and regional issues. Emphasis will be on statistical and related computer methods for the formulation, analysis, and testing of hypotheses and models of social, economic, and physical phenomena of cities and regions. This course will cover applicable methods in probability, descriptive statistics, estimation, hypothesis testing, and regression.

## CRP 321 Introduction to Quantitative Methods for the Analysis of Public

 PolicySpring. 3 credits
M. Drennan.

An introduction to the role and use of quantitative methods in the study of urban and regional issues. This course will focus on various types of models commonly used to analyze urban and regional policy, including techniques for decision analysis, linear programming, cost-benefit analysis, simulation, and regression models, among others. Strengths and weaknesses of those methods will also be considered

CRP 360 Pre-Industrial Cities and Towns of North America (also CRP 666, LA 360, and LA 666)
Spring. 3 credits. S-U grades optional S. Baugher

The pre-industrial approaches to the founding, design, and development of towns and cities in North America until 1815 demonstrate how various American Indian civilizations as well as diverse European cultures have each brought their perspectives to the organization of town and city living. American Indian case studies will include Mayan and Aztec cities, the city of Cahokia, and the towns of the Pueblos, Creeks, and Iroquois. The experiences of Europeans in North America will include Spanish, French, Dutch, and English. This course is a recommended complement to CRP 361

## CRP 361 Seminar in American Urban History (also CRP 662)

Spring. 3 credits. Prerequisite: permission of instructor

Staff.
Seminar in the historical evolution of the American city. Emphasis on factors in urban growth, the process of urbanization, the urban reform movement, and intellectual and social responses to the city

CRP 363 American Indians, Planners, and Public Policy (also CRP 547 and LA 363)
Spring. 3 credits. S-U grades optional. S. Baugher.

Contemporary American Indian people, their reservations, and their cultural heritages are all affected, often adversely, by decisions made by public agencies and private enterprise. To benefit non-Indian cities and economic growth, reservations are sometimes flooded, polluted, strip-mined, and deforested. Archaeological sites and burial grounds are often destroyed. The central focus of the course is how to address urban and regional problems without imperiling the cultural survival of minorities.

CRP 382 Ußan Housing: Sheltered vs. Unsheltered Society (also CRP 582)
Fall. 4 credits.
Staff
Homelessness is the latest in a continuing list of terms to describe unmet housing needs. To understand how and why such needs persist, even in good economic times, one must examine the nature of interactions between housing policies and housing market forces. This course examines the complex interaction of public and private actions in the development and redevelopment of urban housing. More specifically, the course seeks to investigate the many ways in which private and public policy decisions determine which groups in society will have access to housing. This course is appropriate for students with an interest in urban housing and a background in any of the following areas: urban economics, urban sociology, anthropology, history, or geography. The course will consist of lectures, a wide variety of readings, and guest speakers. Students will be evaluated on the basis of class discussions, two exams, a 15-20 page paper, and an oral presentation

## CRP 400 Introduction to Urban and Regional Theory

Fall. 4 credits. Open to juniors and seniors B. G. Jones.

Introductory review of theories dealing with the spatial distribution of population and economic activity, drawn from various social science disciplines such as geography, economics, and sociology. Review of recent research dealing with such topics as population distribution, migration, location of industry and economic activity, and the spatial organization of urban and regional social systems.

## CRP 401 Seminar in Urban Political Economy

Spring. 4 credits. Prerequisites: introductory economics or sociology; for URS students, CRP 400 also.
W. W. Goldsmith

The world economy, the global city, and social change. Population, technology, and work in industrial and developing countries Race, ethnicity, and nationality. Profits, subsistence, and poverty. Students may read
and direct discussions on outstanding texts, write book reviews, and prepare brief reports.

## CRP 404 Urban Economics (also CRP 604)

Fall or spring. 4 credits. Prerequisite: basic economics.

Staff
Urban phenomena are analyzed from an economic point of view. Areas examined include economic aspects of urbanization processes and policies, determinants of urban growth and decline, urban land and housing markets, urban transportation, and urban public services. Some time will be spent in discussing problems of cities in developing countries.

## [CRP 415 Gender Issues in Planning and

 ArchitectureSpring. 3 or 4 credits. Not offered 1994-95.]
[CRP 417 Industrial Restructuring: Implications for State and Local Policy (also CRP 517)
Fall. 4 credits. Not offered 1994-95 S. Christopherson.

A basic introduction to new issues arising from the way in which national and international economic shifts are affecting diverse United States localities. The course will focus on intra-industry restructuring, the location of economic activities, and state and local economic policy. Cases will be drawn from a variety of industries and national situations, with specific application to New York and other Northeast locations.]
CRP 421 Introduction to Computers in Planning (also CRP 522)
Fall. 4 credits.
Staff.
Students learn how to use microcomputers and software packages in the planning and problem-solving processes. Included are word processing, spreadsheets, mapping, and other types of packages that are useful for other classes and for professional work in the field. (WordPerfect, Lotus 1-2-3, dBase and MacGIS are examples of packages that have been taught in previous years.)
CRP 442 The Sociology of Science (also Biology and Society 442)
Fall. 4 credits.
T. J. Pinch.

A view of science less as an autonomous activity than as a social institution. We will discuss such issues as controversies in science, textual analysis, gender and the social shaping of scientific knowledge

## [CRP 448 Social Policy and Social Welfare (also CRP 548) <br> Spring. 4 credits. Not offered 1994-95.]

## [CRP 451 Environmental Law (also CRP 551)

Fall. 4 credits. Not offered 1994-95. Staff.
An introduction to how the legal system handles environmental problems. Study of federal statutes such as the National Environmental Policy Act, the Clean Air Act, and the Clean Water Act, and of important judicial decisions that have been handed down under federal environmental statutes and regulations. Discussion of environmental law topics from a policy management perspective. This course is designed for undergraduate and graduate students interested in urban issues, planning, natural resources, government, environmental engineering, law, business, architecture,
landscape architecture, etc. Course assignments for graduate students will differ in some aspects from those for undergraduates.]

CRP 457 Community Service Fieldwork
Fall or spring. 4 credits variable. Permission is granted by instructor.

Faculty.
Undergraduate students work under the direction of a faculty member in the CRP department on a project that assists a public or nonprofit organization. Projects will involve urban and regional issues as defined by a "client" and agreed upon by the faculty member.
[CRP 461 Methods of Archival Research Fall. 3 credits. Not offered 1994-95.]

## CRP 480 Environmental Politics

Spring. 4 credits
R. S. Booth.

Examines the politics of public decisions affecting the environment. Focuses on the roles played by different political actors, the powers of various interest groups, methods for influencing environmental decisions, and the political and social impacts of those decisions.

CRP 481 Principles of Spatial Design and Aesthetics (also CRP 581 and Landscape Architecture 480)
Fall. 3 credits. Course enrollment is restricted to planning and landscape architecture students unless special permission is granted by instructor.
R. T. Trancik.

A lecture course that introduces the spatial and visual design vocabularies of cities. Aesthetic principles and theories of design are investigated for different types of urban spaces drawn from a variety of international examples, historic and modern. Included in the course are design methods and applications in the contemporary urban context of Europe and North America

## CRP 482 Urban Land Use Concepts

## Fall. 3 credits

## T. Cameron

Explorations of the use of land in urban areas, with an emphasis on the experience of North American cities. The course reviews use types, use characteristics, and use relationships in terms of conflicting social and economic demands. Concepts of organizing urban space in the past and present are reviewed. Physical planning, site planning and urban design issues are discussed.

CRP 490 Student-Faculty Research
Fall or spring. $1-4$ credits. Limited to undergraduate students in the Urban and Regional Studies Program. S-U grades only.

Hours to be arranged. Staff.
Research, reading, and/or writing project in which a student and faculty member choose a topic related to urban and regional studies.

## CRP 492 Honors Thesis Research

Fall or spring. 4 credits. Limited to Urban and Regional Studies Program majors who have been selected as honor students by the department faculty.

Hours to be arranged. Staff.
Each selected student works with his or her thesis adviser.

## CRP 493 Honors Thesis Writing

Fall or spring. 4 credits. Prerequisite: Completion of CRP 492.

Hours to be arranged. Staff.
Each selected student works with his or her thesis adviser.

## CRP 495 Special Topics

Fall, spring, summer. 4 credits. Hours to be arranged.

Staff.

## [CRP 495.16 History of China in Modern Times (also HIST 294)

Spring. 3 credits. Not offered 1994-95. Staff.
Introductory course that has no prerequisites and assumes no prior knowledge of Chinese history. Its requirements include the writing of two short papers and taking two 50 -minute examinations (one at midsemester and one during final examination period).]

## CRP 497 Supervised Readings

Fall or spring. Variable 4 credits. Limited to upperclass students. Prerequisite: permission of instructor.

Staff.

## Graduate Courses and Seminars

Courses numbered from 500 to 599 and 600 to 699 are generally considered introductory or first-year courses; those numbered from 700 to 799 and 800 to 899 are generally considered more advanced. Upperclass undergraduate courses are numbered from 300 to 499 (Undergraduate students with the necessary prerequisites and permission of the instructor may enroll in courses numbered 500 and above.

CRP 500 Urban and Regional Theory Spring. 3 credits.

## W. W. Goldsmith.

A review of attempts by the various social sciences to understand the contemporary city and its problems, particularly as seen by planners. Material is drawn from urban and regional economics, human ecology, urban sociology, psychology, anthropology, and geography in order to explain the location, size, form, and functioning of cities. Traditional and contemporary critical theory is examined as it applies to physical, social, and economic problems of the modern city. Major texts will be read, criticized, and discussed in seminars.

## CRP 511 Concepts and Issues in

 Planning Practice
## Fall. 3 credits

P. Clavel.

A seminar for graduate students and others interested in an in-depth introduction to the main ideas and concepts that underlie the practice of city and regional planning. Weekly discussions will focus on selected articles and books. Interrelations between national, state, and local practices and policies, and developments in methodology, organization, and the political environment, will be explored.

## CRP 512 Public and Spatial Economics for Planners

Fall. 3 credits. Letter grade. No prior
knowledge of economics.
Staff.
Covers basic microeconomic theory and some topics in macroeconomics. What distinguishes it from foundation courses in economics is that the context of every topic is both spatial and public. The concept of space is central to city and regional planning, and the perspective of the public and nonprofit sectors is the perspective of city and regional planning. Both space and the public-nonprofit sectors are peripheral to (or absent from) the usual graduate foundations courses in economics.

The course will also cover the economic theory necessary to understand the many applications of economics presented in subsequent courses in city and regional planning.
[CRP 515 Gender Issues in Planning and Architecture (also CRP 415)
Spring. 3 or 4 credits. Offered alternate years. Not offered 1994-95
S. Christopherson.]
[CRP 517 Industrial Restructuring: Implications for State and Local Policy (also CRP 417)
Fall. 4 credits. Not offered 1994-95.
S. Christopherson.

A basic introduction to new issues arising from the ways in which national and international economic shifts are affecting diverse United States localities. The course will focus on intraindustry restructuring, the location of economic activities, and state and local economic policy. Cases will be drawn from a variety of industries and national situations, with specific application to New York and other locations in the Northeast.]

## CRP 520 Statistical and Mathematical Concepts for Planning

Fall. 3 or 4 credits. Staff.
An introduction to statistical and mathematical concepts and methods of importance in planning and policy analysis. Topics will include matrix algebra, probability, sampling, estimation, and regression as well as the use of a microcomputer statistical package

CRP 521 Mathematical Foundation for Planning Analysis.
Fall. 1 credit. S-U only. Meets for two hours, once each week, for approximately half the semester

## Staff.

Review of mathematical foundations for planning analysis. Topics include probability statistics, mathematical functions, and matrix algebra. Intended for students with prior course work as a refresher course in preparation for higher-level courses in planning analysis. Departmental permission required.

CRP 522 Introduction to Computers in Planning (also CRP 421)
Fall. 4 credits.
Staff.
Students learn how to use microcomputers and software packages in the planning and problem-solving processes. Included are word processing, spreadsheets, mapping, and other types of packages that are useful for other classes and for professional work in the field. (WordPerfect, Lotus 1-2-3, dBase, and MacGIS are examples of packages that have been taught in previous years.)
CRP 532 Real Estate Development Process
Fall. 3 credits. Staff.
Examination of various forms of development as well as the role of major participants in the processes. Review issues in residential, retail, industrial, office, and low-income housing projects. Some guest speakers and case studies.

## CRP 541 The Politics of Technical Decisions I (also Government 628 and Biology and Society 415) <br> Spring. 4 credits. Cosponsored by the

 Program on Science, Technology, and Society.Staff.
Political aspects of decision making in technical areas. Examines the origins and characteristics of "technical politics," the role of experts in government, and the problem of expertise in a democratic system. Alternatives to current decision-making procedures are explored. Explores the politics of artifacts and cultures as well as govemment.

## CRP 545 Introduction to Public Policy

 Analysis and Management Spring. 3 credits. Prerequisite: CRP 520 or equivalent.M. Drennan.

Introduction to systematic methods and processes for analyzing issues and problems of public policy and management. Roles of economic analysis and of analytic techniques in public sector decision making will be reviewed and their respective strengths and weaknesses evaluated. Applications to a variety of public sector problem areas will be explored.

## CRP 546 Conflict Resolution in Community and Environment

Fall. 3 credits.
J. Forester

This course will explore the theories and techniques of conflict resolution as they apply to community, environmental, and related public policy disputes. Analysis will complement skill-building. Issues of power, participation, and strategy are central to our examinations of negotiation and mediation practice.

CRP 547 American Indians, Planners, and Public Policy (also CRP 363)
Spring. 3 credits. S-U grades optional. S. Baugher.

Contemporary American Indian people, their reservations, and their cultural heritages are all affected, often adversely, by decisions made by public agencies and private enterprise. To benefit non-Indian cities and economic growth, reservations are sometimes flooded, polluted, strip-mined, and deforested. Archaeological sites and burial grounds are often destroyed. The central focus of the course is how to address urban and regional problems without imperiling the cultural survival of minorities.

## [CRP 548 Social Policy and Social Welfare (also CRP 448) <br> Spring. 4 credits. Not offered 1994-95.]

CRP 549 Ethics and Practical Judgment in Planning
Spring. 4 credits variable.
J. Forester.

An introduction to problems of practical judgment and ethics as they arise in planning and public-serving professional practice. Issues such as consent, interests, deliberation, and legitimacy are central concerns.

## CRP 550 Built Environment

Spring. 3 credits.
Staff.
This course is intended to introduce graduatelevel students to the study of the built environment. This course will include: 1) theoretical approaches to the study of the built environment; 2) an introductory survey of the literature on built environment "elements," such as streets, grids, houses; 3) consideration of methods used to understand how people affect and are affected by their immediate environment; and 4) special topics, particularly, historic landscapes and
historic preservation. This course will emphasize examples from the United States but some international comparisons will be drawn.

## [CRP 551 Environmental Law (also CRP 451)

Fall. 4 credits. Not offered 1994-95. Staff.
An introduction to how the legal system handles environmental problems. Study of federal statutes such as the National Environmental Policy Act, the Clean Air Act, and the Clean Water Act, and of important judicial decisions that have been handed down under federal environmental statues and regulations. Discussion of environmental law topics from a policy management perspective. This course is designed for undergraduate and graduate students interested in urban issues, planning, natural resources, govemment, environmental engineering, law, business, architecture, landscape architecture, etc. Course assignments for graduate students will differ in some aspects from those for undergraduates.]
CRP 552 Urban Land-Use Planning I Fall. 3 credits.

Staff.
Surveys, analyses, and plan-making techniques for guiding physical development of urban areas; location requirements, space needs, and interrelations of land uses. Emphasis on residential, commercial, and industrial activities and community facilities; housing and neighborhood conditions. Lectures, seminars, and field exercises.

CRP 553 Urban Land-Use Planning II Spring. 3 credits. Prerequisite: CRP 552 or permission of instructor.

Staff.
In-depth consideration of special issues in urban land-use planning, such as industrial districts, large-scale integrated development, Planned Unit Development, public and institutional facilities, open space, land banking, central business districts, neighborhoods, energy impacts, transportation impacts, and others.

## CRP 555 Urban Systems Studio (also

 Landscape Architecture 602)Spring. 6 credits. Prerequisite: permission of instructor.

Staff.
Application of urban design and town planning techniques to specific contemporary problems of city environments. Issues of urbanism are investigated and applied to physical design interventions involving the street, square, block, garden, and park systems. Topics covered in the studio include urban land-use development, spatial systems and aesthetics, and public and private implementation of urban-design plans. This is a specially arranged collaborative studio with the Landscape Architecture Program.

## CRP 556 Built-Environment Education Workshop

Spring. 4 credits.

## M. Tomlan.

Interdisciplinary teams of students from planning, architecture, landscape architecture, historic preservation, and other environmental design disciplines work in classrooms with schoolchildren and teachers to deepen their understanding of the built environment and to encourage their participation in the shaping of their own environment. Work in local schools is emphasized.

CRP 558 City and Regional Planning Workshop
Fall and spring. 4 credits. S-U only. Staff.
Students work on urban issues, such as housing, traffic and parking, economic development, zoning, and related planning issues, with public or non-profit organizations in New York State. Projects are undertaken on a community-service basis for "clients" who specifically request planning assistance. Students work inclividually or in teams.

## CRP 560 Documentation for Preservation (also Architecture 586)

Fall or spring. 3 credits.

## M. A. Tomlan.

Methods of identifying, recording, collecting, processing, and analyzing information dealing with historic and architecturally significant structures, sites, and objects.

## CRP 561 Historic Preservation Planning Workshop: Surveys and Analyses (also Architecture 588)

Fall or spring. 4 credits.
Staff.
Techniques for the preparation of surveys of historic structures and districts; identification of American architectural styles, focusing on upstate New York; and explorations of local historical resources, funding sources, and organizational structures. Lectures and training sessions. Emphasis on fieldwork with individuals and community organizations.

## CRP 562 Perspectives on Preservation (also Architecture 585)

Fall. 3 credits. Staff.
Introductory course for preservationists. A survey of the historical development of preservation activity in Europe and America leading to a contemporary comparative overview. Field trips to notable sites and districts.

## CRP 563 Problems in Contemporary Preservation Practice (also Architecture 584) <br> Spring. Variable credit.

 Staff.A review and critique of ongoing preservation projects and an investigation of areas of expertise currently being developed.
Presented by staff and guest lecturers.

## CRP 564 Building Materials Conservation (also Architecture 587)

Spring. 3 credits. Open to juniors, seniors, and graduate students.
M. A. Tomlan.

A survey of the development of building materials in the United States, chiefly during the nineteenth and early twentieth centuries, and a review of the measures that might be

## taken to conserve them.

## CRP 565 Fieldwork or Workshop in History and Preservation

Fall or spring. Variable credit.
M. A. Tomlan.

Work on applied problems in history and preservation planning in a field or laboratory setting or both.

## CRP 567 Measured Drawing (also

 Architecture 583)Fall. 3 credits. For undergraduate architecture students and graduate students in history and preservation. Prerequisite: permission of instructor.
M. A. Tomlan.

Combines study of architectural drawing as historical documents with exercises in preparing measured drawings of small buildings. Presents the basic techniques of studying, sketching, and measuring a building and the preparation of a finished drawing for publication.

## CRP 569 Archaeology in Historic Preservation Planning (also LA 569)

Fall. 3 credits.
S. Baugher.

Increasingly mandated by federal, state, and local legislation, archaeology plays an important role in planning and land-use decisions. Today, archaeology is integrated with the regulatory processes in historic preservation and environmental review, as well as continuing to influence the design and interpretation of national parks, historic battlefields and historic landmarks. Archaeological research reveals significant insights from the past regarding issues such as public landfill, waste disposal, soil erosion, water quality, and environmental change. Case studies from the United States, Canada, Great Britain, Italy, and Mexico highlight these issues. A graduate level seminar open to upper-level undergraduates.
[CRP 574 Legal Aspects of International Planning
Fall. 3 credits. Offered alternate years. Not offered 1994-95.

> Staff.

Legal systems vary substantially around the world. Planners operate within the parameters established by the legal system of the nation in which they are working. This course allows each student to examine the legal structure of a particular nation (chosen by the student) and to explore how that country's legal system shapes/controls decisions regarding the use, management, and development of land resources. The course emphasizes written and oral presentations.]

## CRP 581 Principles of Spatial Design and

 Aesthetics (also CRP 481 and Landscape Architecture 480)Fall. 3 credits. Course enrollment is restricted to planning and landscape architecture students unless special permission is granted by instructor.
R. T. Trancik.

A lecture course that introduces the spatial and visual design vocabularies of cities. Aesthetic principles and theories of design are investigated for different types of urban spaces drawn from a variety of international examples, historic and modern. Included in the course are design methods and applications in the contemporary urban context of Europe and North America.

## CRP 582 Urban Housing: Sheltered vs. Unsheltered Society (also CRP 382)

## Fall. 4 credits.

## Staff.

Homelessness is the latest in a continuing list of terms to describe unmet housing needs. To understand how and why such needs persist, even in good economic times, one must examine the nature of interactions between housing policies and housing market forces. This course examines the complex interaction of public and private actions in the development and redevelopment of urban housing. More specifically, the course seeks to investigate the many ways in which private and public policy decisions determine which groups in society will have access to housing.

This course is appropriate for students with an interest in urban housing and a background in any of the following areas: urban economics, urban sociology, anthropology, history, or geography. The course will consist of lectures, a wide variety of readings, and guest speakers. Students will be evaluated on the basis of class discussions, two exams, a 15-20 page paper, and an oral presentation.

## CRP 604 Urban Economics (also CRP 404)

Fall or spring. 4 credits. Prerequisite: basic economics.

Staff.
Urban phenomena are analyzed from an economic point of view. Areas examined include economic aspects of urbanization processes and policies, determinants of urban growth and decline, urban land and housing markets, urban transportation, and urban public services. Some time will be spent in discussing problems of cities in developing countries.
CRP 613 The Political Economy of Gender and Work (also Women's Studies 613)
Fall. 3 credits.
L. Beneria.

This course focuses on different approaches to the analysis of gender and work, combining economic and feminist theory. Topics include: gender, economic rationality and the rhetoric of economics; household theory; gender and the labor market; wage differentials; discrimination, and labor market policies; gender and technology; economic restructuring and women's work; gender and demographic change; issues in reproductive technologies. The empirical material in the course concentrates mostly, but not exclusively, on the United States.

## CRP 615 The Politics of Planning

 Spring. 4 credits.P. Clavel.

This graduate-level seminar explores the relationship between the persons who do planning and the community, political, and social movement context for planning. A range of political models is addressed, and literature in politics, sociology, and organizational theory is part of the coverage. Methodology of field research is part of the course, and students will be encouraged to design research that puts them in touch with actual cases, persons, and recent local histories.

## CRP 616 Development and Change in the World Economy

Spring. 3 credits. Letter grade only.
L. Beneria.

This course concentrates on the current dynamics of national and international development, the globalization of national economies, and the forces and trends that are shaping this process. Beginning with an analysis of economic restructuring taking place since the late 1960s, the emphasis is on the factors affecting the new international division of labor and production, the labor market, consumption, trade and finance, and the distribution of resources. This includes the analysis of processes through which the current neoliberal model is being built, such as trade liberalization, labor market flexibilization, the erosion of nation states as economic units, and the formation of trade blocks and global institutions.

CRP 620 Planning Analysis
Spring. 4 credits.
B. G. Jones.

A survey of commonly used techniques for analyzing various aspects of subnational socioeconomic systems. Emphasizes planning applications

## CRP 630 Local Economic Development Policy-Seminar

Spring. 4 credits.
Staff
This course examines the impacts of urban economic restructuring on employment and income opportunities in U.S. cities. Particular attention is focused on the ways in which these effects vary by race and gender. Urban policy responses are evaluated in light of the changing economic, demographic, and political character of U.S. metropolitan areas Alternative policy strategies are examined which seek to redistribute economic resources. Course requirements include a midterm exam, a case study report, and an oral presentation.

## CRP 631 Local Economic Policy-Field Workshop <br> Fall or spring. 4 credits.

P. Clavel.

A group policy analysis exercise in an upstate New York city. Students do a combination of data analysis; interviews with labor, business, and public leaders; and problem papers addressed to current issues presented by a client group. Individual work is synthesized into a comprehensive report at the end of the semester.

## CRP 635 Workshop: State Economic

 Development StrategiesFall or spring. 4 credits. S-U grades optional. Staff.
The purpose of this course/workshop is twofold: 1) to provide students with research tools useful in developing state-level economic development strategies; and 2) to provide a critical understanding of the primary economic development strategy used by U.S. state policymakers: firm specific subsidies. The course will consist of lecture and discussion meetings. The workshop sessions will include exercises in qualitative information gathering on economic development topics; use of the census in combination with geographic information systems for analysis and presentation; and shift-share analysis.

## CRP 642 Critical Theory and the Micro.

 politics of PracticeSpring. 4 credits variable.
J. Forester.

Trying to "solve problems," planners and policy analysts set agendas, shape participation, negotiate relations of power. This seminar explores theories illuminating the communicative micro-politics of their daily practice. We explore issues of power and discourse, practical judgment and deliberation productive and reproductive aspects of ordinary speech and action

## CRP 653 Legal Aspects of Land-Use

 PlanningFall. 3 credits
R. Booth.

Survey of leading cases and legal concepts in land-use planning, with particular attention to zoning, subdivision control, condemnation, and growth-control issues.

## CRP 659.02 Special Topic: Urban Public

 FinanceSpring. 3 credits. Prerequisite: prior exposure to microeconomics
M. Drennan.

An overview of neoclassical public economics theory, particularly those aspects of the theory that are central to urban public finance. In part two, the unusual three-tiered fiscal system of the United States is described along with the evolving fiscal and economic role of large municipal governments. Part three of the course presents the public finance theory of taxation. Major taxes and other revenue sources utilized by large municipalities are described and analyzed. Part four is the heart of the matter, namely the measurement and analysis of the fiscal condition of cities.

## CRP 661 Historic Preservation Planning Workshop: Plans and Programs

 Fall or spring. $1-4$ credits. Prerequisite: CRP 561Staff
Preparation of elements of historic preservation plans, designs, legislation, and special studies. Individual or group projects are selected by students. Fieldwork is emphasized.

## CRP 662 Seminar in American Urban History (also CRP 361)

Spring. 3 credits. Prerequisite: permission of instructor.

Staff.
Seminar in the historical evolution of the American city. Emphasis on factors in urban growth, the process of urbanization, urban reform movement, and intellectual and social responses to the city
[CRP 663 Historic Preservation Law Spring. 3 credits. Offered alternate years. Not offered 1994-95.

Staff.
Law of historic district and landmark designation, tools for preservation (such as police power, taxation, eminent domain), and recent developments in state and federal historic preservation.]

## CRP 664 Economics and Financing of Neighborhood Conservation and Preservation

Fall. 3 credits.
B. G. Jones.

The economic and financial aspects of historic preservation and neighborhood conservation. Topics include public finance, selected issues in urban economics, real estate economics, and private financing of real estate projects.

## CRP 665 Preservation Planning and

 Urban ChangeFall. 3 credits.
M. A. Tomlan.

An examination of fundamental planning concepts and issues as they relate to historic preservation. Neighborhood revitalization, federal housing programs, the role of public and private institutions, displacement, and other social issues are among the primary topics.

## CRP 666 Pre-Industrial Cities and Towns of North American (also CRP 360)

Spring. 3 credits. S-U grades optional S. Baugher.

The pre-industrial approaches to the founding, design, and development of towns and cities in North America until 1815 demonstrate how various American Indian civilizations as well as diverse European cultures have each
brought their perspectives to the organization of town and city living. American Indian case studies will include Mayan and Aztec cities, the city of Cahokia, and the towns of the Pueblos, Creeks, and Iroquois. The experiences of Europeans in North America will include Spanish, French, Dutch, and English. This course is a recommended complement to CRP 361

CRP 670 Regional Planning and Development in Developing Nations Spring. 4 credits. Prerequisite: second-year graduate standing.
W. W. Goldsmith

Extensive case studies of development planning are analyzed. Focus is on the political economy of the process of regional development through urbanization and in particular on the concepts of equity and efficiency, external economies, export linkages, and internal self-sufficiency and integration. Resource development, national integration, human development, and migration problems are discussed

CRP 671 Seminar in International Planning
Spring. 1 credit. S-U grades only
W. W. Goldsmith

The international planning lecture series sponsors lectures by visiting scholars or professionals in the field of international development and planning. The only formal requirement for the course is a brief evaluation of the series at the end of the semester.

## CRP 673 Economics of Regional Development

Fall or spring. 2 or 4 credits.
Staff.
This course deals with the historical process of regional and metropolitan development, emphasizing Third World problems. While its basic approach is mode-of-production analysis, it also critically surveys location, comparative advantage, and feedback system theories. Development is interpreted as the penetration of the capitalist mode of produc tion into precapitalist societies. Its features are analyzed both in terms of the historical stages of expanding capitalism (mercantile phase, imperialism, multinationals) and in terms of the pre-existing (feudal, Asiatic) precapitalist mode of production. Regional and urban development planning problems are discussed in the light of the contradictions of the above process, as well as in the context of newly emerging Third World socialist countries

## CRP 675 Seminar in Project Planning in Developing Countries

Spring. 4 credits
D. Lewis

An examination of the problems and issues involved in preparing project proposals for presentation to funding agencies. Topics include technical design, financial feasibility social impact analysis, and policy relevance, as well as techniques for effective presentation of proposals. The course is organized as seminar-workshop providing both an analysis of the critical elements of effective proposals and an opportunity to use those elements in the preparation of proposals. A multidisciplinary perspective is emphasized.

## CRP 689.08 Special Topics: Environmental Aspects of International Planning

Fall. 3 credits. S-U option.
P. Olpadwala.

What are the major environmental problems of the world today? How may we categorize them? What are their technological and social roots? Who is affected by them? What are the relative roles of rich and poor countries, and rich and poor peoples within countries, in creating the crises (to what extent are these problems of poverty and deprivation? of abundance and overconsumption?)? What is done to combat them and how effective is it/ can it be? What are the possibilities for/limits of national planning? international cooperation?

## CRP 703 Contemporary Theories of

 Regional DevelopmentFall or spring. 4 credits.
W. W. Goldsmith.

An advanced seminar, mainly for doctoral candidates, to review recent contributions to the literature. After a fast-paced review of basic material in political economy, students will read and present summaries of works by major contemporary theorists. A final paper is required.

## CRP 711 Planning and Organization

 TheoryFall. 4 credits.
P. Clavel.

Advanced seminar on theoretical models of planning, organization, and urban structure. The first part of the course, which may be taken separately for one credit, provides an overview of administrative issues affecting planning. Next, attention is given to theories of organizational structure, growth, and change. Final sessions are devoted to the influence of urban and regional structures as context. Critical reading, short papers, and seminar discussion characterize the course.

## CRP 720 Quantitative Techniques for Policy Analysis and Program Management

Fall. 4 credits.
D. Lewis.

Selected analytical techniques used in the planning and evaluation of public policy and public investments are examined. Topics include simulation modeling, benefit-cost and cost-effectiveness analysis (including capital budgeting), and optimization strategies.

## CRP 730 Methods of Regional Science and Planning I

Fall or spring. 4 credits variable.
S. Saltzman.

An introduction to some of the major methods and models used in regional science and planning. This course is half of a twosemester sequence (see CRP 731). Either course may be taken first. Both courses will cover topics related to the structure and assumptions of the models, model development, and their applications in regional science and planning. Where appropriate, computer implementation will be considered. The spring semester emphasizes statistical and econometric models.

CRP 731 Methods of Regional Science and Planning II
Fall or spring. 4 credits.
S. Saltzman.

See CRP 730. The fall semester will provide an introduction to deterministic methods and models such as input/output models, social accounting models, and optimization models.
CRP 733 Seminar in Regional Models
Fall or spring. 3 credits. S-U grades optional. Prerequisites: sufficient methodological background to read the current literature.
S. Saltzman.

A review of the classical and important current literature on socioeconomic and/or environmental models of subnational regions. Each student will be expected to identify his or her own area of interest and critically review and report to the class on important papers in that area.

## CRP 777 Theories of Development and Underdevelopment

Spring. 3 credits.
P. Olpadwala.

Various theories attempting to analyze and explain the phenomena of underdevelopment are examined. Although a range of thought and approaches is considered, the accent is on aspects of political economy revolving around concepts of class and exploitation. Topics include the transition to capitalism; dependent and uneven development; various issues of growth and fluctuation under contemporary capitalism, including crises; rural and industrial development in lessdeveloped countries and planning for development.

## CRP 790 Professional Planning Colloquium : <br> Fall. 1 credit.

Staff.
Visiting lecturers treat problems and opportunities in the practice of planning. Topical focus to be announced. The only formal requirements for the course are attendance and a brief evaluation at the semester's end.

## CRP 792 Master's Thesis, Project, or

 Research PaperFall or spring. 10 credits variable. $\mathrm{S}-\mathrm{U}$ grades optional.

Hours to be arranged. Staff.

## CRP 794 Planning Internships

Fall, spring, or summer. 1-12 credits.
Hours to be arranged. Staff.
Combines a professional planning internship in a metropolitan area with academic study to provide experience and understanding of the planner's role in formulating and implementing plans and policies. Salaried internships in federal or state agencies, legislative offices, and comparable settings include development of research, analysis, and other technical skills. Weekly seminars draw on student field experiences, assigned readings, and guest speakers to examine current issues of federal. urban, and regional policy from the perspective of planning practice.
CRP 795 Master's Thesis in Preservation Planning
Fall or spring. $1-6$ credits.
Hours to be arranged. Staff.
CRP 796 Colloqui Journal Publication Workshop
Fall or spring. 2 credits. S-U grades only. P. Clavel, J. Forester.

Individual and group projects culminating in the production of a professional journal.

CRP 797 Supervised Readings
Fall or spring. 4 variable credits. Limited to graduate students. Prerequisites: permission of instructor.

Staff.
CRP 798 Colloquium in Regional Science, Planning, and Policy Analysis
Fall or spring. 1 credit.
Staff.
Presentation and discussion of current research by faculty, visitors, and graduate students working on their dissertations.
Typically, the colloquium will meet once a
week during the semester.

## CRP 800 Advanced Seminar in Urban and

 Regional Theory IFall. 3 credits. Prerequisite: CRP 500. B. G. Jones.

The theory of urban spatial organization. Economic, technological, and social factors leading to urbanization and various kinds of spatial organizations are explored. Major theoretical contributions to the understanding of intraregional and intraurban distribution of population and economic activity are reviewed.
CRP 801 Advanced Seminar in Urban and Regional Theory II
Spring. 3 credits. Prerequisite: CRP 800. B. G. Jones.

A continuation of City and Regional Planning 800. concentrating on recent developments.

CRP 810 Advanced Planning Theory Fall. 3 credits. Prerequisite: CRP 500 or 710 . B. G. Jones.

A survey of the works of scholars who have contributed to current thinking about planning theory. Alternative assumptions concerning models of man and theoretical concepts concerning the nature of planning today are considered.

CRP 830 Seminar in Regional Sciences, Planning, and Policy Analysis
Fall or spring. Variable- 4 credits. S. Saltzman or W. Isard.

This seminar will provide an opportunity to review some of the literature and current research in regional science, planning, and policy analysis. Specific topics covered will vary each year. Empirical and analytical research will be emphasized. Students will be expected to prepare and present a research paper during the semester on some aspect of the topics under review.

## CRP 890 Planning Research Seminar I

Fall or spring. 2 credits. Staff.
Intended for doctoral candidates in city and regional planning; other students welcome. Presentation and discussion of current problem areas and research by advanced doctoral students, faculty members, and visitors.

## CRP 892 Doctoral Dissertation

Fall or spring. 1-2 credits.
Hours to be arranged. Staff.
Special Topic Courses
Fall or spring. Variable credit.
Hours to be arranged. Staff.
Typical topics are:
CRP 609 Urban and Regional Theory
CRP 619 Planning Theory and Politics

## CRP 629 Quantitative Methods and Analysis

CRP 639 Regional Development Planning
CRP 649 Social-Policy Planning
CRP 659 Urban Development Planning
CRP 669 History and Preservation
CRP 679 Planning and Developing Regions

CRP 689 Environmental Planning
CRP 699 Regional Science
CRP 719 Planning Theory and Politics

## LANDSCAPE ARCHITECTURE

The Landscape Architecture Program at Cornell is jointly sponsored by the College of Agriculture and Life Sciences (in association with the Department of Floriculture and Ornamental Horticulture) and the College of Architecture, Art, and Planning.

## The Program

Program faculty: M. I. Adleman, S. Baugher, H. Gottfried, P. Horrigan, T. H. Johnson, D. W. Krall, L. Mirin, R. T. Trancik, P. J. Trowbridge, K. A. Wolf.

The Landscape Architecture Program offers three professional degree alternatives: a twoyear graduate curriculum directed to those who have undergraduate degrees in landscape architecture or architecture, a three-year graduate curriculum directed to those who have undergraduate degrees in other fields, and a four-year undergraduate curriculum. Graduate studies in landscape architecture are administered through the Graduate School and lead to a Master of Landscape Architecture degree. Undergraduate studies in landscape architecture are administered through the College of Agriculture and Life Sciences and lead to a Bachelor of Science degree.

## Course Information

*LA 141 Freehand Drawing
Fall. 3 credits.
P. Horrigan.
*LA 142 Introduction to Landscape Architecture
Spring. 4 credits.
D. W. Krall.
*LA 201 Design, Composition, and Theory
Fall. 6 credits. M. I. Adelman.
*LA 202 Design, Composition, and Theory
Spring. 6 credits.
T. H. Johnson.
*LA 261 Urban Archaeology (also CRP 2611
Fall. 3 credits.
S. Baugher.
*LA 301 Site Design and Defailing
Fall. 6 credits.
P. Horrigan.

## LANAR 302 Site Design and Detailing

Spring. 6 credits. Prerequisite: LA 301 with a grade of C or better. Cost of supplies, about
$\$ 200$; expenses for field trip, $\$ 250$.
Lecs, M W F 1:25; studios, M W F
2:30-4:25. L Mirin.
This studio will engage course participants in a wide range of site-scaled projects such as subdivision developments, street improvement projects, and gardens. Projects and associated detailing will build upon knowledge gained in LA 301.
*LA 310 Site Engineering for Landscape Architects
Fall. 4 credits.
M. I. Adleman.
*LA 312 Site Construction
Spring. 4 credits.
P. J. Trowbridge.
*LA 360 Pre-Industrial Cities and Towns of North America (also CRP 360, CRP 666 and LA 666)
Spring. 3 credits.
S. Baugher.
*LA 363 American Indians, Planners, and Public Policy (also CRP 363 and CRP 547)

Spring. 3 credits.
S. Baugher.
*LA 382 The American Landscape
Spring. 3 credits. H. Gotffried.

## *LA 401 Urban Design and Planning

Fall. 6 credits
R. T. Trancik.

## *LA 402 Advanced Project Studio

Spring. 6 credits. M. I. Adleman.

## *LA 410 AutoCAD Auto Tutorial

Fall or spring. $1-5$ credits.
P. J. Trowbridge/K. Flahive.
*LA 411 LandCAD Auto Tutorial
Fall or spring. Variable $1-5$ credits. P. Trowbridge/K. Flahive.
*LA 412 Professional Practice Spring. 1 credit. K. Wolf.
*LA 480 Principles of Spatial Design and Aesthetics (also CRP 481/581)
Fall. 3 credits. R. T. Trancik.
*LA 483 Design Criticism
Spring. 2 credits. H. Gottfried.
*LA 491 Design and Plant Establishment (also HORT 491)
Fall. 3 credits.
P. J. Trowbridge/N. Bassuk.
*LA 494 Special Topics in Landscape

## Architecture

Fall or spring. 1-3 credits. Staff.

## LANAR 497 Individual Study in Landscape Architecture

Fall or spring. 1-5 credits; may be repeated for credit. S-U grades optional. Staff.
Work on special topics by individuals or small groups.
*LA 498 Undergraduate Teaching
Fall or spring. $1-3$ credits.
Staff.

## LANAR 501 Theory, Composition, and

 DesignFall. 6 credits. Lab fee, $\$ 20$; cost of basic drafting equipment and supplies, about $\$ 250$. Lecs, M W F 1:25; studios, M W F 2:30-4:25. L. Mirin.
Basic design principles and processes applied to the design of the outdoor environment. Studio projects focus on the analysis, organization, and form of outdoor space through the use of three-dimensional components including structures, vegetation, and earthform.

## *LA 502 Design, Composition, and

 TheorySpring. 6 credits. P. Horrigan.
*LA 505 Graphic Communication I
Fall. 3 credits. T. H. Johnson.
*LA 506 Graphic Communication II Spring. 3 credits. P. Horrigan.
*LA 514 Advanced Site Grading
Spring. 3 credits.
M. I. Adleman.

LANAR 520 Contemporary Issues in Landscape Architecture
Fall. 2 credits, S-U grades only.
Lec, F 11:15-1:10. L. Mirin.
Presentations on topics that are current and significant to the environmental design and planning fields. Issues are discussed from a landscape architecture point of view by practitioners and researchers representing a range of professions.

## LANAR 524 (522) History of European Landscape Architecture

Spring, 3 credits.
Lecs, T R 11:15; discs to be arranged. L. Mirin.

A survey from classical times to the present, emphasizing design principles and techniques that have established the landscape architecture tradition in Europe. Particular reference is made to the manner in which environments such as gardens, streets, plazas, parks, and new towns reflect in their built form a range of response to demands of culture, economics, technology, security, the law, and ecology.

## LANAR 525 (521) Mistory of American

 Landscape ArchitectureFall. 3 credits.
Lecs, T R 11:15; discs to be arranged. L. Mirin.

Landscape architecture in the United States from Jefferson to the present is examined as a unique expression of the American experience. Influences exerted by the physical landscape, the frontier and utopian spirit, and the cultural assumptions of democracy and capitalism are traced as they affect the forms of urban parks, private and corporate estates, public housing, transportation planning, national parks, and other open-space designs.
*LA 569 Archaeology on Preservation Planning and Landscape (also CRP 569)

Fall. 3 credits.
S. Baugher.
*LA 590 Graduate Seminar in Landscape Architecture
Fall. 3 credits.
H. Gottfried.

## *LA 601 Project Design and Application

Fall. 6 credits. Limited to graduate students. Required field trip. T. H. Johnson.
*LA 602 Urban Design and Planning (also CRP 555)
Spring. 6 credits.
R. T. Trancik and staff.
*LA 610 Site Engineering
Fall. 4 credits.
M. I. Adleman.

## *LA 612 Site Construction

Spring. 4 credits.
P. J. Trowbridge.
*LA 666 Pre-Industrial Cities and Towns of North America (also CRP 666, CRP 360, and LA 360)
Spring. 3 credits.
S. Baugher.
*La 680 Graduate Seminar in Landscape Architecture
Fall or spring. $1-3$ credits. Staff.

## *LA 694 Special Topics in Landscape

 ArchitectureFall or spring. $1-3$ credits. Staff.
*LA 701 Natural Systems and Planting Design Studio
Fall. 6 credits.
P. J. Trowbridge/H. Gottfried.

## LANAR 800 Master's Thesis in Landscape Architecture

Fall or spring. 9 credits.
Hours to be arranged. Staff.
Independent research under faculty guidance, leading to the development of a comprehensive and defensible design or study related to the field of landscape architecture. Work is
expected to be completed in the final
semester of residency.
*Offered through the College of Agriculture and Life Sciences.

## FACULTY ROSTER

Baugher, Sherene, Ph.D., SUNY at Stony Brook, Visiting Prof., City and Regional Planning
Beneria, Lourdes, Ph.D., Columbia U. Prof., City and Regional Planning
Bertoia, Roberto, M.F.A., Southern Illinois U. Assoc. Prof., Art
Blum, Zevi, B.Arch., Comell U. Assoc. Prof., Art
Booth, Richard S., J.D., George Washington U. Assoc. Prof., City and Regional Planning
Bowman, Stanley J., M.F.A., U. of New Mexico. Prof., Art
Christopherson, Susan M., Ph.D., U. of California at Berkeley. Asst. Prof., City and Regional Planning
Clavel, Pierre, Ph.D., Comell U. Prof., City and Regional Planning
Cody, Jeffrey, Ph D., Comell U., Visiting Assistant Professor, City and Regional Planning
Colby, Victor E., M.F.A., Comell U. Prof. Emeritus, Art

Crump, Ralph W., B.Arch., Cornell U. Prof. Emeritus, Architecture
Cruvellier, Mark R., M. Eng., Ph.D., McGill U. (Canada). Asst. Prof., Architecture
Czamanski, Stan, Ph D., U. of Pennsylvania. Prof. Emeritus, City and Regional Planning
Daly, Norman, M.A., Ohio State U. Prof. Emeritus, Art
Drennan, Matthew P., Ph.D., New York University. Prof., City and Regional Planning
Evett, Kenneth W., M.A., Colorado Coll. Prof Emeritus, Art
Forester, John, Ph.D., U. of California at Berkeley. Prof., City and Regional Planning
Goehner, Werner H., Dipl. Ing., Technical U. Karlsruhe (Germany), M.Arch., Cornell U. Assoc. Prof., Architecture
Goldsmith, William W., Ph.D., Comell U. Prof., City and Regional Planning
Greenberg, Donald P., Ph.D., Cornell U. Prof., Architecture
Hascup, George E., B.Arch., U. of California at Berkeley. Assoc. Prof., Architecture
Hodgden, Lee F., M.Arch, Massachusetts Inst. of Technology. Prof., Architecture
Hubbell, Kent L., M.F.A.S., Yale. Nathaniel and Margaret Owens Distinguished Alumni Professor of Architecture. Prof., Architecture
Isard, Walter, Ph.D., Harvard U. Prof., City and Regional Planning
Jarzombek, Mark, Ph D., Massachusetts Inst. of Technology. Assoc. Prof., Architecture
Jones, Barclay G., Ph.D., U. of North Carolina. Prof., City and Regional Planning
Kelly, Burnham, M.C.P., Massachusetts Inst. of Technology. Prof. Emeritus, City and Regional Planning
Kira, Alexander, M.R.P., Cornell U. Prof., Architecture
Kord, Victor, M.F.A., Yale U. Prof., Art
Lewis, David B., Ph.D., Comell U. Assoc. Prof., City and Regional Planning
Locey, Jean N., M.F.A., Ohio U. Prof., Art
MacDougall, Bonnie G., Ph.D, Comell U. Assoc. Prof., Architecture
Mackenzie, Archie B., M.Arch., U. of California at Berkeley. Assoc. Prof., Architecture
McMinn, William G., M. Arch., U. of Texas at Austin. Dean, Prof., Architecture
Meyer, Elisabeth H., M.F.A., U. of Texas. Assoc. Prof., Art
Meyers, Victoria L., M. Arch., Harvard U. Asst. Prof. Architecture
Mikus, Eleanore, M.A., U. of Denver. Prof., Art
Miller, John C., M.Arch., Cornell U. Prof., Architecture
Mirin, Leonard J., M.L.A., U. of Michigan. Assoc. Prof., Landscape Architecture
Mulcahy, Vincent J., M.Arch., Harvard U. Assoc. Prof., Architecture
Ochshorn, Jonathan, M. Urban Design, City College of New York, Asst. Prof., Architecture
Olpadwala, Porus, Ph.D., Comell U. Assoc. Prof., City and Regional Planning
Otto, Christian F., Ph.D., Columbia U. Prof., Architecture
Ovaska, Arthur, M.Arch., Comell U. Asst. Prof., Architecture
Page, Gregory, M.F.A., U. of Wisconsin. Assoc. Prof., Art
Parsons, Kermit C., M.R.P., Comell U. Prof., City and Regional Planning
Pearman, Charles W., B.Arch., U. of Michigan. Prof., Architecture
Perlus, Barry A., M.F.A., Ohio U., Assoc. Prof., Art

Poleskie, Stephen F., B.S., Wilkes Coll. Prof., Art
Reps, John W., M.R.P., Comell U. Prof.
Emeritus, City and Regional Planning
Richardson, Henry W., M.R.P., Cornell U. Assoc. Prof., Architecture
Rowe, Colin F., M.A., U. of London (England). A. D. White Prof. Emeritus

Saltzman, Sid, Ph.D., Cornell U. Prof., City and Regional Planning
Saul, Francis W., M.S., Harvard U. Assoc. Prof. Emeritus, Architecture
Schack, Mario L., M.Arch., Harvard U. Prof., Architecture
Shaw, John P., M.Arch., Massachusetts Inst. of Technology. Prof., Architecture
Simitch, Andrea, B.Arch., Comell U. Asst. Prof., Architecture
Singer, Arnold. Prof. Emeritus, Art
Squier, Jack L., M.F.A., Cornell U. Prof., Art
Stein, Stuart W., M.C.P., Massachusetts Inst. of Technology. Prof. Emeritus, City and Regional Planning
Taft, W. Stanley, M.F.A, California College of Arts and Crafts, Asst. Prof., Art
Tomlan, Michael A., Ph D, Comell U. Ass. Prof., City and Regional Planning
Trancik, Roger T., M.L.A.-U.D., Harvard U. Prof., Landscape Architecture/City and Regional Planning
Ungers, O. Mathias, Diploma, Technical U. Karlsruhe (Germany). Prof. Emeritus, Architecture
Vietorisz, Thomas, Ph.D., Massachusetts Inst. of Technology. Adjunct Prof., City and Regional Planning
WalkingStick, Kay, M.F.A., Pratt Institute. Asst. Prof., Art
Warke, Val K., M.Arch., Harvard U. Assoc. Prof., Architecture
Wells, Jerry A., B.Arch., U. of Texas. Prof., Architecture
White, Gail S., M.F.A., Boston Museum School and Tufts U. Asst. Prof., Art
Wilder, Margaret G., Ph.D., U. of Michigan. Asst. Prof., City and Regional Planning
Woods, Mary N., Ph.D., Columbia U. Assoc. Prof., Architecture
Zissovici, John, M.Arch., Cornell U., Asst. Prof., Architecture

## DIVISION OF BIOLOGICAL SCIENCES

The Division of Biological Sciences provides a unified curriculum for undergraduate majors enrolled in either the College of Agriculture and Life Sciences or the College of Arts and Sciences. Courses in biological sciences are integral to many disciplines and are basic requirements in many schools and colleges at Comell.

Graduate study in the biological sciences is administered by more than a dozen specialized fields within the Graduate School, as described in the Announcement of the Graduate School.

## ORGANIZATION

The Division of Biological Sciences is composed of seven sections: Biochemistry, Molecular and Cell Biology; Ecology and Systematics; Genetics and Development; Micrubiology; Neurobiology and Behavior Physiology; Plant Biology; and, in addition the L. H. Bailey Hortorium and the Shoals Marine Laboratory.
Student services are provided by the division's Office for Academic Affairs and the Behrman Biology Center, both located in Stimson Hall, where academic advice, information on biological sciences course offerings, other important information, and counseling are available for undergraduates. The Office for Academic Affairs also follows the progress of biology majors and works closely with faculty advisers. Additional services and resources of the Biology Center include academic program planning, tutoring, lecture tapes, examination files, and information on undergraduate research opportunities. The center has comfortable areas for studying and relaxing.

The Shoals Marine Laboratory, a cooperative venture with the University of New Hampshire, is located on Appledore Island in the Gulf of Maine. Its base office in Stimson Hall provides advising and career counseling for students interested in the marine sciences and administers the SEA Semester program for Cornell students pursuing studies at Woods Hole or aboard the schooner Westward or brigantine Corwith Cramer.

## FACULTY

P. J. Bruns, director; H. T. Stinson, Jr., associate director; E. Adkins-Regan,
K. K. Adler, C. F. Aquadro, W. J. Arion, R. Barker, A. H. Bass, D. M. Bates,
A. Bensadoun, K. W. Beyenbach,
A. W. Blackler, S. E. Bloom, R. Booker, A. C. Borror, A. P. Bretscher, W. J. Brown, W. R. Butler, J. M. Calvo, R. R. Capranica, B. F. Chabot, J. L. Cisne, R. A. Corradino, W. L. Crepet, P. J. Davies, J. I. Davis, T. E. Dawson, A. Dobson, A. A. Dhondt, J. J. Doyle, S. E. Ealick, T. Eisner, S. T. Emlen, P. P. Feeny, G. W. Feigenson, R. H. Foote J. E. Fortune, T. D. Fox, M. A. Geber, W. C. Ghiorse, J. Gibson, Q. H. Gibson,
R. F. Gilmour, M. L. Goldberg, C. H. Greene,
N. G. Hairston, Jr., B. P. Halpern,
M. R. Hanson, R. G. Harrison,
R. M. Harris-Warrick, C. D. Harvell,
L. O. Hedin, J. D. Helmann, L. A. Heppel,
G. P. Hess, P. C. Hinkle, C. D. Hopkins,
K. A. Houpt, T. R. Houpt, R. W. Howarth,
S. H. Howell, H. C. Howland, R. R. Hoy,
T. C. Huffaker, A. T. Jagendorf, P. A. Karplus, M. N. Kazarinoff, E. B. Keller, K. J. Kemphues, K. A. R. Kennedy, L. V. Kochian,
A. S. Kondrashov, R. P. Korf, T. A. LaRue,
R. L. Last, A. C. Leopold, S. A. Levin,
J. K. Liebherr, G. E. Likens, J. T. Lis,
E. R. Loew, M. A. Luckow, R. E. McCarty,
D. K. McClearn, A. R. McCune,
J. M. Fessenden MacDonald, R. J. MacIntyre, E. L. Madsen, W. H. Mark, P. L. Marks, J. K. Moffat, R. P. Mortlock, J. B. Nasrallah, M. E. Nasrallah, K. J. Niklas, K. C. Nixon, T. G. Owens, D. J. Paolillo,
M. V. Parthasarathy, D. Pimentel,
T. R. Podleski, A. G. Power, W. B. Provine,
A. Quaroni, H. K. Reeve, M. E. Richmond,
J. W. Roberts, D. Robertshaw, R. B. Root,
M. J. Rossman, J. B. Russell, M. M. Salpeter,
A. M. Schneiderman, T. D. Seeley,
D. I. Shalloway, J. P. Shapleigh,
P. W. Sherman, R. B. Silver, J. Sirois,
R. M. Spanswick, D. B. Stern, V. J. Stewart,
D. N. Tapper, J. F. Thompson, R. Turgeon,
B.-K. Tye, S. Via, V. M. Vogt, C. Walcott,
R. H. Wasserman, R. O. Wayne, W. W. Webb,
N. F. Weeden, Q. D. Wheeler, D. B. Wilson,
S. C. Winans, D. W. Winkler, M. F. Wolfner,
J. F. Wootton, R. Wu, S. A. Zahler,
S. H. Zinder

## Other Teaching Personnel

G. S. Albrecht, R. R. Alexander, J. E. Blankenship, R. A. Calvo, P. W. Concannon, M. L. Cordts, C. Eberhard, P. R. Ecklund, J. C. Glase, J. M. Griffiths, J. B. Heiser, C. H. McFadden, S. Merkel, C. M. Rehkugler, H. C. Reiss, B. M. Tyler

## DISTRIBUTION REQUIREMENT

In the College of Agriculture and Life Sciences, the biological sciences distribution requirement (Group B) is for a minimum of 9 credits, including at least 6 credits of introductory biology satisfied by Biological Sciences 109-110, 105-106, or 101 and 103 plus 102 and 104, or $107-108$ or any combination of the first term of one sequence and the second term of another. Advanced placement in biology with a score of 4 or 5 ( 6 or 8 credits, respectively) satisfies the requirement for introductory biology. The additional credits may be satisfied by any biological sciences courses except Biological Sciences 152, 200 (unless permission of associate director is obtained), 202, 205, 206, 208, 209, 301 , or 367.

For College of Arts and Sciences students matriculating before fall 1992, the biological sciences distribution requirement is for a twosemester introductory biology sequence
selected from Biological Sciences 109-110, 105-106, or 101 and 103 plus 102 and 104, or $107-108$ or any combination of the first term of one sequence and the second term of another. An Advanced Placement score of 4 or 5 fulfills one-half the distribution requirement. Students must take an upper-level biology course to complete the distribution requirement in biological sciences. The remainder of the distribution requirement may be satisfied by an upper-level course (200+) offered by the Division of Biological Sciences other than Biological Sciences 152, 200 (except by permission of associate director), $202,205,206,208,209,301$, or 367 ; Anthropology 101; or Chemistry 222 or any combination of the first term of one sequence and the second term of another.
For students in the College of Arts and Sciences who matriculate fall 1992 or later, all courses offered by the Division of Biological Sciences can be used toward fulfillment of the biological distribution requirement except Biological Sciences 152, 200 (unless permission of the associate director is obtained), 202, $205,206,208,209,301$, or 367 . The following courses are especially suitable for the distribution requirement because they have no prerequisites: Biological Sciences 101-104, 105-106, 107-108, 109-110, 160, 170, 192, 201, 207, 212, 246, 275. Note that introductory biology can only count for distribution credit when taken as a twosemester sequence: 109-110, 105-106, or 101 and 103 plus 102 and 104, or 107-108, or a combination of the first term of one sequence and the second term of another. Advanced placement in biology with a score of 4 or 5 ( 6 or 8 credits, respectively) may be applied to the Group 1 distribution area in accordance with regulations stipulated by the Arts College

In the College of Human Ecology, the natural sciences distribution requirement is for at least 6 credits selected from Biological Sciences $109-110,101$ and 103 plus 102 and 104, 105106 or 107-108 or from specified courses in chemistry or physics. Advanced placement in biology with a score of 4 or 5 ( 6 or 8 credits, respectively) also satisfies the distribution requirement in the natural sciences

Note: Biological Sciences 101-102-103-104 should be taken as a unit by students of any college except those with advanced placement credit.

Switching from one introductory biology sequence to another at midyear may not be possible because of variation in presentation of topics. Students must receive permission of the instructor to switch sequences. Taking sequences in reverse or inconsecutive order is strongly discouraged.

## THE MAJOR

The Division of Biological Sciences offers a major in biological sciences to students enrolled in either the College of Agriculture and Life Sciences or the College of Arts and Sciences. The undergraduate program is
coordinated for students in both colleges through the division's Office for Academic Affairs, where students submit their applications to the major and obtain biology faculty advisers.

During the second semester of the sophomore year, all students who intend to major in biological sciences must apply for acceptance into the major with the associate director for academic affairs, in 200 Stimson Hall. Students in the College of Agriculture and Life Sciences who were admitted directly to the major complete the application process to declare a program of study area and to assure satisfactory progress toward completion of the major. Acceptance into the major requires completion of the course sequences in introductory biology, chemistry, and math ematics (see requirements 1-3 below), plus one semester of organic chemistry lectures. In addition, a 2.75 Comell cumulative gradepoint average is required for final acceptance into the major except for those students admitted directly to the major as freshmen (College of Agriculture and Life Sciences students only) or as transfers. Students in the process of completing these prerequisites for admission to the major may be accepted on a provisional basis. Final acceptance into the major is required for graduation with a biological sciences major. It is the student's responsibility to assure that final acceptance has been granted

Whenever possible, students should include the introductory biology, chemistry, and mathematics sequences in their freshman schedule and complete the organic chemistry lecture course in their sophomore year Students are not encouraged to continue with the major in biological sciences unless performance in these four subjects gives evidence of capacity to perform satisfactorily at a more advanced level.
The requirements for the biological sciences major are listed below. These courses, with the exception of the language requirement, should be taken for a letter grade, unless the course is offered for S-U grades only.

1) Introductory biology for majors
(one year): Biological Sciences 101 and 103 plus 102 and 104, or 105-106 Biological Sciences 107-108, offered during the eight-week Cornell Summer Session for 8 credits, also satisfies the introductory biology requirement for majors. Students may choose to accept advanced placement if they have received a score of 5 on the Advanced Placement Examination of the College Entrance Examination Board (CEEB). Students with a score of 4 must fulfill the introductory biology requirement by taking Biological Sciences 101-102, 101 and 103,102 and 104, or 103-104. These students should consult information available in the course office ( 1140 Comstock Hall) and in the Biology Center ( 216 Stimson Hall) to determine which semester to take to complete the introductory biology requirement. For students in doubt, completion of Biological Sciences 101 and 103 is advised. These students receive a total of 8 introductory biology credits ( 4 AP credits plus 4 course credits).
2) General chemistry (one year): Chemistry 207-208," or 215-216,* or

103-104.
3) College mathematics (one year) Two semesters of calculus (Mathematics 111-112, 191-192, or their equivalents) or one semester of calculus plus either Mathematics 105 or Statistics and Biometry 102. Education 115 may not be used to fulfill any part of this requirement
4) Organic chemistry: Chemistry 253 and 251 , or 253 and 301 , or 357-358 and 251, or 357-358 and 301, or 359360 and 251 , or 359-360 and 301
5) Physics: Physics 207-208,* 112-213,* or 101-102. Those who take Physics 112-213 are advised to complete Physics 214 as well.
6) Genetics: Biological Sciences 281 .
7) Biochemistry: Biological Sciences 330 , or 331 and 332, or 333.
8) Evolutionary Biology: Biological Sciences 378.
9) A program of study selected from the outline below
10) Foreign language: students registered in the College of Agriculture and Life Sciences must satisfy the foreign language requirement of the Division of Biological Sciences by
(a) presenting evidence of successful completion of three or more years of study of a foreign language in high school or (b) attaining a score of 560 or more on the reading portion of the College Entrance Examination Board achievement test or (c) achieving "qualification" status in a language as defined by the College of Arts and Sciences or (d) successfully completing at least 6 college credits in a foreign language. Students registered in the College of Arts and Sciences must satisfy the language requirement as stated by that college
*Since modern biology has an important physical and quantitative orientation, students are advised to undertake basic science courses that emphasize this approach. Asterisks in the above list indicate the courses that provide this orientation, but all courses listed are acceptable.

Although not required for the biological sciences major, a course in statistics is recommended for students planning graduate study or a research career. Students should consult their faculty advisers when choosing appropriate courses in statistics.

## Programs of Study and Requirements

As noted in the list of requirements above, students accepted into the biological sciences major must choose a program of study. The program of study requirements are designed to help students achieve depth in one area of biology while ensuring that the selected advanced courses form a coherent and meaningful unit. Because of the flexibility allowed in satisfying these requirements, students should consult their faculty advisers. The possible programs of study are listed below.

1) Animal Physiology: BIOAP 311, Introductory Animal Physiology, Lectures; BIOAP 313, Histology: The

Biology of Tissues; BIOAP 316, Cellular Physiology; and BIOAP 319, Animal Physiology Experimentation. The Program of Study in Animal Physiology emphasizes whole-animal, tissue, and cell physiology, and provides considerable opportunity for studies using live animals. It is intended especially for students contemplating careers in biomedical practice or research.
2) Biochemistry: Quantitative Chemistry (Chemistry 300 or completion of Chemistry 215-216 for the general chemistry requirement for the major); a minimum of four credits of organic chemistry laboratory (Chemistry 301302 or 251-252-302 or 301 or 251-252) one of the 5 -credit options of Biochemistry (331 and 332 or 330 for 5 credits) is strongly recommended; a biochemistry laboratory course (BIOBM 638 or 430 or 630 ); and Physical Chemistry (Chemistry 389-390.1 or 287-288 or 287-390.1 or 389-288). Note that Chemistry 288 is designed for biologists. It is recommended that students interested in graduate work in biochemistry take the more rigorous organic chemistry and physics sequences (Chemistry 357-358 or 359360 and Physics 207-208), six credits of organic chemistry laboratory, and a third semester of calculus in preparation for the more rigorous physical chemistry sequence (Chemistry 389390). Students interested in biochemistry should complete a year of introductory chemistry other than Chemistry 103-104 before the start of their sophomore year. Students are also urged to complete introductory biology in their freshman year.
3) Cell Biology: Chemistry 300 or 215216, Quantitative Chemistry; BIOBM 432, Survey of Cell Biology; BIOBM 630, Laboratory in Cell Biology (strongly recommended), or BIOBM 638, Intermediate Biochemical Methods, or BIOBM 430, Basic Biochemical Methods; and at least 5 additional credits chosen from the following courses: BIONB 222 , Neurobiology and Behavior II: Introduction to Neurobiology; BIO G 305, Basic Immunology; BIOAP 313, Histology: The Biology of the Tissues; BIOPL 345, Plant Anatomy; BIOBM 435-436, Undergraduate Biochemistry Seminar; BIOBM 437, Oncogenes and Cancer Viruses; BIOPL 444, Plant Cell Biology; BIOGD 483, Molecular Aspects of Development; BIOBM 636, Cell Biology; BIOBM 639, The Nucleus; An S 419, Animal Cytogenetics.
Students interested in cell biology should complete a year of introductory chemistry other than Chemistry 103104 before the start of their sophomore year. Students are also urged to complete introductory biology in their freshman year and are strongly encouraged to take one of the 5 -credit options of Biochemistry ( 331 and 332 or 330 for 5 credits). If graduate work in cell biology is anticipated, students should consider taking a physical chemistry sequence (Chemistry 389-
390.1 or $287-288$ or $287-390.1$ or $389-$ 288).
4) Ecology and Evolutionary Biology: BIOES 261, Ecology and the Environment, and 10 credits from the following course lists, including at least one course from each group:
(a) BIOES 241, Introductory Botany; BIOES 274, Functional and Comparative Morphology of Vertebrates; BIOES 373, Biology of the Marine Invertebrates; BIOES 466 and 468, Physiological Plant Ecology, Lectures and Laboratory; BIOES 471, Mammalogy; BIOES 472, Herpetology; BIOES 475, Omithology; BIOES 476, Biology of Fishes; Entom 212, Insect Biology
(b) BIOES 263, Field Ecology; BIOES 272, Functional Ecology: How Animals Work; BIOES 448, Plant Evolution and the Fossil Record; BIOES 452,
Herbivores and Plants: Chemical Ecology and Coevolution; BIOES 455, Insect Ecology; BIOES 456, Stream Ecology; BIOES 457 and 459, Limnology: Ecology of Lakes, Lectures and Laboratory; BIOES 461, Population and Evolutionary Ecology; BIOES 462, Marine Ecology; BIOES 463 and 465, Plant Ecology and Population Biology, Lectures and Laboratory; BIOES 464, Microevolution and Macroevolution; BIOES 470, Ecological Genetics; BIOES 473, Ecology of Agricultural Systems; BIOES 478, Ecosystem Biology; BIOES 479, Paleobiology; BIOGD 481, Population Genetics.
Note: One 400 -level, 4 -credit course offered at Shoals Marine Laboratory may be applied toward the 10 credits. Students are encouraged to gain experience in some aspect of field biology through course work at a biological field station or work experience.
Note: The Ecology and Evolutionary Biology program of study offers an undergraduate specialization in Marine Biology and Oceanography. A description of this specialization can be found in the section entitled COURSES IN MARINE SCIENCE.
5) General Biology: The Program of Study in General Biology requires a minimum of 13 credit hours from courses offered by the Division of Biological Sciences in addition to courses counted towards requirements $1-8$ above. These credits must include one course (200-level or above) from the courses listed for at least three of the eight other programs of study (see pages 124-125), and must include a course with a laboratory and a minimum of two upper-level ( 300 and above) courses of two or more credits. BIO G 498 may not be used as one of the upper-level courses. BIO G 499 (minimum of 2 credits, but no more than 3 credits) may count as one of the upper-level courses, and may count as the laboratory course with approval of the adviser.
6) Genetics and Development: A minimum of 13 credits, usually chosen from the following courses: BIOGD 385, Developmental Biology; BIOGD 389, Embryology; BIONB 423,
Neurogenetics; BIOBM 438, Yeast Genetics and Molecular Biology; BIOES 470, Ecological Genetics; BIOGD 481,

Population Genetics; BIOGD 482,
Human Genetics and Society; BIOGD 483, Molecular Aspects of Development; BIOGD 484, Molecular Evolution; BIOMI 485, Microbial Genetics; BIOBM 633, Biosynthesis of Macromolecules; BIOBM 639, The Nucleus; BIOPL 641, Laboratory in Plant Molecular Biology; BIOI'L 644, Plant Growth and Development; BIOPL 652, Plant Molecular Biology II; BIOPL 653, Plant Molecular Genetics; BIOGD 682, Fertilization and the Early Embryo; BIOGD 684, Advanced Topics in Population Genetics; BIOGD 686, Mammalian Development; BIOGD 687, Developmental Genetics; BIOMI 694, Genetics of Diverse Bacteria; P1 Br 606, Advanced Plant Genetics.
Up to 3 credits for this program of study may be chosen from other biological sciences courses with approval of the faculty adviser.
7) Microbiology: BIOMI 290, General Microbiology, Lectures; BIOMI 291, General Microbiology, Laboratory; BIOMI 300, Seminar in Microbiology; BIOMI 391, Advanced Microbiology Laboratory; and at least 5 credits from the following course lists, including at least one course from each group: (a) BIOMI 485, Microbial Genetics; or BIOMI 416, Microbial Physiology; and (b) BIOMI 415, Bacterial Diversity; or BIOMI 451, Structure and Function of Bacterial Cells.
8) Neurobiology and Behavior: The twosemester introductory course sequence, Neurobiology and Behavior I and II (BIONB 221 and 222) with discussion section ( 4 credits per term), and 7 additional credits, among which must be a course from the neurobiology and behavior offerings. BIONB 420, BIO G 498 and 499 , and BIONB 720 may not be used as this neurobiology and behavior course. However, these readings and independent research courses may form part of the additional credits (beyond those provided by the advanced neurobiology and behavior course) required to complete the Program of Study in Neurobiology and Behavior.

Note: Students who declare the Program of Study in Neurobiology and Behavior after taking BIONB 221 or 222 for only 3 credits must complete additional course work in neurobiology and behavior. These students should consult the chair of the Section of Neurobiology and Behavior (W363 Seeley G. Mudd Hall) to determine what course(s) to use to make up the deficiency.
9) Plant Biology: Students choose one area of study from the following two options:
Option (a) Botany: Students are required to take Introductory Botany (BIOPL 241). Students should then choose, with the aid of their faculty adviser, a minimum of three of the following courses, for a total of at least 10 additional credits, to round out their botanical training: BIOPL 242 and 244 , Plant Physiology, Lectures and Laboratory; BIOPL 246, Plants and Civilization; BIOPL 248, Taxonomy of Vascular Plants; BIOPL 342 and 344 ,

Plant Physiology, Lectures and Laboratory; BIOPL 343 and 347, Molecular Biology and Genetic Engineering of Plants, Lectures and Laboratory; BIOPL 345, Plant Anatomy; BIOPL 359, Biology of Grasses; BIOPL 444, Plant Cell Biology; BIOPL 445 , Photosynthesis; BIOPL 447, Molecular Plant Systematics; BIOPL 448, Plant Evolution and the Fossil Record; BIOES 463 and 465, Plant Ecology and Population Biology, Lectures and Laboratory; or BIOES 466 and 468, Physiological Plant Ecology, Lectures and Laboratory.
Option (b) Plant Biotecbnology: Students are required to take BIOPL 343 and 347, Molecular Biology and Genetic Engineering of Plants, Lectures and Laboratory. Students choose, in consultation with their faculty adviser, a minimum of 10 additional credits from the following list: BIOPL 241, Introductory Botany; BIOPL 242 and 244, Plant Physiology, Lectures and Laboratory; BIOPL 342 and 344, Plant Physiology, Lectures and Laboratory; BIOPL 346, Algal Physiology; BIOPL 444, Plant Cell Biology; BIOPL 648, Plant Biochemistry; Pl Br 401, Plant Cell and Tissue Culture; or $\mathrm{Pl} \mathrm{Br} \mathrm{402}$, Tissue Culture Laboratory.
10) Independent Option: A special program for students interested in nutrition is available under this option. In addition, students who want to undertake a course of study not covered by the nine existing programs of study or the special program may petition the Division of Biological Sciences Curriculum Committee. Information on independent options and Curriculum Committee petition forms are available in the Office for Academic Affairs, 200 Stimson Hall.

## Independent Research and Honors Program

Individual research projects under the direction of a faculty member are encouraged as an aspect of study within a program of study. Applicants for research projects are accepted by the individual faculty members, who take into account students' previous academic accomplishments, interests, and goals and the availability of space and equipment suitable for the proposed project Students accepted for independent research enroll for credit in Biological Sciences (BIO G) 499 (Undergraduate Research in Biology) with the written permission of the faculty supervisor. Students register for this course in 200 Stimson Hall. Any faculty member in the Division of Biological Sciences may act as a supervisor. Faculty supervisors outside the division are acceptable only if a faculty member of the division agrees to take full responsibility for the quality of the work. Information on faculty research activities and undergraduate research opportunities is available in the Behrman Biology Center, 216 Stimson Hall.
Research credits may not be used in completion of the following program of study areas: animal physiology; biochemistry; cell biology; ecology and evolutionary biology; genetics and development; microbiology; plant biology. No more than 4 credits of research
may be used in completion of the Program of Study in Neurobiology and Behavior.
The honors program in biological sciences is designed to offer advanced training in laboratory or field research through the performance of an original research project under the direct guidance of a member of the Cornell faculty. Applications for the honors program are available in the Office for Academic Affairs, 200 Stimson Hall, and must be submitted to the Honors Program Committee by the deadline announced early in the senior year. Application forms for the honors program are separate from the enrollment forms for Biological Sciences (BIO G) 499 (Undergraduate Research in Biology). To qualify for the program, students must have been accepted into the biological sciences major, have completed at least 30 credits at Comell, and have an overall Cornell cumulative grade-point average of at least 3.00. In addition, students must have at least a 3.00 Cornell cumulative grade-point average in all biology, chemistry, mathematics, and physics courses. (Grades eamed in courses in other departments that are used to fulfill major requirements are included in this computation.) In addition, candidates must have a faculty member to supervise their research. Any faculty member in the Division of Biological Sciences may act as a supervisor. Students may also work with faculty supervisors outside the division. Students who select supervisors outside the division must arrange for a faculty member of the division to serve as cosigner of the research. The division cosigner must agree to meet with the student on a regular basis, to report to the Honors Program Committee on the progress of the work approximately two months before the thesis is due, and to serve as a reviewer of the thesis. An honors candidate usually enrolls for credit in Biological Sciences (BIO G) 499 (Undergraduate Research in Biology) under the direction of the faculty member acting as honors supervisor, although it is not necessary to do so. Students choosing to earn credit for honors research must enroll in Biological Sciences (BIO G) 499 (Undergraduate Research in Biology) separate from the honors program. Requirements of the honors program include participation in honors research seminars during two semesters, submission of an acceptable honors thesis, completion of all major requirements, and maintenance of the 3.00 Cornell cumulative grade-point average through graduation Recommendation to the faculty that a candidate graduate with honors is the responsibility of the Honors Program Committee.
Students interested in the honors program should consult their faculty advisers early during their junior year. Students are strongly encouraged to begin their research projects in their junior year, although they are not formally admitted to the honors program until the beginning of their senior year. Students who are considering study abroad during their junior year should consult with a member of the Honors Committee during their sophomore year to plan a reasonable schedule for honors research. The Honors Program requires that student participants attend honors seminars in which they give oral presentations during the first and second semesters of their senior year. Therefore, students who are considering studying away from campus during the senior year should
consult with a member of the Honors Committee no later than the beginning of the first semester of their junior year. Details pertaining to thesis due dates, seminars, and other requirements may be obtained from the chair of the Honors Program Committee or from the Office for Academic Affairs, 200 Stimson Hall. Information on faculty research activities is available in the Behrman Biology Center, 216 Stimson Hall. Deviation from any of the requirements of the Honors Program requires a petition in the form of a letter to the Honors Program Committee, c/o 200 Stimson Hall.

## CURRICULUM COMMITTEE

Many decisions pertaining to the curriculum, to division-wide requirements, and to the programs of study are made by the Curriculum Committee of the division. The committee consists of faculty and elected student members and welcomes advice and suggestions from all interested persons.

## ADVISING

Students in need of academic advice are encouraged to consult their advisers, come to the Behrman Biology Center ( 216 Stimson Hall), or contact the associate director for academic affairs ( 200 Stimson Hall).
Students interested in marine biology should visit the Cornell Marine Programs Office, G14 Stimson Hall.
Students interested in the multidisciplinary program Biology and Society should see
"Special Programs and Interdisciplinary Studies," in the College of Arts and Sciences section of this catalog.

## INDEX OF COURSES

The following course identifiers are used to denote biological sciences courses in specific areas: General Courses, BIO G; Animal Physiology, BIOAP; Biochemistry, Molecular and Cell Biology, BIOBM; Ecology and Systematics, BIOES; Genetics and Development, BIOGD; Microbiology, BIOMI; Neurobiology and Behavior, BIONB; Plant Biology, BIOPL; Shoals Marine Laboratory, BIOSM.
Note: Biological sciences courses count as agriculture and life sciences credits for students in the College of Agriculture and Life Sciences and as arts and sciences credits for students in the College of Arts and Sciences.

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## GENERAL COURSES (BIO G)

BIO © 101-102 Biologlcal Sciences, Lectures
101, fall; 102, spring. 2 credits each term. Prerequisite: concurrent enrollment in Bio G 103 (fall) or 104 (spring). Passing grade (D or better) in 101 is prerequisite to 102 unless permission is obtained from instructor. S-U grades optional, with permission of instructor. May not be taken for credit after Bio S 105106 or 109-110.

Lecs, M W F 9:05 or 10:10. 2 lecs each week; to accommodate these, students must reserve all 3 days. Evening prelims: fall, Sept. 22 and Nov. 8; spring, Feb. 23 and Apr. 6. A. W. Blackler.

Designed both for students who intend to specialize in biological sciences and for those who want to obtain a thorough knowledge of biology as part of their general education. The fall semester covers the chemical and cellular basis of life, energy transformations, and cell and tissue biology. The spring semester covers genetics, development, evolution, and ecology. Each topic is considered in the light of modern evolutionary theory.

## BIO G 103-104 Biological Sciences, Laboratory

103, fall; 104, spring. 2 credits each term Prerequisite: concurrent enrollment in BIO G 101 (fall) or 102 (spring). 103 is prerequisite to 104 unless permission is obtained from instructor. S-U grades optional, with permission of instructor. No admittance after second week of classes.

Lab, M T W or R 1:25-4:25, M or W 7:30-
$10: 30 \mathrm{p} . \mathrm{m}$. or T R or $\mathrm{S} 8-11$. One 3 -hour lab each week and a weekly lec for discs, special lecs, etc. J. C. Glase, P. R. Ecklund, and staff.
BIO G 103-104 is designed to provide laboratory experience with major biological phenomena in order to support an understanding of the important concepts, principles, and theories of modern biology. A second objective of the laboratory course is to help students gain expertise in the methods used by biologists to construct new knowledge. Students are exposed to basic concepts, research methods, including laboratory and data transformation techniques, and instrumentation in the major areas of biology. Firstsemester topics include biochemistry, physiology, invertebrate diversity, and behavior. In the second semester, laboratory experience is provided in the areas of genetics, biotechnology, immunology, plant biology, population genetics and growth, and ecology. During the first semester, dissection of a doubly-pithed frog is included. Pithing is done by the instructor

## BIO G 105-106 Introductory Biology

105 , fall; 106, spring. 4 credits each term (or 2 credits, with permission of instructor). Enrollment limited to 200 students. Prerequisite: 105 is prerequisite to 106 , unless written permission is obtained from instructor. S-U grades optional, with written permission of instructor. May not be taken for credit after BIO G 101-104 or 109-110. No admittance after first week of classes. Estimated cost for dissection kit, \$11.

Lec, T 9:05 (1st lec of fall term, R 8/25
9:05); additional study and lab hours to be arranged. Staff.
Designed primarily for biology majors, preprofessionals, and other students who desire a challenging, broad introduction to fundamental concepts of biology. Physiology, anatomy (accompanied by preserved vertebrate and invertebrate dissection), and biochemistry are strongly emphasized in the fall semester. Subjects of study in the spring semester are genetics, development, ecology, evolution, behavior, and the diversity of organisms. The course uses an autotutorial format and offers considerable flexibility in scheduling. Completion of the course requires mastery of a group of core units. Testing on these units is primarily by oral examination. Students who cannot respect deadlines should take another course. Four formal laboratory sessions are offered each semester; additional laboratory work is
included in the core units. Evaluation is based on written reports on experimental work or on extensive dissections (both vertebrate and invertebrate) with practical exams. Performance on the core units, the laboratories, and the final examination determine the final grade. Students who object to dissecting live invertebrates may want to take another biology course.

## BIO G 107-108 General Biology

Summer (8-week session; 107, weeks 1-4; 108, weeks 5-8). 4 credits each. Prerequisite: BIO G 101-103, 105, or 107 is a prerequisite for 108 . Fee, $\$ 25$ for weeks $1-4 ; \$ 15$ for weeks 5-8.

Lecs, M-R 9-12; labs, M T R 1:30-4:30, F 9-12. Staff.
Designed for students who plan further study in biology and for students who want a broad course in biology as part of their general education. BIO G 107 covers biological metabolism, first at the molecular level and then progressively to the organ system level The laboratory work involves an introduction to some major techniques, vertebrate dissection, and a survey of plant organization. BIO G 108 seeks to integrate the topics of genetics, developmental biology, population biology, and ecology in a general consideration of biological evolution. The laboratory work is a continuation of the material covered in BIO G 107 and involves more techniques, a survey of animal organization, and the design and performance of a field study. BIO G $107-$ 108 fulfills the introductory biology requirement for majors and forms a suitable
introductory biology course sequence for students intending to go to medical school.

## BIO G 109-110 Biological Principles

109, fall; 110 , spring. 3 credits each term. Limited to 600 students. A passing grade in 109 or $101-103$ or 105 is prerequisite to 110 unless written permission is obtained from the instructor and the student has at least 3 credits of college biology. Since 109-110 together constitute an integrated survey, 109 cannot be used to satisfy the College of Arts and Sciences or College of Agriculture and Life Sciences distribution requirement unless it is followed by 110 or an exemption is obtained from the instructor. Letter grades only. May not be taken for credit after BIO G 101-104 or 105-106. This course sequence may be used to fulfill the distribution requirement in the Colleges of Agriculture and Life Sciences, Arts and Sciences, and Human Ecology but may not be used as an introductory course for the major in biological sciences. Note that this course may not always satisfy the prerequisite for second- and third-level courses in biology.

Lecs, M W F 9:05 or 10:10; lab, M T W R or
F 2-4:25 or T 10:10-12:35. Students do not choose lab sections during course
enroliment; lab assignments are made during first day of classes. Each student must attend lab on alternate weeks.
Evening prelims: fall, Sept. 22 and Nov. 8; spring, Feb. 23 and Apr. 6. R. Turgeon, C. Eberhard.

Students who do not plan to major in biology may take this broad introductory course in modern biology. It is not a course in social biology but addresses itself to biological principles with academic rigor. The content is designed to appeal to anyone who seeks a comprehensive knowledge of biology as part of a general education. Laboratory sections enable small groups of students to meet with the course staff and are used for problem-
solving experiments, demonstrations, and discussions. No live dissections are involved; there are dissections of vertebrate and invertebrate material.

BIO 0152 Special Topics in Biology Spring. 1 credit. Limited to 30 students. Prerequisites: superior performance in BIO G 109 or equivalent and concurrent enrollment in 1 BIO G 102, 106, or 110 , or written permission of instructor. S-U grades only. This course may not be used in fulfillment of college distribution requirements.

Lec, T 3:35; occasional field trips to be
arranged. R. Turgeon, C. Eberhard, and guest lecturers. Guest lecturers discuss topics in their field of research interest. This course is designed to complement introductory biology by providing an opportunity for deeper exploration of selected topics of interest. Class involvement and discussion are encouraged.

## BIO G 170 Evolution of the Earth and Life

 (also Geological Sciences 102) Spring. 3 credits. Recommended: Geol 101. S-U grades optional.Lecs, T R 9:05 or 11:15; lab, M T W or
R 2:00-4:25; field trips during lab.
J. L. Cisne.

Earth systems and their evolution. Earth history's astronomical context. Plate tectonics, continental drift, and their implications for climate and life. Coevolution of life and the atmosphere. Precedents for ongoing global change. Dinosaurs; mass extinctions; human ancestry. Laboratories on reconstructing geological history and mapping ancient geography. Fossil collecting on field trips.

## BIO G 200 Special Studies in Biology

Fall, spring, or summer. 1-3 credits.
Prerequisites: transfer- or special-student status and written permission of instructor and of the associate director of the Division of Biological Sciences. Students must register using a special form available in Stimson 200. S-U grades optional, with permission of instructor.

Hours to be arranged. Staff.
A registration device for students who want to take only a portion of a regular biological sciences course-for example, only the lectures or only the laboratory in a course that includes both. Only students who have already had training equivalent to the portion of the regular course that is to be omitted may register in this manner. This course may not be substituted for 100-level courses and may not be used in fulfillment of college distribution requirements except by permission of the associate director of the division.

## [BIO G 201 Biotechnology: The "New" Biology (also Biology and Society 201)

Spring. 3 credits. This course is for students not majoring in biological sciences. Students who have taken or are currently enrolled in BIOGD 281 or BIOBM 330 or 331 may not enroll. S-U grades optional. Not offered 1994-95.

Lecs, T R 2:30-4:25. Disc T or R 3:35 starting week 3 ; disc assignments made during week 2. J. M. Fessenden
MacDonald, J. M. Calvo, S. Howell.
Designed for nonmajors, a general introduction to the application and issues of modern molecular biology in medicine and agriculture Information on recombinant DNA technology, monoclonal antibodies, plant cell culture techniques, and embryo maniputation
methods is presented. Topics include medical diagnostics and treatments; environment, agriculture, and food; and economic, socialpolicy, regulatory, ethical, and legal issues that surround biotechnology. The course is taught in three modules and the topics vary from year to year. Topics for 1995 are human gene mapping and genetic screening, crop plant biotechnology, immunodiagnostics and therapy, and AIDS and cancer. Recommended for those students who want to understand some new research discoveries, their applications, and social, legal, ethical, and policy issues stemming from them.]
BIO G 205 Ethics and Health Care lalso Biology and Society 205 and Science and Technology Studies 205)
Fall or summer (6-week session). 4 credits. Limited to 100 students ( 25 under BIO G 205, 25 under B\&Soc 205, and 50 under Phil 245). Registered students not attending during the first week will be dropped from the course.
Open to sophomores, juniors, and seniors.
Lecs, T R 8:40-9:55; disc, T or R 10:10 or $1: 25$. Staff.
This course examines the ethical problems that emerge from cases of health care and search for practical solutions, while also delving deeper into understanding the nature of ethical responsibility and the tools of ethical analysis. This is a lab course in philosophy, with considerable work-both individually and in groups-on specific cases, problems, and fundamental ethical questions. Major sections include life, death, reproduction, and ethics; concepts of health care;
health care and society; and research.
BIO Gi 206 Ethics and the Environment (also Biology and Society 206 and Science and Technology Studies 206)

Spring. 4 credits. Limited to 100 students ( 25 under BIO G 206, 25 under B\&SSoc 206, and 50 under Phil 246). Permission of instructor required for freshmen.

Lecs, T R 8:40-9:55. Disc, 1 hour each week to be arranged. Staff.
This course addresses how ethical analysis helps shape our responses to environmental problems. Case studies help guide our assessments. This is a lab course in philosophy. The course challenges the student to develop ethical solutions or approaches individually and in groups. Major aims of the course include articulating the relationships between knowledge and values and distinguishing between ethics and economics, ecology, ideology, politics, and prudence or wisdom. A background in basic ecology or environmental issues or ethics is strongly recommended.
BIO G 207 Evolution (also History 287 and Science and Technology Studies 287)

Fall or summer. 3 credits. Intended for students with no background in college biology. May not be taken for credit after BIOES 378. S-U grades optional.

Lecs, T R 10:10; disc, 1 hour each week to be arranged. W. B. Provine.
Evolution is the central concept in biology. This course examines evolution in historical and cultural contexts. Aims of the course include understanding the major issues in the history and current status of evolutionary biology and exploring the implications of evolution for culture. Issues range from controversies over mechanisms of evolution in
natural populations to the conflict between creationists and evolutionists.

BIO G 208 Drawing the Muman FIgure
Summer ( 6 -week session). 3 credits.
Labs, M T W 3-5:15. K. Kucharski.
Human anatomy. Emphasis on learning correct anatomical information relating to the skeletal and muscular systems as approached through observation and drawing practices.

## BIO G 209 Introduction to Natural

 Science lllustrationSummer (6-week session). 2 credits. Limited to 12 students. Prerequisite: free-hand drawing or permission of instructor. S-U grades optional.

Lecs and labs, T R 6:30-9:30 p.m.
B. S. King.

An introduction to the att of natural science illustration for publication, and to the techniques of various media including pencil, pen and ink, watercolor, colored pencil, scratchboard, and carbon dust. Potentials and limitations of line and half-tone reproduction, copyright, and portfolio presentation are discussed.
BlO G 301 Biology and Society: The Social Construction of Llfe (also Biology and Society 301 and Science and Technology Studies 401)
Fall. 4 credits. Prerequisite: one year of introductory biology.

Sems and discs, M W 2:30-4:25.
P. J. Taylor

Controversial issues, past and present, in the life sciences and tools for analysis of the social, historical, and conceptual underpinnings of these issues. Topics include evolution and natural selection, heredity and genetic determinism, biotechnology and reproductive interventions, and ecology and environmental change. Analytic themes include bias, metaphor, historical semantics, styles of explanation, determinism, causality, interest, social construction, and gender. Through discussions and writing assignments, students develop analytic skills and their own responses to current issues.

## BIO G 305 Basic Immunology, Lectures

 (also Veterinary Microbiology 315)Fall. 3 credits. Strongly recommended: basic courses in microbiology, biochemistry, and genetics. S-U grades optional, with permission of instructor.

Lecs, T R 8:30-9:55. Evening prelims:
Sept. 22, Oct. 13, and Nov. 10.
A. J. Winter.

A survey of immunology, with emphasis on the biological functions of the immune response.
BIO G 400 Undergraduate Seminar in Biology
Fall or spring. Variable credit ( $1-3$ credits assigned for individual seminar offerings). May be repeated for credit. S-U grades optional.

> Sem to be arranged. Staff.

From time to time specialized seminars on topics of interest to undergraduates are offered by visiting faculty or faculty from the Sections of Ecology and Systematics, Genetics and Development, or Plant Biology. Topics and instructors are listed in the division's catalog supplement issued at the beginning of the semester. For students interested in Biochemistry, Physiology, or Neurobiology please see descriptions under appropriate section.

## BIO G 401 Introduction to Scanning Electron Microscopy

Fall or spring, weeks $1-8.1$ credit. Limited to 8 students (fall), 12 students (spring).
Prerequisite: permission of instructor. S-U grades optional

Lec, M 10:10; lab, T R or F 9:05-12:15 or T W or R 1:25-4:25. Fee may be charged. M. V. Parthasarathy.

An introductory course that includes the principle and use of the scanning electron microscope. Students use biological material to explore and understand some of the fine biological architecture. In addition to preparing the specimens, the students use the scanning electron microscope to study and obtain micrographs of features that interest them.

## BIO G 403 Transmission Electron Microscopy for Biologists

Fall. 1, 2, or 3 credits. 3 credits if student takes both sections. Limited to 12 students. Prerequisites: BIOAP 313, BIOPL 345 or 443 , or written permission of instructor. S-U grades optional.

Lec, T 11:15; labs, M W or T R 1:25-4:25 Two sections: Sec 01, 1 credit, weeks $1-4$; $\sec 02,2$ credits, weeks 5-8. Students may register for one or both sections. Fee may be charged. M. V. Parthasarathy.
Section 01, 1 credit, weeks $1-4$, covers the principles and use of the transmission electron microscopy (TEM), with emphasis on proper operation of the instrument and interpretation of images obtained. Negatively stained materials are used for viewing with the transmission electron microscope. Section 02, 2 credits, weeks 5-8, covers the principles and techniques of preparing biological material for transmission electron microscopy. Using animal, plant, and microbe materials this section studies chemical fixtures, cryofixations, ultrathin sectioning, and metal shadowing techniques. Students have two additional weeks to complete laboratory assignments at the end of each section.

## BIO G 405 Electron Microscopy in Molecular Blology

Fall, weeks 9-12. 1 credit. Limited to 12 students. Prerequisites: BIO G 403 or proficiency in transmission electron microscopy and written permission of instructor. S-U grades optional.

Lec, T 11:15; labs, M W or T R 1:25-4:25. Fee may be charged. M. V. Parthasarathy, M. Kyle.

An introductory course to electron microscopy (EM) for use as a tool in analyzing molecular structure, interactions, and processes. Methods considered to be most generally applicable to current studies in molecular biology are covered, including visualization of nucleic acids, heteroduplexes, protein molecules and filaments, and EM immunolabelling.

## BIO G 408 Viruses and Disease (also

 Veterinary Microblology 417) (formorly Bio $\$ 308$ and VETMI 317) Spring. 3 credits. Prerequisites: BIOMI 290, 291; BIO G 305; and permission of instructor Recommended: BIOGD 281Lecs, M W $7: 30$ p.m. J. Casey.
The course covers basic concepts in virology with emphasis on virus-host interactions, strategies for gene regulation, and mechanisms of pathogenicity. Selected viral infections that result in immune dysfunction and neoplasis are highlighted in the context of
approaches to prevent or reduce the severity of diseases.

## Blo G 450 Light and Video Microscopy for Biologists

Spring. 3 credits. Limited to 12 students. Prerequisite: one year of introductory biology and permission of instructor.

Lecs, T R 1:25-2:30; lab, R 2:30-4:30.
R. O. Wayne.

Theoretical and practical aspects of light microscopy, including brightfield, darkfield, phase-contrast, polarization, Hoffmanmodulation contrast, interference, differentialinterference contrast, and fluorescence microscopy, as well as video- and computerbased digital image enhancement, are studied. Students leam both qualitative and quantitative techniques to probe noninvasively the structure and function of living plant cells.

## B10 G 469 Food, Agriculture, and Society (also Biology and Society 469 and Science and Technology Studles 469)

Spring. 3 credits. Prerequisite: an introductory ecology course or permission of instructor. S-U grades optional. Limited to 20 students.

Lecs, T R 1:25-2:40. A. G. Power A multidisciplinary course dealing with the social and environmental impact of food production in the United States and developing countries. Agroecosystems of various kinds are analyzed from biological, economic, and social perspectives. The impacts of traditional, conventional, and alternative agricultural technologies are critically examined in the context of developed and developing economies. Specific topics include pest management, soil conservation, plant genetic resources, biotechnology, and sustainable development.

## BIO G 498 Teaching Experience

Fall or spring. 1-4 credits. Enrollment limited. Prerequisites: previous enrollment in the course to be taught or equivalent, and written permission of instructor. S-U grades optional, with permission of instructor. Students in the College of Arts and Sciences may not count credits from this course toward the 120 credits required for graduation.

Hours to be arranged. Staff.
Designed to give qualified undergraduate students teaching experience through actual involvement in planning and assisting in biology courses. This experience may include supervised participation in a discussion group, assisting in a biology laboratory, assisting in field biology, or tutoring. Biological sciences courses currently offering such experience include BIO G 105-106; BIOAP 311, 319; BIOBM 231, 330, 430; BIOES 274, 475; and BIOMI 291, 292.

## BIO a 499 Undergraduate Research in

 BlologyFall or spring. Variable credit. Students in the College of Arts and Sciences may not register for more than 6 credits per term with one supervisor or 8 credits per term with more than one supervisor. Prerequisite: written permission of staff member who supervises the work and assigns the grade. Students must register in the Office for Academic Affairs in 200 Stimson Hall. Each student must submit an independent study statement describing the proposed research project during course registration. (Special forms for this purpose are available in the college offices and in 200 Stimson Hall.) S-U grades
optional. Any faculty member in the Division of Biological Sciences may act as a supervisor. Faculty supervisors outside the division are acceptable only if a faculty member of the division agrees to serve as cosigner, taking full responsibility for the quality of the work.

Hours to be arranged. Staff.
Practice in planning, conducting, and reporting independent laboratory and library research programs. Research credits may not be used in completion of the following programs of study: animal physiology and anatomy; biochemistry; cell biology; ecology and evolutionary biology; genetics and development; microbiology; plant biology. No more than 4 credits of research may be used in completion of the program of study in neurobiology and behavior.

## BIO 0606 Freeze-Fracture Technique

 Spring, weeks 9-14. 1 credit. Primarily for graduate students. Limited to 8 students.Prerequisites: BIO G 403 or equivalent, and permission of instructor. S-U grades only. Lec, M 10:10; disc to be arranged; labs, M W 1:25-4:25. Fee may be charged.
M. V. Parthasarathy.

Principles of freeze-fracturing and freezesubstitution technique, freezing artifacts, and interpretation of images.

## BIO 0608 Advanced Electron Microscopy for Biologists

Spring, weeks 10-14. 1 credit. Primarily for graduate students. Limited to 6 students. Prerequisite: BIO G 403 or equivalent. S-U grades only.

Hours to be arranged. Fee may be
charged. M. V. Parthasarathy.
Project in biological ultrastructure.

## Blo © 702 X-Ray Elemental Analysis in

 BiologySpring, weeks 7-14. 1 credit. Limited to 6 students. Prerequisites: BIO G 403 or equivalent, and permission of instructor. S-U grades only. Offered altemate years.

Lec and lab to be arranged. Fee may be
charged. M. V. Parthasarathy,
C. Daugherty.

Principles of X-ray elemental analysis are discussed, with special reference to the energy-dispersive system. Emphasis is on qualitative elemental analysis of biological specimens and preparation of material for such analysis, including freeze-substitution technique. A brief incroduction to quantitative elemental analysis is also given.

## [BIO G 705 Advanced Immunology

 Lectures (also Veterinary Microbiology 705)Spring. 3 credits. Prerequisite: BIO G 305 or permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, M W F 9:05. Coordinator:
A. J. Winter.

Coverage at an advanced level of molecular and cellular immunology.]

## BIO G 706 Immunology of Infectlous

 Diseases and Tumors (also Veterinary Microbiology 719)Spring. 2 credits. Prerequisite: BIO G 305 or permission of instructor. S-U grades with permission of instructor. Offered alternate years.

Lec, R 10:10-12:05. Coordinator:
A. J. Winter.

Coverage at an advanced level of the immunology of diseases caused by selected bacterial, viral, protozoan, and helminthic parasites, and tumor immunology.

Related Courses in Other Departments
The Sea: An Introduction to Oceanography (Biological Sciences [BIOES] 154)
Medicine and Civilization (Biology and Society 322)
Pathogenic Bacteriology and Mycology (Biological Sciences [BIOMI] 304 and Veterinary Microbiology 318)

## ANIMAL PHYSIOLOGY (BIOAP)

## BIOAP 212 Human Physiology for MonBiology Majors

Spring. 3 credits. May not be taken for credit after BIOAP 311. Limited to 130 students.
This course may be used toward the science distribution requirement of the College of Arts and Sciences and the Group B distribution requirement of the College of Agriculture and Life Sciences. This course may not be used to fulfill the requirements of any Program of Study in the biological sciences major. Lecs, M W F 1:25; disc, M W or F 2:15. Evening prelims: Mar. 2 and Apr. 18.
P. Concannon and staff.

Introduction to the physiology of all major organ systems and the relation of that physiology to human health and disease. Emphasis on understanding of major body functions and control mechanisms regulating each organ system. Students develop a fundamental understanding of how their bodies work that will be the basis of making informed decisions about their own health and medical needs and those of their families. Taught by staff of research physiologists and cooperating physicians.

## BIOAP 214 Biological Basis of Sex Differences (also Biology and Soclety 214 and Women's Studies 214)

Fall. 3 credits. Limited to non-biology majors and freshman and sophomore biology majors. Prerequisite: one year of introductory biology. S-U grades optional. Offered alternate years.

Lecs, T R 8:30-9:55; occasional discussion to be arranged. J. E. Fortune.
The structural and functional differences between the sexes are examined. Emphasis is placed on mechanisms of mammalian reproduction; where possible, special attention is given to studies of humans. Current evidence on the effects of gender on nonreproductive aspects of life (behavior, mental and physical capabilities) is discussed. The course is intended to provide students with a basic knowledge of reproductive endocrinology and with a basis for objective evaluation of sex differences in relation to contemporary life.

## BIOAP 311 Introductory Animal Physiology, Lectures (also Veterinary Physiology 346)

Fall. 3 credits. Prerequisites: one year of college biology, chemistry, and mathematics. Recommended: previous or concurrent course in physics. S-U grades optional, with permission of instructor.

Lecs, M W F 11:15. Evening prelims: Sept.
20 and Oct. 27. E. R. Loew and staff. A general course in animal physiology emphasizing principles of operation, regulation, and integration common to a broad range of living systems from the cellular to the organismal level. Structure/function
relationships are stressed along with underlying physico-chemical mechanisms.

## BIOAP 312 Farm Animal Behavior (also Animal Science 305)

Spring. 2 credits. Prerequisites: introductory course in animal physiology. Recommended: at least one animal production course or equivalent experience. S-U grades optional. Lecs, T R 11:15. E. A. Oltenacu,
K. A. Houpt.

The behavior of production species (avian and mammalian) influences the success of any management program. Students study behaviors relating to feeding, reproduction, and social interactions of domestic animals, and their physiological basis. Management systems for commercial livestock production and their implications for animal behavior and welfare are stressed.

## BIOAP 313 Histology: The Biology of the Tissues

Fall. 4 credits. Prerequisite: one year of introductory biology. Recommended: BIOAP $311,316,319$, or their equivalents; BIOBM 330 or 331 , or their equivalents; and organic chemistry.

Lecs, T R 1:25; labs, T R 2:30-5.
R. B. Silver.

Provides students with a basis for understanding the microscopic, fine-structural, and functional organization of vertebrates, as well as methods of analytic morphology at the cell and tissue levels. Dynamic interrelations of structure, composition, and function in cells and tissues are emphasized. The course may include work with invertebrate or vertebrate animals.

## BIOAP 316 Cellular Physiology

Spring. 4 credits. Limited to 100 students, With preference given to students studying in animal physiology and anatomy. Each lab limited to 24 students. Prerequisite: concurrent or previous enrollment in BIOBM 330 or 331 and 332 or 333.

Lecs, M W F 9:05; lab, M T or W 1:25-5 (a
R 1:25-5 lab may be added if enrollment
exceeds 72 students). Evening prelims:
Feb. 28, Apr. 6, and May 2. A. Quaroni
and staff.
Lectures introduce students to the most current information on the way cells function and regulate themselves and neighboring cells and on what molecules are involved in these regulatory processes. Laboratories provide an introduction to cell and organ culture and to immunological techniques used to study cell structure and function in vivo and in vitro. Experiments performed in the laboratory are closely related to, and provide practical experience with, subjects covered in the lectures. Vertebrate animals are used in this course. No experimentation is performed on live animals.

## BIOAP 319 Animal Physiology <br> Experimentation

Fall. 4 credits. Designed for upper-level undergraduate and graduate students studying in physiology, and other students interested in biomedically related professions. Graduate students in the Field of Physiology and related fields without equivalent background are strongly encouraged to enroll. Each of 4 afternoon laboratory sections limited to 20 students. Prerequisite: concurrent or previous enrollment in BIOAP 311 or permission of instructor based on previous meritorious performance in another introductory animal physiology course.

Lec, F 12:20; lab, M T W or R 12:20-5
(includes disc section). R. A. Corradino. A series of student-conducted in vilro and in vivo experimental exercises designed to illustrate basic physiological processes in animals and to introduce students to animal physiology research techniques, instrumenta tion, experimental design, and interpretation of results. Techniques include anesthesia dissection, vivisection under anesthesia, physiographic recording, and computer analysis. Experiments with living tissues and live animals examine properties of blood, muscle, and nerves; cardiovascular, respiratory, and renal function and their control; and endocrine regulation of renal, cardiovascular, and reproductive tissue activity. Experimental resources include live animals of several vertebrate species, including frogs, rats, and rabbits, which are euthanized in conjunction with the laboratory exercises. Written reports of laboratory activities are required. Grading is hased on evaluation of these reports, quizzes, and laboratory performance

## BIOAP 419 Advanced Animal Physiology

 ExperimentationSpring. 3 credits. Prerequisite: BIOAP 319 previous semester. Limited to 6 selected students.

Lab to be arranged. R. A. Corradino,
coordinator.
Advanced research on slected aspects of
laboratories conducted in BIOAP 319, Animal Physiology Experimentation.
BIOAP 458 Mammalian Physiology
Spring. 3 credits. Enrollment limited.
Graduate student auditors allowed. Prerequisite: BIOAP 311. Students not meeting this prerequisite must obtain written permission of instructor in 826 Vet Research Tower before the first class.

Lecs, M W F 10:10. K. W. Beyenbach and staff.
An in-depth treatment of selected topics in mammalian physiology and human physiology. Emphasis is on a conceptual and working knowledge of physiology rather than a factual, memorizing knowledge. Topics selected, in order of presentation, include recurrent themes in physiology; basic functional elements of biological systems; design of multicellular animals; mammalian fluid compartments; homeostasis; cardiovascular, respiratory, gastro-intestinal, and renal physiology; and energy metabolism. The course concludes with a discussion of integrative physiology by considering the multiple, parallel short-term responses of the human body to exercise. Recommended for biological sciences majors, pre-med and prevet students, and beginning graduate students in physiology, nutrition, and animal science.

## BIOAP 615 Nutrition, Physiology, and

 Biochemistry of Mineral Elements (also Veterinary Physiology 759 and Nutritional Sciences 659)Spring. 2 credits. Prerequisites: courses in basic physiology, intermediate biochemistry, and general nutrition.

Lec, T 2:30-4:25. R. Schwartz,
R. H. Wasserman, D. R. Van Campen,
C. C. McCormick.

Lectures on nutritional aspects and physiological, biochemical, and hormonal relationships of the major macroelements and microelements, with emphasis on recent developments. Discussions of methodologies of mineral research and essentiality, transport, function, homeostasis, interrelationships, and toxicity of various mineral elements.
[BIOAP 618 Biological Membranes and Nutrient Transfer (also Veterinary Physiology 752
Spring. 2 credits. Prerequisites: courses in animal or plant physiology, quantitative and organic chemistry, and physics. Recommended: a course in cellular physiology. S-U grades optional, with permission of instructor Offered alternate years. Not offered 1994-95.

Lecs, T R 11:15. R. H. Wasserman.
An introduction to elementary biophysical properties of biological membranes; theoretical aspects of permeability and transport; mechanism of transfer of inorganic and organic substances primarily across epithelial membranes; and characteristics and properties of transporting macromolecules and ion channels.]

## BIOAP 619 Lipids (also Nutritional Sciences 602)

Fall. 2 credits.
Lecs, T R 11:15. A. Bensadoun
Advanced course on biochemical, metabolic, and nutritional aspects of lipids. Emphasis is placed on critical analysis of current topics in lipid methodology; lipid absorption; lipoprotein secretion, molecular structure, and catabolism; molecular biology; function and regulation of lipoprotein receptors; mechanism of hormonal regulation of lipolysis and fatty acid synthesis; and cholesterol metabolism and atherosclerosis.

## [BIOAP 658 Molecular Mechanisms of Hormone Action (also Veterinary Physiology 758)

Spring. 2 credits. Prerequisite: permission of instructor. Minimum enrollment of 6 required. Offered alternate years. Not offered 1994-95

Lecs, T R 10:10. R. A. Corradino
An advanced course developed from the current literature on endocrine mechanisms Primarily a lecture course with student discussion.]

## BIOAP 710-718 Special Topics in

 PhysiologyFall or spring. 1 or 2 credits for each topic May be repeated for credit. Enrollment in each topic may be limited. S-U grades optional, with permission of instructor Lectures, laboratories, discussions, and seminars on specialized topics.
Fall 1994: four topics are offered.

## BIOAP 711 Stress Physiology

Fall. 1 credit. Prerequisite: BIOAP 311 or equivalent. Offered alternate years.

Lec, 1 hour each week to be arranged. K. A. Houpt.

Emphasis of course is on physiological and behavioral assessment of stress in domestic and laboratory animals.

BIOAP 713 Cardiac Electrophysiology
Fall. 1 credit. Offered alternate years.
Lec, 1 hour each week to be arranged. R. F. Gilmour.

Survey of cardiac action potentials, passive membrane properties, ion channels, and cardiac arrhythmias. Emphasis on non-linear dynamical aspects of cardiac electrophysiology and cardiac arrhythmias.

## BIOAP 715 Acid-Base Relations (also

 Veterinary Physiology 627)Fall or spring. 2 credits.
Autotutorial. A Dobson.

BIOAP 717 Proteolysis in Physiological Function and Dysfunction

## Fall. 1 credit

Lec, 1 hour each week to be arranged. J. F. Wooton.

Spring 1995: two topics are offered.
BIOAP 714 Physiology of Pregnancy
Spring. 2 credits. Offered alternate years.
Lec, 2 hours each week to be arranged.
P. W. Nathanielsz.

Seminar course covering aspects of maternal, placental, and fetal function. Emphasis on fetal growth, respiration, neural and endocrine and cardiovascular functions, myometrial activity, parturition, and placental function

## BIOAP 715 Acid-Base Relations (also

 Veterinary Physiology 627)Fall or spring. 2 credits.
Autotutorial. A Dobson.
BIOAP 719 Graduate Research in Animal Physiology (also Veterinary Physiology 628)
Fall or spring. Variable credit. Prerequisites: written permission of the section chair and of the staff member who supervises the work and assigns the grade. Students must register in Vet Research Tower 725. S-U grades optional.

Hours to be arranged. Staff. Similar to BIO G 499 but intended for graduate students who are working with faculty members on an individual basis.

## [BIOAP 757 Current Concepts in

 Reproductive BiologyFall. 3 credits. Limited to 20 students. Prerequisites: undergraduate degree in biology and a strong interest in reproductive biology. S-U grades optional. Offered alternate years. Not offered 1994-95.

Lec, 2 hours each week to be arranged;
disc, 1 hour each week to be arranged.
J. E. Fortune, W. R. Butler, and staff. A team-taught survey course in reproductive physiology/endocrinology. Lectures by a number of reproductive biologists on various aspects of male reproductive function (endocrine regulation, testis function, spermatogenesis, and sperm physiology/ function); female reproductive function (endocrinology, ovarian development and functions, oocyte physiology/function); fertilization and early embryo development; pregnancy; parturition; puberty; and reproductive technology. Student participation in the form of discussions and/or presentations.]

## BIOAP 811 Advanced Physiological

 Methods IFall. 2 credits. Enrollment limitecl. Prerequisites: graduate student status or permission of course coordinator. S-U grades only.

Lab to be arranged. Staff. (Coordinator: K. Beyenbach).

This is a course primarily for graduate students in physiology and related disciplines. Experiments are carried out in the laboratories of physiology faculty members to acquaint graduate students with the latest techniques/ methods in physiological research. Three modules are offered each semester by arrangement with the course coordinator.

## BIOAP 812 Advanced Physiological Methods II

Spring. 2 credits. Enrollment limited. Prerequisites: graduate student status or permission of course coordinator. S-U grades only.

Lab to be arranged. Staff. (Coordinator: K. Beyenbach).

This is a course primarily for graduate students in physiology and related disciplines. Experiments are carried out in the laboratories of physiology faculty members to acquaint graduate students with the latest techniques, methods in physiological research. Three modules are offered each semester by arrangement with the course coordinator.

## Related Courses In Other Departments

Adaptations of Marine Organisms (Biological Sciences [BIOSM] 413)
Advanced Work in Animal Parasitology (Veterinary Microbiology 737)

Animal Development (Veterinary Anatomy 507)
Animal Reproduction and Development (Animal Science 300)

Developmental Biology (Biological Sciences [BIOGD] 385)
Embryology (Biological Sciences [BIOGD] 389)
Fundamentals of Endocrinology (Animal Science 427)

Insect Morphology (Entomology 322)
Integration and Coordination of Energy Metabolism (Biological Sciences [BIOBM] 637 and Nutritional Sciences 636)
Neuroanatomy (Veterinary Anatomy 504)
Sensory Function (Biological Sciences [BIONB] 492)

Teaching Experience (Biological Sciences [BIO G] 498)

Undergraduate Research in Biology (Biological Sciences [BIO G] 499)

## BIOCHEMISTRY, MOLECULAR AND CELL BIOLOGY (BIOBM)

## BIOBM 132 Orientation Lectures in

 BiochemistrySpring, weeks 1-3. No credit. Primarily for freshmen, sophomores, and transfer students. S-U grades only (registered students receive an unsatisfactory grade for nonattendance). Lec, S 10:10-11:00, for first 3 S of semester. Section chair and staff.
Discussions by six professors about their research and promising areas for research in the future.

## BIOBM 231 General Biochemistry

Fall. 3 credits. Intended for students who have not studied biochemistry previously and who do not expect to pursue it further. Not recommended for students who have taken organic chemistry. Prerequisite: Chemistry 104 or 208 or equivalent. Preregistration with instructor required (306 B Rice Hall). S-U grades optional.

Lecs, M W F 12:20. J. M. Griffiths. A brief introductory section relating organic chemistry to biochemistry is given, followed by the biochemical material in the usual onesemester introductory courses. Topics of general interest are also included.

## BIOBM 232 Recombinant DNA

Technology and Its Applications (also Biology and Society 232)
Spring. 3 credits. S-U grades optional.

Limited to freshmen with AP 4 or 5 in biology. Possible fee for course material.

Lecs and disc, M W F 11:15. J. M. Calvo,
J. M. Fessenden MacDonald.

An introduction to molecular approaches to biology. Basic concepts underlying recombinant DNA technology together with strategies for cloning genes are discussed. Much of the course deals with applications of recombinant DNA technology to basic research and to biotechnology. Applications to be discussed include screening for genetic diseases, animal and plant improvement, and production of proteins useful in medicine, agriculture, and industry. Scientific, historical, regulatory, social, and ethical issues are presented and discussed. Recommended especially for students desiring a firm background in recombinant DNA technology in preparation for taking genetics and biochemistry.

## BIOBM 330-331 Principles of

 BiochemistryIntroductory biochemistry is offered in two formats: individualized instruction (330) and lectures ( 331 and 332). Individualized instruction is offered to a maximum of appruximately 200 students each semester. Lectures given fall semester (331) and spring

## (332) semesters.

## BIOBM 330 Principles of Biochemistry, Individualized Instruction

Fall or spring. 4 or 5 credits (5-credit option includes 4 additional papers and 4 other activities). Prerequisite: One year introductory biology for majors, Chem 253 or 358 or equivalent, or permission of instructor. May not be taken for credit after BIOBM 331, 332, or 333. S-U grade optional for graduate students only.

Hours to be arranged. Evening prelims:
fall, Oct. 18; spring, Mar. 14.
J. E. Blankenship, G. S. Albrecht,
P. C. Hinkle, R. Wu, and staff.

Fourteen units that cover protein structure and function, enzymes, basic metabolic pathways, INA. RNA, protein synthesis, and an introduction to gene cloning. No formal lectures; autotutorial format. The four-credit option includes discussion sessions on three research papers on protein structure and function. The five-credit option includes four additional research papers on molecular biology and four other activities that include use of a silicon-graphics workstation, discussion of review articles, or discussion of other research papers.

## BIOBM 331 Principles of Biochemistry:

 Proteins and MetabolismFall. 3 credits. Prerequisites: One year introductory biology for majors and Chem 253 or 358 or equivalent, or permission of instructor. May not be laken for credit after BIOBM 330 or 333 . S-U grades with permission in instructor.

Lecs, M W F 10:10. G. W. Feigenson. The chemical reactions important to biology, and the enzymes that catalyze these reactions, are discussed in an integrated format. Topics include methods for studying proteins, protein folding, enzyme catalysis, bioenergetics, and key reactions of synthesis and catabolism.

## BIOBM 332 Principles of Blochemistry: Molecular Biology

Spring. 2 credits. Prerequisites: One year general biology and one semester organic chemistry or permission of instructor. May not be taken for credit after BIOBM 330 or 333. S-U grades optional with permission of instructor.

Lecs, T R 12:20. T. C. Huffaker. A comprehensive course in molecular biology that covers the structure and properties of DNA. DNA replication and recombination, synthesis and processing of RNA and proteins, the regulation of gene expression, and the principles and uses of recombinant DNA technologies.

## BIOBM 333 Principles of Biochemistry,

 LecturesSummer ( 6 -week session). 4 credits.
Prerequisite: Chem 253 or 358 or equivalent. Lecs, M-F 9-11. J. M. Griffiths.
The chemistry of biological substances and their transformations in living organisms. The major areas of biochemistry are covered comprehensively. For advanced undergraduates and graduate students; a prerequisite for the intermediate and advanced courses in biochemistry offered during the fall and spring terms or a terminal course.

## BIOBM 430 Basic Biochemical Methods

 Fall or spring. 4 credits. Enrollment limited. Prerequisites: Either BIOBM 330 or 333 or 332 and concurrent enrollment in 331, organic chemistry lectures and laboratory, and permission of instructor obtained by preregistering in Rice 306 B. Concurrent registration in BIOBM 330 or 331 may be arranged in the fall term for graduate students.Lec and disc, F 1:25; labs, M W or T R 12:20-4:25. R. R. Alexander, J. M. Griffiths, and staff.
A laboratory course designed to introduce students to the biochemical techniques commonly used in the study of biological materials. Various assay methods, chromatography, electrophoresis, and use of the scintillation counter are taught. Students work in small groups and rotate through three modules. An enzymology module teaches methods used in protein isolation, purification, the study of enzyme kinetics and of enzyme characterization. In the nucleic acids module, students are introduced to recombinant DNA methodology and isolating and studying some of the properties of calf thymus DNA. In the fall, the third module is a study of lipids. Students isolate and purify lipids from a source of individual choice, quantify the material for lipid content and degree of fatty acid saturation, identify the various lipids by thin layer chromatography, and analyze for phosphate and cholesterol content. During the spring term, the third module introduces students to techniques used in the clinical laboratory. Methods used in blood and urine analyses are applied to the students' own samples; some nutritional assays are done for protein and vitamin content of foods.

## BIOBM 432 Survey of Cell Biology

Spring. 3 credits. Prerequisite: BIOBM 330 or 333 or 331 and 332 or equivalent. S-U grades optional for graduate students only.

Lecs, M W 11:15-12:30. W. J. Brown and staff.
A survey of a wide array of topics focusing on the general properties of eucaryotic cells. The topics include methods used for studying cells, the structure and function of the major cellular organelles, and analyses of cellular processes such as mitosis, endocytosis, cell motility, secretion, cell-to-cell communication, gene expression, and oncogenesis. Some of the material is covered in greater depth in BIOBM 437; BIOGD 483: BIOBM 632, 636, and 639.

## BIOBM 435-436 Undergraduate

 Biochemistry Seminar435, fall; 436, spring. 1 credit each term. May be repeated for credit. Limited to upperclass students. Prerequisite: BIOBM 330 or 333 or 331 and 332 or written permission of instructor. S-U grades only.

Sem to be arranged. Organizational
meeting first W of each semester at 4 p.m. Fall: G. P. Hess; spring: Staff. Selected papers from the literature on a given topic are evaluated critically during six or seven two-hour meetings.

## BIOBM 437 Oncogenes and Cancer Viruses

Fall. 3 or 4 credits ( 4 credits for participation in the writing component of the course). Undergraduates are required to do the 4 -credit option. Prerequisite: BIOBM 330 or 333 or 331 and 332. Recommended: BIOGD 281. S-U grades optional, with permission.

Lecs, T R 12:20-1:35; disc, W 7:30 p.m. D. I. Shalloway.

The use of animal cells in culture as an experimental system for studying the cellular mechanisms involved in carcinogenesis through the use of recombinant DNA and biochemical methods. Topics include immortalization of cells, the cell cycle, differences between normal and neoplastically transformed cells, growth factors, molecular biology and biochemistry of cancer viruses, and structure and function of viral and cellular oncogenes. Understanding of relevant experimental techniques, experimental design and comprehension of primary research literature is emphasized. This is not a sunvey course; it is designed primarily for students planning a career in research. A series of exercises to develop scientific writing skills are required for undergraduate students except by special permission. Depending on availability, graduate students may also participate in this writing component. Four credits are given when the writing component is included.

## BIOBM 438 Yeast Genetics and

 Molecular BlologySpring. 2 credits. Prerequisites: BIOGI) 281 and BIOBM 330 or 332 or 333 , or permission of instructor. S-U grades optional. Offered alternate years.

Lec W 8-9:55 p.m. B. K. Tye. An advanced overview of genetic studies in yeast, primarily Saccharomyces cerevisiae. Special attention is given to the use of yeast as a model for studying problems in cell biology in eukaryotes. Both genetic and molecular approaches to selected problems of biological interest are discussed.

## BIOBM 630 Laboratory in Cell Biology

Spring. 4 credits. Enrollment limited. Prerequisites: Either BIOBM 330 or 333 or 332 and concurrent enrollment in 331, or a course in cell biology, and permission of instructor obtained by negistering in 258 Biotechnology Building with J. Gibson.

Labs, M W 1:25-4:25 or R 9:05-4:25; disc
to be arranged. J. Gibson, B. Tyler. The course emphasizes approaches to experimental design and theory of experimental techniques as well as providing experience in handling and experimenting with cells of different kinds. Limited numbers of vertebrate animals are used for two experiments where no alternative approach exists.

## BIOBM 631 Protein Structure and Function

Fall. 3 credits. Prerequisites: BIOBM 330 or 333 or 331 and 332, physical chemistry, and organic chemistry. S-U grades optional Lecs, M W F 9:05. P. A. Karplus Presentations on the principles of protein structure and the nature of enzymatic catalysis. Specific topics include protein folding, stability, dynamics and evolution, folded conformations and structure prediction, ligand binding energetics, and the structural basis of catalysis.

## [BIOBM 632 Membranes and Bioenergetics

Spring. 2 credits. Prerequisite: BIOBM 330 or 333 or 331 and 332 or equivalent. Offered alternate years. Not offered 1994-95.

Lecs, T R 11:15. P. C. Hinkle.
Structure and dynamics of biological membranes, physical methods, model membranes, ionophores, ion-transport ATPases, mitochondrial and chloroplast electron transfer chains, and examples of transport from plants, animals, and bacteria.]

## BIOBM 633 Biosynthesis of

## Macromolecules

Fall. 2 credits. Prerequisite: BIOBM 330 or 333 or 331 and 332. Recommended: BIOGD 281.

## Lecs, T R 9:05. J. W. Roberts,

D. B. Wilson.

Synthesis of DNA, RNA, and proteins, and regulation of gene expression.

## BIOBM 635 Enzymes, Coenzymes, and Metabolic Regulation (also

## Nutritional Sciences 635)

Spring. 2 credits. Prerequisites: at least 4 credits of Principles of Biochemistry and Chem 358 or 360 , or permission of instructor. Offered alternate years.

Lecs, T R 9:05. M. N. Kazarinoff.
Lectures on the identification and characterization of regulatory steps in metabolism, considered from both theoretical and practical aspects. The intracellular mechanisms of regulation are emphasized, with specific examples in mammalian metabolism examined in detail.

## BIOBM 636 Cell Biology

Spring. 2 credits. Prerequisites: BIOBM 330 or 333 or 331 and 332 , and 432 , or their equivalents.

Lec, T 9:05-11:00. A. P. Bretscher. Lectures covering current topics in cell biology, including a detailed discussion of secretion, endocytosis, membrane-bound organelles, membrane recycling, the cytoskeleton, cell motility, junctions, the cell cycle, and related topics. Together with BIOBM 632 and 639, this course provides broad coverage of the cell biology subject area.

## [BIOBM 637 Integration and

Coordination of Energy Metabolism (also Nutritional Sciences 636)
Fall. 3 credits. Prerequisite: BIOBM 330 or 331 or 333 or equivalent. Not offered 1994-95.

Lecs, M W F 9:05. Evening prelims to be arranged. W. J. Arion.
The elements and dynamics of energy metabolism in humans and higher animals are developed systematically through biochemical characterizations of the metabolic components and structure of major tissues and organs. Emphasis is placed on correlations with
physiologic functions. Mechanisms that control energy metabolism within individual tissues and coordinate these processes in vivo are analyzed in the contexts of selected physiologic and pathologic stresses.]

## BIOBM 638 Intermediate Biochemical

 MethodsFall or spring. 4 credits. Limited to 24 students. Prerequisite: Either BIOBM 330 or 333 or 332 and concurrent enrollment in 331 or equivalent biochemistry course. Primarily for graduate students minoring in the field of Biochemistry, Molecular and Cell Biology, and undergraduates in the biochemistry program of study. Admission to the course requires an interview with the instructor or the teaching support specialist ( $\mathrm{x} 5-8072$ ). There is no admission to the course without the interview. Students are urged to schedule their interviews at least 3 weeks before the start of classes. May not be taken for credit after BIOBM 430.

Lab, T 9:05-4:25 (fall); lab, T or R 9:05-
4:25 (spring). V. M. Vogt and staff. Selected experiments on proteins (purification, enzymology, methods of detection) and DNA (cloning, restriction mapping, sequencing, PCR). The course emphasizes quantitative aspects as well as experimental design in modern biochemical research

## BIOBM 639 The Nucleus

Spring. 2 credits. Prerequisite: BIOBM 330 or 333 or 331 and 332 or equivalent. Recommended: BIOGD 281

Lec, M 7:30-9:25 p.m. J. T. Lis. Lectures on topics of eucaryotic gene organization, regulation of gene expression, RNA processing, chromatin structure, the structure and movement of chromosomes, and the architecture of the nucleus. This course covers the structure and function of the nucleus at the molecular and cell biological levels, and together with BIOBM 632 and 636, provides broad coverage of the cell biology subject area

## BIOBM 648 Plant Biochemistry

Spring. 3 credits. Prerequisites: BIOBM 330 or 333 or 331 and 332 , organic chemistry, and a course in plant physiology. Offered alternate years.

Lecs, M W F 9:05. A. T. Jagendorf,
R. L. Last, T. G. Owens.

Selected areas of plant biochemistry are reviewed in the context of the plant life cycle and responses to the environment. Topics include metabolism of lipids, carbohydrates, organic acids, and proteins; nitrogen and sulfur assimilation; respiration; photosynthesis; development and replication of chloroplasts; and cell-wall composition and properties. Attention is paid to operation of control mechanisms.

## BIOBM 692 Protein-Nucleic Acld

 Interactions (BIOMI 692)Spring. 3 credits. Prerequisites: BIOBM 330 or 333 or 331 and 332 and 633.

Lecs, T R 10:10-11:25. J. D. Helmann. The physical and chemical bases of proteinnucleic acid interactions are explored including both theory and specific examples Proteins considered include: bacterial nonspecific and sequence specific DNA and RNA binding proteins, nucleic acid polymerases, recombinases, topoisomerases, DNA repair enzymes, and nucleases.

## BIOBM 732-737 Current Topics in

 BiochemistryFall or spring. $1 / 2$ or 1 credit for each topic. May be repeated for credit. Prerequisite: BIOBM 330 or 333 or 331 and 332 or equivalent. S-U grades only Lectures and seminars on specialized topics. Topics for fall and spring to be announced in the division's course supplement published at the beginning of each semester.

## BIOBM 738 Macromolecular

Crystallography (also Chemistry 788) Spring. 3 credits. S-U grades optional. Prerequisite: permission of instructor. Offered alternate years.

Lecs, M W F 10:10. S. A. Ealick,
P. A. Karplus, J. C. Clardy.

Lectures briefly cover the fundamentals of crystallography and focus on methods for determining the 3 -dimensional structures of macromolecules. These include crystallization, data collection, multiple isomorphous replacement, molecular replacement, model building, refinement, and structure interpretation.

BIOBM 750 Cancer Cell Biology (also Veterinary Pathology 750)
Spring. 3 credits. Prerequisite: BIOBM 330 or 333 or 331 and 332 or equivalent.

Lecs to be arranged. J. Guan, R. Levine,
B. Pauli, D. Shalloway, A. Yen. This course focuses on the role of oncogenes, tumor suppressor genes, extracellular matrix and cell surface adhesion receptors in tumorigenesis and tumor progression. The course is taught in large part from the contemporary literature. Course topics include cell proliferation and oncogenes, regulatory effects of cell-substrate and cell-cell interactions, and angiogenesis, invasion, and metastasis.

BIOBM 751 Ethical Issues and Professional Responsibilities (also Toxicology 751 and Science and Technology Studies 751)
Fall or spring. 1 credit. Limited to graduate students beyond first year. S-U grades only. Sem, 2:30-4:15 (ten weeks). Additional
sections may be offered. Organizational
meeting W 3:35 (Fall: 8/31; spring: 1/25).
J. Fessenden MacDonald.

Ethical issues in research and the professional responsibilities of scientists are discussed in a case-study format. Topics to be discussed include regulations; data selection, manipulation, and representation; fraud, misconduct, and whistle-blowing; conflicts of interest and commitment; authorship, ownership, and intellectual properties; peer review and confidentiality; scientific response to external pressure; legal liabilities; and professional codes of ethics.

## BIOBM 830 Blochemistry Seminar

Fall or spring. No credit.
Sem, F 4:30. Staff.
Lectures on current research in biochemistry, presented by distinguished visitors and staff members.

## BIOBM 831 Advanced Blochemical

 Methods IFall. 6 credits. Limited to graduate students majoring in biochemistry. S-U grades optional.

Labs and discs, 12 hours each week to be arranged. Organizational meeting first $R$ of semester, 10:10. B. Tyler and staff. This course emphasizes experimental design and the concepts implicit in current ap-
proaches to research in biochemistry and cell biology. Students are required to read papers and participate actively in discussions in order to design their own protocols before performing experiments using the techniques most common in the recent literature of these fields.

## BIOBM 832 Advanced Blochemical

 Methods IISpring 6 credits. Limited to graduate students majoring in biochemistry. S-U grades only.

Lab to be arranged. Staff (coordinator:
J. M. Calvo, graduate faculty representative).
Research in the laboratories of two or three different professors chosen by the student. Arrangements are made jointly between the graduate field representative and the research adviser.

## BIOBM 833 Research Seminar in

 BiochemistryFall or spring. 1 credit each term. May be repeated for credit. Required of, and limited to, second-, third-, and fourth-year graduate students majoring in biochemistry. S-U grades only.

Sem, T 5-6:30 p.m. T. C. Huffaker,
W. J. Brown, J. T. Lis.

Each student presents one seminar per year on his or her thesis research and then meets with instructors and thesis committee members for evaluation.
BIOBM 835-836 Methods and Logic in Biochemistry, Molecular and Cell Biology
835, fall; 836, spring. 1 credit each term. Limited to first-year graduate students majoring in the Field of Biochemistry, Molecular and Cell Biology. S-U grades only. Sem and disc to be arranged. Fall:
S. E. Ealick, G. P. Hess; spring:
T. C. Huffaker.

A seminar course with critical discussion by students of original research papers. A variety of topics in biochemistry, molecular and cell biology are covered.

## Related Courses in Other Departments

Lipids (Biological Sciences [BIOAP] 619 and Nutritional Sciences 602)

Molecular Aspects of Development (Biological Sciences [BIOGD] 483)

Molecular Mechanisms of Hormone Action (Biological Sciences [BIOAP] 658 and Velerinary Medicine 758)
Teaching Experience (Biological Sciences [BIO G] 498)

Undergraduate Research in Biology (Biological Sciences [BIO G] 499)

## ECOLOGY AND EVOLUTIONARY BIOLOGY (BIOES)

## BIOES 154 The Sea: An Introduction to

 Oceanography (also Geological Sciences 104)Spring. 3 credits. S-U grades optional, with permission of either instructor

Lecs, M W 11:15; lab, M or W 7:30-10 p.m or MTWR or F 2-4:25. Evening prelims: Feb. 23 and Apr. 6. C. H. Greene,
A. L. Bloom.

The oceans remain one of the last frontiers, yet they affect our everyday lives in many subtle ways. This course surveys what is known of the physics, chemistry, geology, and biology of the oceans. Topics include seafloor spreading and plate tectonics; geology and biology of mid-ocean ridges; biological and geological control on the chemistry of seawater; ocean currents and circulation; the oceans and climate, including El Niño, the greenhouse effect, and the Ice Ages; ecology of open-ocean, ocean-bottom, and near-shore communities; coastal processes; marine pollution and waste disposal; mineral and biological resources of the sea; and Law of the Sea. At the level of Scientific American.

## BIOES 261 Ecology and the Environment

 Fall or summer. 4 credits. Prerequisite: one year of introductory biology. S-U grades optional.Lecs, M W F 11:15; disc, W or R 1:25, 2:30, or $3: 35$. Evening prelim: Oct. 6.
T. E. Dawson, R. B. Root.

An introduction to principles of ecology concerning the interactions between organisms and their environment. The course deals with both terrestrial and aquatic ecology, drawing examples from both plant and animal studies. Phenomena that occur at the individual population, community, and ecosystem levels of organization are discussed. These principles are extensively applied to current environmental problems and issues.

## BIOES 263 Field Ecology

Fall. 2 credits. Limited to 20 students Prerequisite: concurrent or previous enrollment in BIOES 261.

Lec, R 1:25; lab, F 12:20-5. One weekend field trip to the Hudson Valley. Small fee for field trip. R. B. Root.
Field exercises designed to give students direct experience with field work, with emphasis on developing observational skills, journal keeping, and a landscape perspective. Topics include plant succession, niche relationships of insects, influence of herbivores and competition on plant performance, decomposition of soil litter, sampling plankton, and use of scientific collections.

## [BIOES 272 Functional Ecology: How

 Animals WorkSpring. 4 credits. Enrollment limited to 60 students ( 15 per laboratory section); preference given to sophomores and juniors. Prerequisite: one year of introductory biology for majors. Offered alternate years. Not offered 1994-95.

Lecs, M W F 9:05; lab, M T W or R 1:25-
4:25. Fee, $\$ 15$. Staff.
An introductory course for students interested in organismal biology. The features of the physical environment that are important to insects and vertebrates are used to illustrate the interaction of physiological, behavioral, and morphological characteristics in organismal activity and homeostasis. Laboratories include a survey of the diversity of endothermal and ectothermal animals, ecophysiological measurements, and measurements of important environmental parameters in local habitats. This course uses live and preserved vertebrate animals for field observations and laboratory exercises.]

## BIOES 274 Functional and Comparative

 Morphology of VertebratesSpring. 4 credits. Prerequisite: one year of introductory biology. Offered alternate years. Lecs, M W F 12:20; labs, M T or W 1:254:25. Evening prelims Feb. 23, Apr. 6, and May 4. Fee, \$15. D. K. McClearn. An exploration of the relations between form and function in biological systems with an emphasis on trends in vertebrate evolution. Lectures integrate data from topics such as locomotion, feeding, size, and scaling with issues of historical importance and current interest (e.g., correlation of body parts, adaptationist explanations, developmental constraints, criteria for determining biomechanical and energetic "efficiency"). Laboratories include dissections of preserved vertebrate animals and noninvasive live animal demonstrations (motion analysis, surface electrode, and force-plate recordings).

## [BIOES 275 Human Biology and

 Evolution (also Anthropology 275 and Nutritional Sciences 275)Fall. 3 credits. S-U grades optional, with permission of either instructor. Offered alternate years. Not offered 1994-95.

Lecs, W F 10:10; disc, M 10:10.
K. A. R. Kennedy, J. D. Haas. An introduction to the biology of Homo sapiens through an examination of human evolution, biological diversity, and modes of adaptation to past and present environments. Evolutionary theory is reviewed in relation to the current evidence from the fossil record and studies of the evolution of human behavior. A survey of human adaptation covers a complex of biological and behavioral responses to environmental stress. Human diversity is examined as the product of longterm evolutionary forces and short-term adaptive responses. Topics such as creationism, the Piltdown fraud, the sociobiology debate, genetic engineering, race and IQ, and racism are presented as examples of current issues in human biology.]

## [BIOES 371 Human Paleontology (also

 Anthropology 371)Fall. 4 credits. Prerequisite: one year of introductory biology or Anthr 101 or permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, M W F 2:30; lab, one hour each
week to be arranged; occasional field trips.
K. A. R. Kennedy.

A broad survey of the fossil evidence for human evolution with special attention to skeletal and dental anatomy, geological contexts, paleoecology, dating methods, archaeological associations, and current theories of human origins and physical diversity.]

## [BIOES 373 Biology of the Marine

 InvertebratesFall. 4 credits. Limited to 30 students. Prerequisite: one year of introductory biology for majors. Offered alternate years. Not offered 1994-95.

Lecs, M W F 10:10; lab, W 1:25-4:25;
1 optional weekend field trip to Shoals
Marine Laboratory. $\$ 60$ fee for optional
field trip. C. D. Harvell.
An introduction to the biology and evolution of the major invertebrate phyla, concentrating on marine representatives. In addition to the evolution of form and function, lectures cover aspects of ecology, behavior, physiology, chemical ecology, and natural history of invertebrates. The Shoals field trip is an
excellent opportunity to study representatives of most of the major phyla in their natural habitat. Laboratory demonstrations on campus involve live marine and freshwater invertebrates.]

## BIOES 378 Evolutionary Biology

Spring. 4 credits. Limited to 300 students. Prerequisite: one year of introductory biology or permission of instructor. S-U grades optional. This course is undergoing major revisions that were not ready at press time; please check your fall registration packets or go to the Office for Academic Affairs, 200 Stimson Hall for up-io-date information.

Lecs, M W F 10:10; disc, 1 hour each week to be arranged. Evening prelims: Mar. 2 and Apr. 6. R. G. Harrison.
The course considers explanations for patterns of diversity and for the apparent "good fit" of organisms to the environment. Topics covered include the genetic and developmental basis of evolutionary change, processes at the population level, the theory of evolution by natural selection, levels of selection, concepts of fitness and adaptation, modes of speciation, long-term trends in evolution, rates of evolution, and extinction.

## BIOES 452 Herblvores and Plants: Chemical Ecology and Coevolution (also Entomology 452)

Spring. 3 credits. Prerequisites: One year of introductory biology, BIOES 261, Chem 253 or $357 / 358$ and 251 or 301 , or permission of instructor. S-U grades optional. Offered alternate years.

Lecs, M W 11:15; disc, F 11:15. Field trips, additional lectures, or laboratory demonstrations may be held in place of $F$ disc P. P. Feeny.

Topics include significance of plant chemistry in mediating interactions between plants and herbivorous animals; mechanisms and strategies of plant finding and exploitation by animals, especially insects, and of defense and escape by plants; evolutionary hypotheses for ecological patterns of resistance and attack; and implications for human food and agriculture.

## [BIOES 455 Insect Ecology (also

 Entomology 455)Fall. 3 credits. Prerequisites: BIOES 261 or equivalent and Entom 212 or knowledge of another taxon. Offered alternate years. Not offered 1994-95.

Lecs, W F 11:15; disc, M 11:15. R. B. Root. Topics include the nature and consequences of biotic diversity, BIO Geography, coevolution, adaptive syndromes exhibited by various guilds, population regulation, impact of insects on ecosystems, comparative and functional analysis of communities, and differences in the organization of natural and managed systems. Ecological and evolutionary principles are integrated by thorough study of exemplars.]

## BIOES 456 Stream Ecology (also Entomology 456)

Spring. 4 credits. Recommended: BIOES 261. S-U grades optional, with permission of instructor.

Lecs, T R 9:05; labs, T W or R 1:25-4:25.
Field project with term paper.
B. L. Peckarsky, M. B. Bain.

Lectures address the question: How does flow influence the patterns and processes occurring in stream ecosystems? Patterns include channel structure and formation, chemical suspension and dissolution,
watershed influences, and plant, invertebrate, and fish community structure. Processes include nutrient cycling and downstream transport, trophic dynamics, plant and animal colonization and succession, community dynamics, conservation, and the impacts of natural and anthropogenic disturbances. Laboratory: a field project is designed to teach descriptive and experimental techniques and to test hypotheses related to stream environmental assessment.

## BIOES 457 Limnology: Ecology of Lakes,

 LecturesFall. 3 credits. Prerequisite: BIOES 261 or written permission of instructor. Recommended: introductory chemistry. Offered alternate years.

Lecs, M W F 11:15. N. G. Hairston, Jr. The study of continental waters, with emphasis on lakes and ponds. Factors regulating nutrients, population and community dynamics of freshwater organisms, and physical and chemical properties of fresh water are considered.

## BIOES 459 Limnology: Ecology of Lakes, Laboratory

Fall. 2 credits. Prerequisite: concurrent or previous enrollment in BIOES 457. Offered alternate years.

Lab, T W or R 1:25-4:25; 1 weekend field trip. Fee, \$10. N. G. Hairston, Jr. and staff.
Laboratories and field trips devoted to studies of the biological, chemical, and physical properties of lakes and other freshwater environments. Vertebrate dissection (fish) during one laboratory exercise and during a portion of weekend field trip

## BIOES 461 Population and Evolutionary

 EcologySpring. 4 credits. Prerequisites: BIOES 261 or 378 plus two semesters of calculus, or permission of instructor. S-U grades optional. Offered alternate years.

Lecs, M W F 9:05; lab, M or T 1:25-4:25.
D. W. Winkler, A. S. Kondrashov. Problems of ecology are viewed from an evolutionary perspective, exploring issues of adaptation and fitness definition by developing advanced understanding of demography and interspecific interactions. Blending theory and empirical findings, the course explores population dynamics; life-history theory; dispersal; competition; predation; parasite-host coevolution; mutualisms; and sexual, kin, and group selection. Methods of estimation and analysis are learned in laboratory.

## BIOES 462 Marine Ecology

Spring. 3 credits. Prerequisite: BIOES 261 Offered alternate years.

Lecs and disc, M W F 10:10. C. D. Harvell. Lectures and discussion focus on current research in broad areas of marine ecology with an emphasis on processes unique to marine systems. A synthetic treatment of multiple levels of organization in marine systems including organismal, population, community, ecosystems, and evolutionary biology.

## BIOES 463 Plant Ecology and Population

 Biology, LecturesFall. 3 credits. Prerequisite: BIOES 261 or 378 or equivalents, or permission of instructor. Recommended: some taxonomic familiarity with vascular plants and concurrent enrollment in BIOES 465. Offered alternate years Lecs, M W F 11:15. M. A. Geber, P. L. Marks.

This course examines the biological and historical factors affecting the structure of plant communities, and the distribution, abundance, and population dynamics of individual species. The influence of the environment, disturbance history, competition, and herbivory on the organization of plant communities are considered first. Plant populations are then studied through an analysis of plant life histories and plant-plant and plant-animal interactions. Throughout the course an attempt is made to blend empirical patterns, experimental results, and theory. Readings are drawn from the primary literature.

## [BIOES 464 Microevolution and

 Macroevolution (also Entomology 464)Spring. 4 credits. Limited to 25 students. Prerequisite: BIOES 378 or permission of instructor. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1994-95. Next offered spring 1996, and alternate spring semesters thereafter.

Lecs, T R 10:10-11:30; disc, 1 hour each
week to be arranged. A. R. McCune,
S. Via.

An advanced course in evolutionary biology integrating macroevolutionary and microevolutionary approaches. Areas of emphasis include patterns and processes of speciation, phylogeny reconstruction in populations and higher taxa, the origins and fate of variation, and causes of major evolutionary transitions. Discussion of these problems involve data and approaches from genetics, morphology, systematics, paleobiology, development, and ecology.!

## BIOES 465 Plant Ecology and Population

 Biology, LaboratoryFall. 1 credit. Prerequisite: concurrent enroilment in BIOES 463. Offered alternate years.

Lab, F 12:05-5. M. A. Geber, P. L. Marks. Laboratory and field exercises designed to give firsthand experience with the ecology and population biology of plants. Emphasis is on making observations and measurements of plants in the field and greenhouse, and on simple data analysis.

## [BIOES 466 Physiological Plant Ecology, Lectures

Spring. 3 credits. Limited to 35 students. Prerequisite: BIOES 261 or introductory plant physiology. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, T R 10:10-11:25. T. E. Dawson. A detailed survey of the physiological approaches used to understand the relationships between plants and their environment. Lectures explore physiological adaptation; limiting factors; resource acquisition and allocation; photosynthesis, carbon, and energy balance; water use and water relations; nutrient relations; linking physiology, development, and morphology; stress physiology; life history and physiology; the evolution of physiological performance; and physiology at the population and community and ecosystem levels. Readings draw from the primary literature and textbooks.]

## [BIOES 468 Physiological Plant Ecology, Laboratory

Spring. 2 credits. Limited to 15 students. Prerequisite: previous or concurrent enrollment in BIOES 466. Offered alternate years. Not offered 1994-95

Lab, T 1:25-4:25, plus additional lab hours to be arranged; 1 weekend field trip required. Fee, $\$ 15$. T. E. Dawson. A detailed survey of the physiological approaches used in understanding the relationships between plants and their environment. Laboratories apply physiological techniques to specific ecological problems and cover aspects of experimental design and computer-aided data analysis. Most laboratories run past the three-hour period, with students spending an average of 3 hours/ week in additional lab time for this course.)

## BIOES 470 Ecological Genetics (also

 Entomology 470)Spring. 4 credits. Prerequisite: BIOES 378 or permission of instructor. S-U grades optional. Offered alternate years.

Lecs, T R 10:10-11:30; disc, 1 hour each
week to be arranged. S. Via.
A study of the relationships between genetic and ecological processes in populations. Topics include consequences of genetic variation in age-structured populations; demographic concepts of fitness; evaluation of methods for measuring genetic variation and natural selection on ecologically important traits; genetics of competitive ability and predator avoidance; genetic and ecological aspects of phenotypic plasticity; character displacement; maintenance of genetic variability; limits to selection. How theory can be used to formulate hypotheses about evolutionary mechanisms in natural populations is considered and experiments designed to test such hypotheses are evaluated.

## [BIOES 471 Mammalogy

Fall. 4 credits. Recommended: BIOES 274. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, M W F 9:05; lab, M T or W 1:25-4:25;
1 weekend field trip required. Carpooling
to the Vertebrate Collections at Research
Park is necessary several times during the
semester. Fee, \$15. D. K. McCleam.
Lectures on the evolution, classification, distribution, and adaptations of mammals. Laboratory and fieldwork on systematics, ecology, and natural history of mammals of the world, with primary emphasis on the North American fauna. Systematics laboratories held in the museum at Research Park. Live animals are studied in the field and are sometimes used in the laboratory for nondestructive demonstrations or experiments. The systematics laboratory exercises are based on museum specimens.]

## [BIOES 472 Herpatology

Spring. 4 credits. Recommended: BIOES 274. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, T R 12:20; labs, M W or T R 1:25-
4:25; occasional field trips and special projects. Fee, $\$ 15$. Staff.
Lectures cover various aspects of the biology of amphibians and reptiles, including evolution, zoogeography, ecology, behavior, and physiology. Laboratory includes systematics, functional morphology, and behavior. Live animals are studied in the field and are used in the laboratory for non-
destructive demonstrations and experiments. The systematics laboratory exercises are based on museum specimens and dissection of preserved materials.)

## BIOES 473 Ecology of Agricultural

 Systems (also Soil, Crop, and Atmospheric Sciences 473)Fall. 3 credits. Limited to 45 students. Prerequisite: BIOES 261 or permission of instructor. S-U grades optional. Offered alternate years.

Lecs and discs, T R 2:30-3:45. During the first 6 weeks of class the Thursday meetings may run to $5: 00$ because of field trips. A. G. Power, T. W. Scott. Analysis of the ecological processes operating in agricultural systems, with an emphasis on the interactions between organisms. Topics include nutrient dynamics in agroecosystems plant competition and facilitation, intercropping, the ecology of species invasions, mutualism in agroecosystems, plant-herbivore relations, plant-pathogen interactions, biological pest control, and evolutionary processes in agriculture. Case studies from both the tropics and the temperate zone are used to illustrate important concepts.
BIOES 474 Laboratory and Field Methods in Human Blology (also Anthropology 474)

Spring. 5 credits. Limited to 16 students with permission of instructor obtained by preregistering in E231 Corson. Prerequisite; one year of introductory biology or ANTHR 101 or permission of instructor. Offered alternate years.

Lecs and labs, T R 10:10-12:05; additional hours to be arranged. Independent research project required.
K. A. R. Kennedy.

Practical exercises and demonstrations of modern approaches to the methodology of physical anthropology. Emphasis on comparative human anatomy, osteology, description of skeletal and living subjects, paleopathology, skeletal maturation, and relevant field techniques for the archaeologist and forensic anthropologist. There is a dissection of a profused (dead) nonhuman primate, usually a macaque or baboon Students attend demonstrations of the dissection prepared by the presector (a hired graduate student).

## BIOES 475 Ornithology

Fall. 4 credits. Limited to 30 students, with permission of instructor obtained by preregistering in E241 Corson. Recommended BIOES 274. S-U grades optional, with permission of instructor. Offered altemate years.

Lecs and labs, T R 12:20-4:25; occasional field trips and special projects. Carpooling to the Vertebrate Collections at Research
Park is necessary once a week. Fee, $\$ 15$.

## D. W. Winkler.

Lectures cover various aspects of the biology of birds, including anatomy, physiology, systematics, evolution, behavior, ecology, and BIO Geography. Laboratory includes dissection of dead material, studies of skeletons and plumages, and specimen identification of avian families of the world and species of New York. Independent projects emphasize research skills.

## BIoEs 476 Blology of Fishes

Fall. 4 credits. Limited to 24 students Recommended: BIOES 272 or 274 or equivalent experience in vertebrate zoology

S-U grades optional, with permission of instructor. Offered alternate years. Lecs, M W F 10:10; lab, M 1:25-4:25. A small lab fee may be required. A. R. McCune.

An introduction to the study of fishes: their structure, evolution, distribution, ecology, physiology, behavior, classification, and identification, with emphasis on local species. Live animals are studied in the field and are sometimes used in the laboratory for nondestructive demonstrations or experiments. The systematics and dissection laboratories use preserved specimens.

## BIOES 478 Ecosystem Biology

Spring. 4 credits. Prerequisite: BIOES 261 or equivalent. S-U grades optional. Offered alternate years.

Lecs and discs, T R 10:10-12:05.
R. W. Howarth, L. O. Hedin. Analysis of ecosystems in terms of energy flow and nutrient cycles, emphasizing an experimental approach and comparative aspects of terrestrial, freshwater, and marine ecosystems. Consideration of anthropogenic effects on ecosystems, such as from acid precipitation and offshore oil pollution. Analysis of climate change and regional environmental change from an ecosystem perspective

## [BIOES 479 Paleobiology (also

 Geological Sciences 479)Fall. 3 credits. Prerequisites: one year of introductory biology for majors and either BIOES 272 or 274, GEOL 375, BIOES 373, or permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, M W F 12:20. J. L. Cisne and staff. A survey of the major groups of organisms and their evolutionary histories. Intended to fill out the biological backgrounds of geology students and the geological backgrounds of biology students concerning the nature and significance of the fossil record for their respective studies.]
[BIOES 660 Field Studies in Ecology and Systematics
Spring. Variable credit. Prerequisites: BIOES 261, a taxon-oriented course, and permission of instructor. Estimated cost of room and board (exclusive of transportation) to be announced. Not offered 1994-95.

Lecs and labs to be arranged. R. B. Root, P. L. Marks.

This course provides students an opportunity to learn techniques and a new biota by participating in an intensive series of field exercises. An extended field trip is scheduled during either intersession or spring break. The region visited, trip objectives, and other details are announced by the instructor in charge in the division's catalog supplement issued at the beginning of the semester. Meetings on campus are devoted to orientation and reports on completed projects.]

BIOES 661 Environmental Policy falso ALS 661 and Biology and Society 461)

Fall and spring. 3 credits each term.
(Students must register for 6 credits each term, since an " $R$ " grade is given at the end of the fall term.) Limited to 12 students. Prerequisite: permission of instructor.

Sem, R 2:30-4:30. D. Pimentel.
This course uses an interdisciplinary approach to focus on complex environmental and energy problems. Ten to twelve students, representing several disciplines, investigate
significant environmental problems. The research team spends two semesters preparing a scientific report for publication in Science or BioScience.
[BIOES 662 Mathematical Ecology (also Statistics and Biometry 662)
Spring. 3 credits. Prerequisites: one year of calculus and a course in statistics. Recommended: a general ecology course. S-U grades optional, with permission of instructor Offered alternate years. Not offered 1994-95. Lecs, M W F 12:20. C. Castillo-Chavez and staff.
Mathematical and statistical analysis of populations and communities: theory and methods. Spatial and temporal pattern analysis. Deterministic and stochastic models of population dynamics. Model formulation, parameter estimation, simulation, and analytical techniques.]

## [BIOES 664 Seminar in Insect-Plant

 Interactions (also Entomology 684)Spring. 2 credits. Intended for seniors and graduate students. Limited to 15 students. Prerequisites: courses in entomology, ecology, evolution, and organic chemistry and permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

Sem to be arranged. Staff.
Presentations and discussions by students on the evolution of patterns of interaction between plants and insects, emphasizing critical evaluation of concepts and evidence.]

## [BIOES 665 Limnology Seminar

Spring. 1 credit. May be repeated for credit. Primarily for graduate students; written permission of instructor required for undergraduates. S-U grades optional. Offered alternate years. Not offered 1994-95.

Sem to be arranged. N. G. Hairston, Jr. A seminar course on advanced topics in freshwater ecology.]

## [BIOES 668 Principles of Biogeochemistry

Spring. 4 credits. Limited to 20 students Prerequisite: solid background in ecology, environmental chemistry, or related environmental science. Permission of instructor required for undergraduates. S-U grades optional. Offered alternate years. Not offered 1994-95.

Lecs and discs, T R 10:10-12:05.
R. W. Howarth

Lectures cover the biotic controls on the chemistry of the environment and the chemical control of ecosystem function Emphasis is on cycles of major elements and minor elements globally and in selected ecosystems, stressing the coupling of element cycles. A comparative approach is used to illustrate similarities and differences in element cycling among ecosystems. Analysis of both theoretical and applied issues, including global atmospheric changes and factors controlling the acidification of lakes and soils.]
[BIOES 669 Plant Ecology Seminar
Spring. 1 credit. May be repeated for credit. Suggested for students majoring or minoring in plant ecology. S-U grades optional. Not offered 1994-95

Sem to be arranged. Staff. Includes review of current literature, student research, and selected topics of interest to participants.]

BIOES 670 Graduate Seminar in Vertebrate Biology
Fall or spring. 1 credit. May be repeated for credit. Primarily for graduate students; written permission of instructor required for undergraduates. S-U grades only.

Sem to be arranged. Staff.
Seminar presentations and discussions by students on areas of current research in vertebrate biology. Topics vary from semester to semester.

## [BIOEs 672 Graduate Seminar in

 Physiological EcologySpring. 2 credits. Limited to 12 students. Prerequisite: a course in plant or animal physiology, especially BIOES 466 or 467 Permission required for undergraduates. May be repeated for credit. S-U grades only Offered alternate years. Not offered 1994-95.

Sem, 2 hours each week to be arranged.
T. E. Dawson and staff.

Discussion of topics on water balance, energetics, and temperature regulation emphasize parallels and contrasts in the relations of animals and plants to their biophysical environments. Each student leads a discussion and prepares a written review of a topic, drawing on the primary literature of his or her own research interests.]

## BIOES 673 Human Evolution: Concepts,

 History, and Theory (also Anthropology 673)Fall. 3 credits. Prerequisite: one year of introductory biology, Anthr 101, or permission of instructor. Offered altemate years.

Lec, M 2:30; sem and disc, W 7:30-9:30 p.m. K. A. R. Kennedy.

The historical background of present-day concepts of man's evolutionary variations and adaptations in space and time is surveyed. The formation of biological anthropology as an area of scientific inquiry within the social and biological sciences is reviewed. Students select their own topics within a broad range of readings in the history of Western concepts of human origins, diversity, and place in nature

## [BIOES 674 Principles of Syatematics

 (also Entomology 674)Spring. 4 credits. Limited to 15 students. Prerequisite: permission of instructor. Recommended: an introductory biological systematics course. Offered alternate years. Not offered 1994-95.

Lecs, discs, and labs, M W 1:25-4:25
Q. D. Wheeler and staff.

An introduction to modern theory and methods of systematic biology. Lectures are on theoretical systematics and include species concepts, classification, phylogenetics, and BIO Geography. Laboratories include modern methods of analysis of data, including cladistic hand and computer methods and numerical methods. Laboratory grade is based in part on a final paper.]

## BIOES 760 Special Topics in Evolution

 and EcologyFall or spring. $1-3$ credits. May be repeated for credit. Enrollment limited. S-U grades optional, with permission of instructor.

Hours to be arranged. Staff.
Independent or group intensive study of special topics of current interest. Content varies and is arranged between student and staff member.

## BIOES 767 Current Topics in Ecology

 and Evolutionary BiologyFall. 4 credits. Prerequisites: BIOES 261 and 378 or their equivalents. S-U grades optional Lecs and discs, T R 10:10-12:05. One weekend field trip. R. G. Harrison and staff.
Critical evaluation and discussion of theory and research in ecology and evolutionary biology. Lectures by faculty and student-led discussions of topics in areas of current importance

Related Courses in Other Departments
Advanced Soil Microbiology (Soil, Crop, and Atmospheric Sciences 666)

Advanced Work in Parasitology (Veterinary Microbiology 737)

Animal Social Behavior (Biological Sciences [BIONB] 427)

Early People: The Archaeological and Fossil Record (Anthropology 203 and Archaeology 203)

Evolution of the Earth and Life (Biological Sciences [BIO G] 170, Geological Sciences 102)

Marine Sciences Courses (Biological Sciences [BIOSM] 363-370, 477)
Plant Geography (Biological Sciences [BIOPL] 440)
Related Courses in Entomology (Entomology 212, 331, 332, 370, 453, 471, 621, 631, 634, 636, 672)

Related Courses in Natural Resources (Natural Resources 270, 302)

Taxonomy of Vascular Plants (Biological Sciences [BIOPL] 248)

Teaching Experience (Biological Sciences [BIO G] 498)

Undergraduate Research in Biology (Biological Sciences [BIO G] 499)

Undergraduate Seminar in Biology (Biological Sciences [BIO G] 400)
Veterinary Parasitology (Veterinary Microbiology 510)

## GENETICS AND DEVELOPMENT (BIOGD)

## BIOGD 184 Understanding Genetics

Spring. 3 credits. May not be taken for credit after BIOGD 281 or 282 . This course may be used toward the science distribution requirement of the College of Arts and Sciences and the Group $B$ distribution requirement of the College of Agriculture and Life Sciences. This course may not be used to fulfill the requirements for any Program of Study in the biological sciences major. S-U grades optional.

Lecs, M W F 9:05. T. D. Fox
An introduction to genetics for students majoring in fields other than biology. Genetics is a rapidly developing science that is providing insight into all aspects of biology and practical tools which increasingly affect our lives. The course shows how major conclusions about inheritance have been derived from the experimental evidence, drawing on examples from the biology of humans, other animals, plants, fungi, and bacteria. It also illustrates current and future
applications of genetic discoveries. For example, the basic principles of inheritance, in conjunction with methods for the isolation and detection of specific gene fragments, is used to understand the detection of genetic diseases and the identification of individuals (DNA fingerprinting). Other topics to be covered include the origin of mutations, use of genetics methods to alter the properties of organisms and the influence of inheritance on behavior.

## BIOGD 281 Genetics

Fall, spring, or summer (8-week session). 5 credits. Not open to freshmen in fall semester. Enrollment may be limited to 200 students. Prerequisite: one year of introduc tory biology or equivalent; written permission of instructor required for students who have taken BIOGD 282. No admittance after first week of classes.

Lecs, T R 10:10-12:05; lab, T W or F 2:304:25; additional hours to be arranged. Students do not choose lab sections during course enrollment; lab assignments are made during first day of classes
T. D. Fox, M. L. Goldberg, R. J. MacIntyre. A general study of the fundamental principles of genetics in eukaryotes and prokaryotes. Discussions of gene transmission, gene action and interaction, gene linkage and recombination, gene structure, gene and chromosome mutations, genetic aspects of differentiation, genes in populations, breeding systems, and extrachromosomal inheritance. Aspects of recombinant DNA technology are discussed In the laboratory, students perform experiments with microorganisms and conduct an independent study of inheritance in Drosophila.

## BIOGD 282 Human Cenetics

Spring. 2 or 3 credits ( 2 credits if taken after BIOGD 281). Each discussion limited to 25 students. Prerequisite: one year of introductory biology or equivalent; permission of instructor required for students who have taken BIOGD 281. S-U grades optional.

Lecs, M W 10:10 (lecs, also F 10:10 1st 3 weeks only); disc, R 10:10 or F 10:10 or

## 11:15. R. A. Calvo.

A course designed for nonmajors. Lectures provide the technical background needed to understand controversial personal, social, and legal implications of modern genetics that are discussed in section meetings.

## BIOGD 385 Developmental Biology

Fall. 3 credits. Prerequisite: BIOGD 281 Lecs, M W F 11:15. K. J. Kemphues. An introduction to the morphogenetic, cellular, and genetic aspects of the developmental biology of animals.

## [BIOGD 389 Embryology

Spring or summer. 3 credits. Limited to seniors. Prerequisites: one year of introductory biology and a knowledge of mammalian adult anatomy. Not offered 1994-95.

Lecs, T R 10:10; labs, T R 2-4:25.
A. W. Blackler

A course in the embryonic development of vertebrate animals, with emphasis on the comparative aspects of morphogenesis and function at the tissue level. The laboratory has a strong morphogenetic bias, emphasizing the comparative aspects of developmental anatomy. Preserved materials are used in the laboratory.]

## BIOGD 481 Population Genetics

Fall. 4 credits. Prerequisite: BIOGD 281,
BIOES 378, or equivalents.
Lecs, M W F 10:10; disc, M 2:30 or T 1:25.
C. F. Aquadro.

Population genetics is the study of the transmission of genetic variation through time and space. The class explores how to quantify this variation, what the distribution of variation tells us about the structure of natural populations, and about the processes that lead to evolution. Topics include the diversity and measurement of genetic variation, mating and reproductive systems, selection and fitness, genetic drift, migration and population structure, mutation, multilocus models, the genetics of speciation, quantitative traits, and the maintenance of molecular variation. Emphasis is placed on DNA sequence variation, and the interplay between theory and the data from experiments and natural populations. Specific case studies include the population genetic issues involved in DNA fingerprinting, the genetic structure and evolution of human populations, and the study of adaptation at the molecular level. Examples are drawn from studies of animals, plants, and microbes.

## BIOGD 482 Human Genetics and Society

 Fall. 3 credits. Enrollment limited to 24 senior biological sciences majors, with preference given to students studying genetics and development. Prerequisites: BIOGD 281 and BIOBM 330 or 333 or 331 and 332. S-U grades optional.Disc, T 2:30-4:25 and R 2:30-3:30.
R. A. Calvo, H. T. Stinson.

Presentation of some of the science and technology, plus discussion of the ethical, social, and legal implications of recent advances in human genetics. Among the topics considered are new reproductive strategies, eugenics, genetic counseling, genetic screening (prenatal, neonatal, presymptomatic, carrier, and workplace), wrongful life and wrongful birth, genetic effects of abused substances, genetics and behavior, and therapy for genetic diseases. Students lead most discussions. There is a major writing component in the course.

## BIOGD 483 Molecular Aspects of

 DevelopmentSpring. 3 credits. Prerequisites: BIOGD 281; BIOBM 332 (preferred) or 330 or 333; and BIOGD 385. Offered alternate years.

Lecs, T R 10:10-11:25. M. F. Wolfner. An examination of the molecular biology of developing systems, with emphasis on the genomic, transcriptional, post-transcriptional, translational, and post-translational mechanisms involved in regulating development. Both prokaryotic and eukaryotic systems are considered, but emphasis is on the latter. Topics to be discussed include changes in chromatin structure, DNA rearrangements, control of RNA synthesis and processing, translational controls, nucleo-cytoplasmic interactions, and genetic responses to hormone treatment. The regulation of selected developmental systems is considered in detail.

## [BIOGD 484 Molecular Evolution

Spring. 3 credits. Prerequisites; BIOGD 281 and organic chemistry. Offered alternate years. Not offered 1994-95.

Lecs, T R 11:15. R. J. MacIntyre. An analysis of evolutionary changes in proteins and nucleic acids. Theories on the evolution of the genetic code and the
construction of phylogenetic trees from biochemical data are discussed. The second half of the course concerns the evolution and the organization of genomes from viruses to higher eukaryotes.]

## BIOGD 485 Microbial Genetics (BIOMI 485)

Fall. 2 credits. Limited to upperclass and graduate students. Prerequisite: BIOGD 281 Recommended: BIOMI 290 and BIOBM 330 or 331 and 332 or 333 . S-U grades optional.

Lec, W 7:30-9:25 p.m. V. J. Stewart. Concepts and principles of formal genetic analysis as applied to microorganisms, with emphasis on enterobacteria and their viruses. Topics include mutagenesis and isolation of mutants; genetic exchange, recombination, and mapping; complementation; transposons; suppression, including allele-specificity; epistasis; genome organization and dynamics; and gene expression and regulation.

## [BIOGD 682 Fertilization and the Early Embryo

Spring. 2 credits. Prerequisites: BIOGD 281; BIOBM 332 (preferred), 330 or 333; and BIOGD 385. Offered alternate years. Not offered 1994-95.

Lec, R 2:30-4:25. M. F. Wolfner. This course treats the earliest events in the formation of a new organism. The methods and findings of genetic, developmental, and molecular analyses are discussed. Readings in the recent literature and discussions focus on pre-gastrulation embryos from several animal species. Topics include fertilization, pronuclear fusion, triggering mitosis, cleavage divisions, cytoplasmic determinants, changes in nuclear and cytoplasmic architecture, and midblastula transition.]

## BIOGD 684 Advanced Topics in Population Genetics

Spring. 2 credits. Limited to 20 students. Prerequisites: BIOGD 481 or equivalent and written permission of instructor. S-U grades optional. Offered alternate years.

Lec, T 2:30-4:25. C. F. Aquadro. An in-depth exploration of current areas of research in population genetics. Readings primarily from recent books and the current literature. Specific topics are announced the previous fall and in the division's catalog supplement. Format includes lectures, discussion, and presentations by students.

## [BIOGD 686 Mammalian Development

Spring. 3 credits. Limited to 25 students. Prerequisites: BIOGD 281, BIOBM 330 or 332, and BIOGD 385, or their equivalents. S-U grades optional. Offered alternate years. Not offered 1994-95.

Lecs, T R 10:10-11:25. W. H. Mark. An in-depth study of mammalian development using the mouse as the animal model. The course covers classical embryology beginning with gametogenesis followed by morphogenetic and biochemical analyses of pre- and post-implantation development. Current topics in experimental embryology, including genetic analysis of mutants, study of cell lineage with chimeras, in vitro culturing of embryonic stem cells, and molecular approaches to understanding development are examined.]
BIOGD 687 Developmental Genetics
Fall. 2 credits. Limited to 20 students. Prerequisites: B1OGD 281 and 385 or their equivalents. S-U grades optional. Offered alternate years.

Lec to be arranged. K. J. Kemphues. Selected topics focus on the use of genetic analysis in understanding mechanisms of development. Topics are drawn primarily from studies in Drosophila, Caenorbabditis, and mouse. Possible topics include pattern formation, cell lineage, neural development, maternal information in development, germ cell development, sex determination, and intercellular communication. Students read current literature and are given the opportunity to discuss each topic in class.

## BIOCD 780 Current Topics in Genetics

Fall or spring. 2 credits. May be repeated for credit. Primarily for graduate students, with preference given to majors in the Field of Genetics; written permission of instructor required for undergraduates. Limited to 20 students. No auditors. S-U grades optional, with permission of instructor.

Sem to be arranged. Staff.
A seminar course with critical presentation and discussion by students of original research papers in a particular area of current interest. Content of the course and staff direction vary each year and are announced a semester in advance.

## BIOQD 781 Problems in Genetics and Development

Fall. 2 credits. Limited to first-year graduate students in the Field of Genetics and Development.

Disc to be arranged. Staff.
An introduction to the research literature in selected areas through weekly problem sets and discussions.

## BIOCD 782-783 Current Genetics/

 Development TopicsFall or spring. $1 / 2$ or 1 credit for each topic. May be repeated for credit. S-U grades only. Lectures and seminars on specialized topics to be announced.

## BIOGD 786 Research Seminar in

 Genetics and DevelopmentFall and spring. 1 credit. Required of second, third-, and fourth-year graduate students in Genetics and Development. S-U grades only. Sem, W 12:20-1:30. Staff.
Each graduate student presents one seminar per year based on his or her thesis research. The student then meets with the thesis committee members for an evaluation of the presentation.

## BIOGD 787 Seminar in Genetics and

 DevelopmentFall or spring. 1 credit. Limited to graduate students in Genetics and Development. S-U grades only.

Sem, M 4-5. Staff.
Seminars in current research in genetics and developmental biology conducted by distinguished visitors and staff.

## Related Courses in Other Departments

Advanced Plant Genetics (Plant Breeding 606)
Animal Development (Veterinary Anatomy 507)
Biosynthesis of Macromolecules (Biological Sciences [BIOBM] 633)

Current Topics in Biochemistry (Biological Sciences [BIOBM] 731-736)
Evolutionary Biology (Biological Sciences [BIOES] 378)

Laboratory in Molecular Biology and Genetic Engineering of Plants (Biological Sciences [BIOPL] 347)

Laboratory in Plant Molecular Biology (Biological Sciences [BIOPL] 641)

Molecular Biology and Genetic Engineering of Plants (Biological Sciences [BIOPL] 343)
Neurogenetics (Biological Sciences [BIONB] 423)
Plant Cytogenetics (Plant Breeding 446)
Plant Growth and Development (Biological Sciences [BIOPL] 644)
Plant Molecular Biology I (Biological Sciences [BIOPL] 653)
Plant Molecular Biology II (Biological Sciences [BIOPL] 652)

Protein-Nucleic Acid Interactions (Biological Sciences [BIOMI] 692)
The Nucleus (Biological Sciences [BIOBM] 639)
Undergraduate Research in Biology (Biological Sciences [BIO G] 499)
Yeast Genetics and Molecular Biology (Biological Sciences [BIOBM] 438)

## MICROBIOLOGY (BIOMI)

## BIOMI 192 Microorganisms on the Planet

 EarthSpring. 3 credits. S-U grades optional. Lecs, M W F 11:15. R. P. Mortlock. A course in microbiology designed to introduce students who have a limited background in science. The course introduces students to the microorganisms that populate our planet earth. Among the microorganisms studied are the bacteria, the archeae, some of the microeukaryotes, and the viruses. Topics covered are the basic nature of microorganisms, their evolution on earth, their composition and growth, their role in the ecology of this planet, their role in human history and disease, and their use in bioengineering. This course is not a prerequisite for advanced courses in microbiology and should not be taken for credit after BIOMI 290.

## BIOMI 290 General Microbiology,

 LecturesFall, spring, or summer ( 6 -week session). 2 or 3 credits ( 2 credits if taken after BIOMI 192). Prerequisites: one year of introductory biology for majors and Chem 104 or 208, or equivalent. Recommended: concurrent registration in BIOMI 291.

Lecs, M W F 11:15. M. L. Cordts,
S. M. Merkel.

A comprehensive overview of the biology of microorganisms, with emphasis on bacteria. The biology of eukaryotic microorganisms and viruses is also discussed briefly. Topics include microbial cell structure and function, physiology, metabolism, genetics, diversity, and ecology. Applied aspects of microbiology are also covered such as biotechnology, the role of microorganisms in environmental processes, and immunology and medical microbiology.

## BIOMI 291 General Microbiology,

 LaboratoryFall or spring, 2 credits. Summer (6-week session), 2 or 3 credits. Prerequisite: concurrent or previous enrollment in BIOMI 290.

Labs, M W 2-4:25, or T R 11:15-1:45 or 2-4:25. C. M. Rehkugler.
A study of the basic principles and techniques of laboratory practice in microbiology, and fundamentals necessary for further work in the subject.

## BIOMI 292 Ceneral Microblology,

## Discussion

Spring. 1 credit. Prerequisite: concurrent or previous enrollment in BIOMI 290. S-U grades only.

Disc to be arranged. C. M. Rehkugler,
E. Seacord.

A series of discussion groups in specialized areas of microbiology to complement BIOMI 290.

BIOMI 300 Seminar in Microbiology
Spring. 1 credit. Required of biological science students in the microbiology program of study. Strongly recommended for students considering the microbiology program of study. S-U grades only.

Sem, W 12:20. Staff.
A series of lectures and seminars designed to present students with laboratory safety training and acquaint them with research projects in microbiology on the Cornell campus.

## [BIOMI 304 Pathogenic Bacteriology and Mycology (also Veterinary Microbiology 318)

Spring. 2 or 4 credits ( 4 credits with lecture and laboratory). Limited to 40 students. Prerequisites: BIOMI 290 and 291. Strongly recommended: BIO G 305. Offered altemate years. Not offered 1994-95.

Lecs, T R 1:25; labs, T R 2:25-5.
E. Tullson.

The study of the major bacterial and fungal agents of infectious disease, with emphasis on the function of virulence mechanisms and the host-parasite interaction. Lectures cover the significance of normal flora, antibiotic therapy and drug resistance, and vaccine development. Laboratories emphasize techniques for isolation, culture, and identification of infectious agents. Animal models are used to help understand certain pathogenic mechanisms.]
BIOMI 305 Basic Immunology, Lectures (BIO G 305) (also Veterinary Microblology 315)
Fall. 3 credits. Strongly recommended: basic courses in microbiology, biochemistry, and gentics. S-U grades optional, with permission of instructor.

Lec, T R 8:30-9:55. Evening prelims: Sept. 22 , Oct. 13, and Nov. 10. A. J. Winter. A survey of immunology, with emphasis on the biological functions of the immune response.

## BIOMI 391 Advanced Microbiology

 LaboratoryFall. 3 credits. Prerequisites: BIOMI 290. 291 , and BIOBM 330 or 331 or 333. Preference given to biological sciences students in the microbiology program of study.

Lab, M W or T R 1:25-4:25; disc, F 1:25.
J. B. Russell and staff.

A laboratory course that illustrates basic principles of experimental microbiology. The course is organized into four modules which last three weeks each: 1) ecology,
2) physiology, 3) genetics, and 4) structure and function. Students select a topic from one of the modules and conduct a two-week independent experiment at the end of the semester.

## BIOMI 398 Environmental Microbiology (also Soil, Crop, and Atmospheric Sciences 398)

Spring, 3 credits, Prerequisite: BIOES 261 or BIOMI 290 or SCAS 260 or permission of instructor. Offered alternate years.

Lecs, M W F 10:10. W. C. Ghiorse, E. L. Madsen.

Behavior and function of microorganisms in natural environments and the role of microorganisms in ecologically significant processes including nutrient cycling and the transformation of pollutants.

## BIOMI 406 Clinical Microbiology

Fall and spring. 15 credits each semester. Prerequisite: permission of instructor

Hours to be arranged. R. P. Mortlock. Training and practical experience in clinical microbiology in the hospital laboratory of the Cornell Medical College and New York Hospital in New York City. Emphasis is on developing students' capability in the isolation and rapid identification of organisms from various types of clinical specimens. This course is intended to prepare the student for state and federal licensing in various areas of clinical microbiology. This is a full-time program, taking place from September to August of the student's senior year.
BIOMI 408 Viruses and Disease (Bio G 408) (also Veterinary Microbiology 417)

Spring. 3 credits. Prerequisites: BIOMI 290, 291; Bio G 305; and permission of instructor. Recommended: BIOGD 281.

Lecs, M W 7:30 p.m. J. Casey
The course covers basic concepts in virology with emphasis on virus-host interactions, strategies for gene regulation, and mechanisms of pathogenicity. Selected viral infections that result in immune dysfunction and neoplasis are highlighted in the context of approaches to prevent or reduce the severity of diseases.
BIOMI 415 Bacterial Diversity, Lectures Fall. 3 credits. Prerequisites: BIOMI 290, 291, and BIOBM 330 or 331 or 333.

Lecs, M W F 11:15. S. H. Zinder A consideration of the physiology, ecology, genetics, and practical potential of important groups of bacteria. Topics include molecular methods for determining bacterial phylogeny and taxonomy, the evolution of diverse mechanisms of energy conservation, fixation of carbon and nitrogen, and adaptation to extreme environments.

## BIOMI 416 Microbial Physiology,

 LecturesSpring. 3 credits. Prerequisites: BIOMI 290, 291 , and BIOBM 330 or 331 or 333 , or their equivalents. Recommended: BIOMI 415. S-U grades optional for students not specializing in the microbiology program of study.

Lecs, M W F 11:15. J. P. Shapleigh The concern is with the physiological and metabolic functions of microorganisms. Consideration is given to chemical structure, regulation, growth, and the energy metabolism of prokaryotic organisms. Special attention is given to those aspects of microbial metabolism and carbohydrate catabolism not normally studied closely in biochemistry courses.

## [BIOMI 451 Structure and Function of

 Bacterial CellsFall. 3 credits. Prerequisites: BIOMI 290 and BIOBM 330 or 331 or 333 or permission of instructor. Recommended. BIOMI 415 . S-U grades optional. Offered alternate years. Not offered 1994-95.

Lecs, M W F 10:10. W. C. Ghiorse. Morphology, ultrastructure, macromolecular organization, and life cycles of bacterial cells are considered with regard to chemical composition and physiological and ecological function of cellular components.]

## BIOMI 485 Microbial Genetics

Fall. 2 credits. Limited to upper-class and graduate students. Prerequisite: BIOGD 281 Recommended: BIOMI 290 and BIOBM 330 or 331 or 333. S-U grades optional.

Lecs, w 7:30-9:25 p.m. V. J. Stewart Concepts and principles of formal genetic analysis as applied to microorganisms, with emphasis on enterobacteria and their viruses. Topics include mutagenesis and isolation of mutants; genetic exchange, recombination and mapping; complementation; transposons; suppression, including allele-specificity; epistasis; genome organization and dynamics; and gene expression and regulation.

## BIOMI 652 (Section 04) Molecular

 Plant-Microbe Interactions (BIOPL 652, Sec 04)Spring. 1 credit. Prerequisites: BIOGD 281,
BIOBM 330 or 331 or 333 , and BIOPL 653 (section 01) or their equivalents. S-U grades optional.

Lecs, M W F 10:10 (12 lecs) Mar. 29-Apr.
24. S. C. Winans, T. A. LaRue.

Course focuses on the interactions of Agrobacteria and Rbizobia with plants. Topics on Agrobacterium-plant interactions include plant-microbe recognition mechanisms, T-DNA transfer process, oncogenesis, and use of Agrobacterium to produce transgenic plants. Topics on Rhizobium-plant interactions include regulation of nitrogenase activity and expression, organization and function of the sym plasmid, nodule development, and plant genetics involved in plantmicrobe interaction.

## BIOMI 692 Protein-Nucleic Acid

## Interactions

Spring. 3 credits. Prerequisites: BIOBM 330 or 331 or 333 and 633.

Lecs, T R 10:10-11:25. J. D. Helmann. The physical and chemical bases of proteinnucleic acid interactions are explored including both theory and specific examples. Proteins considered include bacterial nonspecific and sequence specific DNA and RNA binding proteins, nucleic acid polymerases, recombinases, topoisomerases, DNA repair enzymes, and nucleases.

## BIOMI 694 Genetics of Diverse Bacteria

Spring. 3 credits. Prerequisite: BIOMI 485 or equivalent.

Lecs, M W 2:30-3:45. S. C. Winans Selected topics in bacterial diversity, with strong emphasis placed on underlying molecular mechanisms. Topics include interactions between bacteria and plants and animals, prokaryotic developmental biology, biodegradation of xenobiotics, and synthesis of antibiotics.
BIOMI 795-796 Current Topics in
Microbiology
Fall, 795 ; spring, $796.1 / 2$ or 1 credit for each
topic. May be repeated for credit. Designed
primarily for graduate students in microbiology. Prerequisite: upper-level courses in microbiology. S-U grades only.

Lecs to be arranged. Staff.
Lectures and seminars on special topics in microbiology.

## BIOMI 797 Graduate Seminar in

 MicrobiologyFall and spring. 1 credit each semester. All students in the Graduate Field of Microbiology must enroll for at least their first three semesters in residence. Students are expected to lead discussions on recent primary literature in microbiology. S-U grades only.

Sem to be arranged. Staff.
BIOMI 798 Graduate Research Seminar in Microbiology
Fall and spring. 1 credit each semester. Required of all graduate students in the Graduate Field of Microbiology. S-U grades only.

Sem to be arranged. Staff.
A seminar relating to the research activities of those enrolled. Students who have completed the Bio S 797 series requirement are required to present a seminar concerning their research interests and activities at least once each year.

## BIOMI 799 Microbiology Seminar

Fall and spring. Required of all graduate students in the Graduate Field of Microbiology and open to all who are interested.

Sem to be arranged. Staff.

## Related Courses in Other Departments

Advanced Animal Virology, Lectures (Veterinary Microbiology 708)
Advanced Food Microbiology (Food Science 607)
Advanced Immunology Lectures (Biological Sciences [BIO G] 705 and Veterinary Microbiology 705)
Advanced Soil Microbiology (Soil, Crop, and Atmospheric Sciences 666)
Advanced Work in Bacteriology, Virology, or Immunology (Veterinary Microbiology 707)
Algal Physiology (Biological Sciences [BIOPL] 346)
Bacterial Plant Diseases (Plant Pathology 647)
Basic Immunology, Lectures (Biological Sciences [BIO G] 305 and Veterinary Microbiology 315)
Bioprocessing Applications in Agriculture (Agricultural and Biological Engineering 467)
Ciliophorology (Biological Sciences [BIOSM] 409)
Comparative Biogeochemistry (Biological Sciences [BIOES] 668)
Controlled Cultivation of Microbial Cells (Chemical Engineering 646)
Ecology of Soil-Borne Pathogens (Plant Pathology 644)

Food Microbiology, Laboratory (Food Science 395)
Food Microbiology, Lectures (Food Science 394)

## Food Mycology (Food Science 411)

Immunology of Infectious Diseases and Tumors (Biological Sciences [BIO G] 706 and Veterinary Microbiology 719)

## Insect Pathology (Entomology 453)

Intermediate Soil Science: Chemistry and Microbiology (Soil, Crop, and Atmospheric Sciences 364)

Introduction to Bioprocess Engineering (Chemical Engineering 643)

Introduction to Scanning Electron Microscopy (Biological Sciences [BIO G] 401)
Introductory Mycology (Plant Pathology 309)
Limnology: Ecology Lakes, Lectures (Biological Sciences [BIOES] 457)

Magical Mushrooms, Mischievous Molds (Plant Pathology 201)

Marine Plankton Ecology (Biological Sciences [BIOES] 468)
Microbiology of Water and Wastewater (Civil and Environmental Engineering 651)

Optical Methods of Biologists (Biological Sciences [BIO G] 450)

Plant Virology (Plant Pathology 645)

## NEUROBIOLOGY AND BEHAVIOR (BIONB)

## BIONB 221 Neurobiology and Behavior I: Introduction to Behavior

Fall. 3 or 4 credits ( 4 credits with discussion and written projects). 4-credit option required of students studying neurobiology and behavior. Each discussion limited to 20 students, with preference given to students studying neurobiology and behavior, Not open to freshmen. Prerequisite: one year of introductory biology for majors. May be taken independently of BIONB 222. S-U grades optional.

Lecs, M W F 12:20; disc to be arranged.
S. T. Emlen and staff.

A general introduction to the field of behavior. Topics include evolution and behavior, behavioral ecology, sociobiology, chemical ecology, communication, rhythmicity, orientation and navigation, and hommonal mechanisms of behavior.
BIONB 222 Neurobiology and Behavior II: Introduction to Ne urobiology
Spring. 3 or 4 credits ( 4 credits with discussion and written projects). 4 -credit option required of students studying neurobiology and behavior. Each discussion limited to 20 students, with preference given to students studying neurobiology and behavior. Not open to freshmen. Prerequisites: one year of introductory biology for majors and one year of chemistry. May be taken independently of BIONB 221. S-U grades optional

Lecs, M W F 12:20; disc to be arranged. R. M. Harris-Warrick.

A general introduction to the field of cellular and integrative neurobiology. Topics include neural systems, neuroanatomy, developmental neurobiology, electrical properties of nerve cells, synaptic mechanisms, neurochemistry, motor systems, sensory systems, learning, and memory.

## BIONB 322 Hormones and Behavior (also Psychology 322)

Spring. 3 or 4 credits; the 4 -credit option involves a one-hour section once a week, in which students are expected to read original papers in the field andparticipate in discussion. Limited to juniors and seniors; open to sophomores only by permission. Prerequisites: one year of introductory biology, BIONB 221 or 222 or a course in psychology S-U grades optional.

Lecs, M W F 11:15; disc to be arranged. D. Gudermuth.

Following a review of the neural and endocrine systems, this course connects endocrine physiology to specific behaviors observed in various species, including humans. Although the relationship between sexual physiology and behavior is strongly emphasized, the lectures also describe hormonal contributions to parental behavior, aggression, stress, leaming and memory, homeostasis, and biology rhythms. Topics for the discussion sections are chosen by the students within the context of homonal influences on behavior.

## BIONB 324 Biopsychology Laboratory (also Psychology 324)

Fall. 4 credits. Limited to 20 upperclass students. Prerequisites: laboratory experience in biology or psychology, BIONB 221 and 222 or Psych 123 and 222; and permission of instructor.

Labs, T R 1:25-4:25. T. J. DeVoogd. Experiments designed to provide research experience in animal behavior (including learning) and its neural and hormonal mechanisms. A variety of techniques, species, and behavior patterns are included. Live animals are used in the laboratory.

## BIONB 325 Neurodiseases - Molecular

 AspectsFall. 3 credits. Prerequisites: Two of the following three courses: BIONB 222, BIOGD 281, or BIOBM 330 or 331; co-registration in one of two is acceptable. S-U grades optional Offered alternate years.

Lecs, T R 9:05; disc, T 2:30. T. R. Podleski. The intent of this course is to teach students how to use recombinant DNA techniques for the study of neurodiseases. How are genes responsible for diseases identified and how are the functions of these genes studied? Attention is focused on those neural diseases in which significant advances have been made using these techniques, for example,
Alzheimer's, Huntington's, color blindness, affective disorders, disorders affecting ion channels, and muscular dystrophies. In addition to the molecular studies, when appropriate, time is devoted to discussions of other aspects of the diseases. Emphasis is placed on how these studies provide a useful approach to studying the nervous system by exposing the functions of genes that would be difficult to identify in other ways.

## [BIONB 326 The Visual System

Spring. 4 credits. Prerequisite: BIONB 222 or BIOAP 311, or permission of instructor. S-U grades optional. Offered altemate years. Not offered 1994-95.

Lecs, M W F 10:10; disc, 1 hour each week to be arranged. H. C. Howland.
The visual systems of vertebrates and invertebrates are discustsed in breadth and depth. Topics covered include the optics of eyes, retinal neurophysiology, structure and function of higher visual centers, and ocular development.]

## BIONB 328 Biopsychology of Learning and Memory (also Paychology 332)

Spring. 3 credits. Prerequisites: one year of biology and either a course in biopsychology or BIONB 222.

Lecs, M W F 11:15. T. J. IDeVoogd. This course surveys the approaches that have been or are currently being used to understand the biological bases for leaming and memory. Topics include invertebrate, "simple
system" approaches, imprinting, avian song learning, hippocampal and cerebellar function, and human pathology. Many of the readings are from primary literature
[BIONB 396 Introduction to Sensory Systems (also Psychology 396) Spring. 3 or 4 credits ( 4 credits with term paper). Registration for the 4 -credit option requires permission of instructor. No auditors. Prerequisites: an introductory course in biology or biopsychology, and a second course in neurobiology or behavior or perception or cognition or biopsychology; students are expected to have elementary knowledge of perception, neurophysiology behavior, and chemistry. Offered alternate years. Not offered 1994-95.

Lecs, M W F 10:10. B. P. Halpern. This course employs the Socratic method, in which the instructor asks questions of the students. Students read, analyze, and discuss in class difficult original literature dealing with both those characteristics of sensory systems that are common across living organisms and those sensory properties which represent adaptations of animals to particular habitats or environments. Classroom discussion can increase, but not decrease, a student's final grade. There are two preliminary exams and a final exam. The principles and limitations of major methods used to examine sensory systems are considered. General principles of sensory systems and auditory, visual, and somesthetic systems are covered. One aspect of each system (e.g., localization of objects in space by sound, color vision, and thermoreception) is selected for special attention. Two or more textbooks, and a course packet of reproduced articles are used. At the level of An Introduction to the Physiology of Hearing, by J. O. Pickles; Pbysiological acoustics, neural coding, and psychoacoustics, by W. L. Gulick, G. A. Gescheider, and R. D. Frisina; The Retina: An approachable part of the brain, by J. E. Dowling; Handbook of Pbysiology-The Nervous System. III. Sensory Processes, edited by J. M. Brookhard and V. B. Mountcastle.]

## BIONB 420 Topics in Neurobiology and

 BehaviorFall or spring. Variable credit. May be repeated for credit. Primarily for undergraduates. S-U grades optional.

To be arranged. Staff.
Courses on selected topics in neurobiology and behavior; can include lecture and seminar courses. Topics, instructors, and time of organizational meetings are listed in the division's catalog supplement issued at the beginning of the semester
BIONB 421 Effects of Aging on Sensory and Perceptual Systems (also Psychology 431 and 631)
Fall. 3 or 4 credits ( 4 credits with term paper) Limited to 25 students. Prerequisites: Introductory course in biology or psychology, plus a second course in perception or neurobiology, cognition, or biopsychology. S-U grades optional. Offered alternate years

Lecs, T R 10:10-11:25. B. P. Halpern. A literature-based examination of postmaturation changes in the perceptual, structural, and physiological characteristics of somesthetic, chemosensory, visual, and auditory systems. There is emphasis on human data, with non-human information included when especially relevant. The course examines the current developments in human sensory prosthetic devices, and in
regeneration of receptor structures. Brief written statements (preferably by electronic mail) of questions and problems related to each set of assigned readings are required at least one day in advance of each class meeting. This course employes the Socratic Method, in which the instructor asks questions of the students. Students read, analyze, and discuss in class difficult original literature dealing with the subject matter of the course.

## [BIONB 423 Neurogenetics

Fall. 3 credits. Limited to junior, senior, and graduate students. Prerequisites: Permission of instructor, one year of introductory biology or equivalent, and BIONB 222 and BIOGD 281. S-U grades optional. Offered alternate years. Not offered 1994-95

Lecs, T R 2:30; disc, R 3:35.
A. M. Schneiderman.

Lectures, discussions, and student presentations focus on the uses of genetics for the study of the nervous system. Emphasis is on recent advances in genetic and molecular biological techniques and their application to the study of neural development and behavior. Both invertebrate and vertebrate systems are discussed, and main consideration is given to the fruit fly and the mouse. Readings are taken primarily from original journal articles.]

## BIONB 424 Neuroethology (also Psychology 424)

Spring. 3 credits. Prerequisites: BIONB 221 and 222. Offered alternate years. Offered spring 1995,1996 , and alternate spring semesters thereafter.

Lecs, M W F 9:05; disc to be arranged.
C. D. Hopkins.

From the 1950 s through the 1970 s, ethologists attempted to understand the mechanisms of animal behavior through the use of comparative methods, evolutionary analysis, careful observations of animals in their native habitats, and clever experimentation. Now, with the explosion of knowledge and techniques in the neurosciences, many of the ethologist's mechanisms are being explained in terms of neural systems. This course reviews the status of research in neuroethology, including mechanisms of acoustic communication in insects and in verebrates, echolocation in bats and sound localization in owls, electroreception and electrolocation, chemical communication, and visual processing. In addition, the course reviews studies of the neural systems involved in decision making, in initiating action, and in coordinating fixed acts. Assigned readings include original articles from the scientific literature. A term paper or poster on neuroethology is required.

BIONB 426 Electronics for Neurobiology Spring. 3 credits. Limited to 20 students. Prerequisites: BIONB 222 and one year of introductory physics. Offered alternate years. Lecs, T R 9:05; lab, 4 hours each week to be arranged. Staff.
The course deals with electronics as applied to neurobiology and behavior. Analog circuits centered around operational amplifiers are emphasized. Topics include a review of basic electrical concepts; the cell as circuit, voltage, and current amplifiers; transducers (temperature, light, pressure, etc.); filtering; timing circuits; radiotelemetry; basic trouble shooting; and reading schematics. In the last third of the term, students design and construct a circuit (both circuit board and housing box) of
their own choosing relative to their research and/or interests.

BIONB 427 Animal Social Behavior
Fall. 4 credits. Limited to 30 students.
Prerequisites: BIONB 221 and BIOES 261 or 378 , and advance permission of instructor. S-U grades optional, with permission of instructor. Offered alternate years.

Lecs and discs, M W 2:30-4:25.
P. W. Sherman.

An intensive course for upper-division students interested in behavorial ecology and sociobiology. Lectures, discussions, and student presentations examine topics including adaptation, spacing systems, mating systems, sexual selection, sex ratios, senescence, mate choice, conflict and cooperation in animal societies, and the evolution of deceit, honesty, and altruism.

## BIONB 428 Topics in Behavior

 Fall or spring. 2-4 credits. (Credits based on number of lectures and/or field exercises as outlined in the division's catalog course supplement and subject to approval through the associate director's office.) May be repeated for credit. Primarily for undergraduates. S-U grades optional.Sem to be arranged. Staff.
Courses on selected topics in behavior; can include lecture and seminar courses; may include laboratory. Past topics have included animal orientation, insect behavior, biorhythms, and communication. Topics, instructors, and time of organizational meeting are listed in the division's catalog supplement issued at the beginning of each semester

## [BIONB 429 Olfaction and Taste: Structure and Function (also Psychology 429)

Fall. 3 or 4 credits ( 4 credits with term paper or research project, which can, but need not, study nonhuman vertebrates). Preference given to junior and senior psychology and biology majors and graduate students. Graduate students, see Psych 629. Prerequisite: a 300-level course in biopsychology or equivalent. S-U grades optional for graduate students only. Offered alternate years. Not offered 1994-95.

Lecs, T R 9:05. B. P. Halpern
The structural and functional characteristics of olfaction and taste are explored by reading and discussing current literature in these areas. Structure is examined at the light levels of electron microscopes, as well as at the molecular level. Function is examined primarily in its neurophysiological and biochemical aspects. The emphasis is on vertebrates, especially air-breathing vertebrates in the case of olfaction, although there is some coverage of invertebrate forms. A textbook and a course packet of reproduced articles are used. At the level of Smell and Taste in Health and Disease, edited by T. V. Getchell, R. L. Doty, L. M. Bartoshuk, and J. B. Snow; The Neurobiology of Taste and Smell, edited by T. E. Finger and W. L. Silver.]

## BIONB 491 Principles of

Neurophysiology
Fall. 4 credits. Limited to 20 students. Prerequisite: BIONB 222 or written permission of instructor. S-U grades optional for graduate students.

Lecs, M W 10:10; lab, M or W 12:20-4:25;
additional hours to be arranged
B. R. Johnson.

A laboratory-oriented course designed to teach the theory and techniques of modern
cellular neurophysiology. Lecture time is used to present laboratory exercise results, to supplement laboratory topics, and for discussion of primary research papers. Intracellular and extracellular recording techniques are used to analyze neuronal properties such as resting potentials, electrical and chemical synaptic transmission, ionic currents under voltage-clamp, and functional expression of foreign membrane proteins in Xenopus oocytes. A variety of preparations are used as model systems. Computer acquisition and analysis of laboratory results are emphasized.

## BIONB 492 Sensory Function (also Psychology 492)

Spring. 3 or 4 credits. (The 4 -credit option involves a one-hour section once a week, in which students are expected to participate in discussion. The 4 -credit option is not always offered.) Prerequisite: a 300-level course in biopsychology or BIONB 222 or BIOAP 311, or permission of instructors. Students are expected to have a knowledge of elementary physics, chemistry, and behavior. S-U grades optional. Offered alternate years

Lecs, M W F 10:10; disc, hours to be
arranged. B. P. Halpern, H. C. Howland. This course covers classical topics in sensory function such as vision, hearing, touch, and balance, as well as some more modern topics like sensory coding, location of stimulus sources in space, the development of sensory system, nonclassical topics such as
electroreception and internal chemoreceptors. Both human and nonhuman systems are discussed. In all cases the chemical, physical, and neurophysiological bases of sensory information are treated, and the processing of this information is followed into the central nervous system. At the level of The Senses, edited by Barlow and Mollon, and $A n$ Introduction to the Physiology of Hearing, 2nd edition, by Pickles.

## BIONB 493 Developmental Neurobiology

 Fall. 3 credits. Prerequisite: BIONB 222 or permission of instructor. S-U grades optional, with permission of instructor. Offered alternate years.Lecs, M W F 9:05. R. Booker. Lectures covering the development of the nervous system, taking examples from both vertebrates and invertebrates. Emphasis is on cellular and molecular issues, that is, How do nerve cells differentiate both morphologically and biochemically? The role of cues such as hormones and developmental genes in neural development is discussed. Readings are taken from original journal articles.

## BIONB 494 Comparative Vertebrate

 NeuroanatomySpring. 3 credits. Intended for juniors, seniors, and graduate students. Prerequisite: BIONB 222 or equivalent. S-U grades optional. Offered alternate years.

Lecs, T R 10:10-11:30. A. H. Bass. Organization and evolution of neuroanatomical pathways as substrates for species-typical vertebrate behaviors. The course is divided into three major sections: development, general principles of brain organization, and co-evolution of vertebrate brain and behavior

BIONB 495 Membrane Ion Channels
Spring. 3 credits. Limited to 15 students. Prerequisites: BIONB 222, college introductory physics, and calculus, or permission of instructor. S-U grades optional. Offered alternate years.

Lecs, M W F 10:10. Staff.
The functional and mechanistic aspects of membrane ion channels, beginning with basic concepts and model systems. Theories of ion permeation and channel gating are discussed. Development of membrane ion channels during neuron differentiation and the role of membrane channels in disease states are also considered.

## BIONB 496 Bioacoustic Signals in

 Animals and ManSpring. 3 credits. Limited to 12 junior, senior, and graduate students. Prerequisites: one year of introductory biology, Phys 101-102 or 207-208, and permission of instructor. S-U grades optional. Offered alternate years.

Lecs, $M$ W 9:05; lah to be arranged.
C. Clark, R. R. Hoy.

Humans and most terrestrial animals live in a world of sound. Acoustic signals mediate social interactions and predator-prey behavior This course teaches students about animal acoustical communication by introducing them to the different communication systems that are based on sound. The course presents the physical properties of sound, the physiological mechanisms of sound production and hearing, and an analysis of the behavioral context of signaling. In the laboratory students learn how to record, synthesize, and analyze acoustic signals with the aid of tape recorders and the Macintosh computer. Laboratories are designed around the lecture material and provide "real-world" exercises designed to stimulate discovery of the fundamental principles described in class Class research projects on a selected topic in bioacoustics are required. The laboratory is based on software instrumentation running on a Macintosh II platform equipped with A/D-D/ A data acquisition boards

## BIONB 497 Neurochemistry and

Molecular Neurobiology
Fall. 3 credits. Limited to 30 students. Prerequisites: BIONB 222 and either BIOBM 330 or $331 / 332$, or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

Lecs, T R 9:05; disc, T 2:25.
R. M. Harris-Warrick.

This course focuses primarily on the biochemistry/molecular biology of neurons. Emphasis is on the molecular properties of these cells that account for their unique function. The presynaptic regulation of release and postsynaptic mechanism of action of the major classes of neurotransmitters are discussed, as well as selected neuromodulators and hormones. Readings are selected primarily from research journals.]

## BIONB 623 Chemical Communication

 (also Chemistry 622)Fall. 3 credits. Primarily for research-oriented students. Limited to 30 students. Prerequisites: one year of introductory biology for majors or equivalent, course work in biochemistry, and Chem 358 or equivalent. Offered alternate years.

Lecs, M W 1:25; disc, F 1:25. Coordinators
J. Meinwald, T. Eisner, W. L. Roelofs, and guest lecturers.
The production, transmission, and reception of chemical signals in communicative interactions of animals, plants, and microorganisms. Studies of insects are emphasized. Specific topics are treated with varying emphasis on chemical, biochemical, ecological, behavioral, and evolutionary principles.

The discussion sessions focus on readings from the recent literature and involve studentled discussions of contemporary topics.

## BIONB 626 Sex Differences in Brain and Behavior (also Psychology 524)

Spring. 2 credits. Limited to 12 students. Prerequisite: BIONB 322 or permission of instructor.

Discs and sems, M W 3:35-5:30.
T. J. DeVoogd.

A survey of the newly discovered animal models for sex differences in the brain. Topics include the role of steroids in brain development, whether hormones can modify the structure of the adult brain, and the consequences of such sex differences in anatomy for behavior.
BIONB 720 Seminar in Advanced Topics in Neurobiology and Behavior Fall or spring. Variable credit. May be repeated for credit. Primarily for graduate students; written permission of instructor required for undergraduates. S-U grades optional.

Sem to be arranged. Staff and students. Designed to provide several study groups each semester on specialized topics. A group may meet for whatever period is judged adequate to enable coverage of the selected topics. Ordinarily, topics are selected and circulated during the preceding semester. Discussion of current literature is encouraged. Suggestions for topics should be submitted by faculty or students to the chair of the Section of Neurobiology and Behavior

## BIONB 721 Introductory Graduate

Survey in Neurobiology and Behavior Fall. 2 credits each term. Required of graduate students majoring in neurobiology and behavior. Concurrent registration in BIONB 221 and 222 not required. S-U grades only.

Lecs and discs, T R 11:15-12:05, alternate weeks. Staff.
Lectures by faculty and student-led discussions on topics of current importance in neurobiology and behavior. Topics are linked to the materials presented in BIONB 221 and 222. Class meets twice a week, every other week Students are required to write four term papers, over the two semesters, on selected topics in two of three sub-areas: (1) cellular and molecular neurobiology; (2) integrative neurobiology; (3) behavior.

## BIONB 723 Advanced Topics in Animal

 BehaviorFall or spring. Variable credit. May be repeated for credit. Primarily for graduate students in behavior. Prerequisite: permission of instructor. S-U grades optional.

Sem to be arranged. Staff A seminar on a specific topic in animal behavior. The instructor presents lectures during the first few course meetings; the remainder of the course is devoted to student presentations. Topic and instructor are listed in the division's catalog supplement issued at the beginning of the semester

## BIONB 724 Field Methods in Animal

 BehaviorFall or spring. Variable credit. May be repeated for credit. Primarily for graduate students in behavior. Prerequisite: permission of instructor. S-U grades optional.

Sem and fieldwork to be arranged. Staff. A seminar-field experience course designed for first-year graduate students in animal
behavior. Weekly seminars discussing field methodology, data collection, and hypothesis testing are followed by an intensive period (ten days to two weeks) in the field. Specific topics and field sites vary from semester to semester. Topic and instructor are listed in the division's catalog supplement issued at the beginning of the semester.

## BIONB 790 Advanced Topics in Cellular and Molecular Meurobiology

Fall or spring. Variable credit. May be repeated for credit. Limited to graduate students and advanced undergraduates studying neurobiology and behavior. Prerequisite: BIONB 222. S-U grades optional.

Lecs and sem to be arranged. Staff. A lecture-seminar course on selected topics in cellular and molecular neurobiology. Students read original papers in the scientific literature and lead discussions of these articles. Suggestions for topics may be submitted by faculty or students to the chair of the Section of Neurobiology and Behavior. Topic and instructor are listed in the division's catalog supplement issued at the beginning of the semester.

## BIONB 792 Advanced Laboratory in

Cellular and Molecular Neurobiology Fall or spring. 2 credits. May be repeated for credit. Primarily for graduate students Prerequisites: BIOBM 330 or 331 or equivalent, BIONB 491 or equivalent, and written permission of instructor. S-U grades optional

Lab to be arranged. Staff.
A two-week intensive laboratory course designed to provide experience with a specific technique currently used in cellular and molecular neurobiology. The technique under study and instructor in charge vary from semester to semester and are listed in the division's catalog supplement issued at the beginning of the semester.

## BIONB 793 Advanced Topics in Integrative Neurobiology

Fall or spring. Variable credit. May be repeated for credit. Primarily for graduate students; written permission of instructor required for undergraduates. S-U grades optional.

Lecs and discs to be arranged. Staff. A course designed to provide in-depth knowledge of current research in anatomical and physiological bases of vertebrate and invertebrate behavior. Readings are primarily from specialty books and selected journal articles. Topic and instructor are listed in the division's catalog supplement issued at the beginning of the semester.
BIONB 794 Advanced Laboratory Techniques in Integrative Neurobiology
Fall or spring. Variable credit. May be repeated for credit. Prerequisite: permission of instructor based upon a personal interview

Lab to be arranged. Staff.
A laboratory in the integrative, or neuroethological, approach to studies of animal behavior. Designed to provide practical working knowledge of research methods in anatomical, physiological, and behavioral approaches to studies of vertebrate and invertebrate behavior. Laboratory technique to be covered and instructor are listed in the division's catalog supplement issued at the beginning of the semester.

Related Courses in Other Departments
Animal Behavior (Psychology 535)
Biochemistry and Human Behavior (Psychology 361 and Nutritional Sciences 361)
Brain and Behavior (Psychology 425)
Developmental Biopsychology (Psychology 422)
Evolution of Human Behavior (Psychology 326)
Human Behavior: A Sociobiological Perspective (Anthropology 476)

Insect Behavior Seminar (Entomology 662)
Neurobiology of Animal Behavior (Biological Sciences [BIOSM] 327)
Primates and Evolution (Anthropology 490)
Primate Behavior and Ecology (Anthropology 390)
Teaching Experience (Biological Sciences [BIO G] 498)

Undergraduate Research in Biology (Biological Sciences [BIO G] 499)

## PLANT BIOLOGY (BIOPL)

BIOPL 241 Introductory Botany

## Fall. 3 credits.

Lecs, T R 9:05; lab, M T W R or F 1:25-
4:25, or M or W 7:30-10:30 p.m.
K. J. Niklas.

Introductory botany for those interested in the plant sciences. Emphasizes structure, reproduction, and classification of angiosperms and the history of life on earth. Laboratory emphasizes development of skills in handling plant materials, including identification. First and second weeks of laboratory are field trips, starting with the first day of classes. Those who register for an evening laboratory are still required to attend the afternoon field trips.

BIOPL 242 Plant Physiology, Lectures
Spring. 3 credits. Primarily for undergraduates in agricultural sciences, but also for any Biological Sciences students wanting to know about plant function. Suitable as a secondlevel course for nonmajors to satisfy the biology distribution requirement. Prerequisites: one year of introductory biology and/or BIOPL 241. Recommended: one year introductory chemistry. Concurrent enrollment in BIOPL 244 required of undergraduates except those majoring in the social sciences or humanities, for whom it is recommended. May not be taken for credit after BIOPL 342 except by written permission of instructor.

Lecs, M W F 10:10. P. J. Davies. How plants function and grow. Examples deal with crop plants or higher plants where possible, though not exclusively. Topics include cell structure and function; plant metabolism, including photosynthesis; light relations in crops; plant-water relations; water uptake, transport, and transpiration; irrigation of crops; sugar transport; mineral nutrition; growth and development-hormones, flowering, fruiting, dormancy, and abscission; stress; tissue culture; and genetic engineering.

## 〔BIOPL 243 Taxonomy of Cultivated

 PlantsFall. 4 credits. Prerequisite: one year of introductory biology or written permission of instructor. May not be taken for credit after BIOPL 248. Not offered 1994-95.

Lecs, M W 10:10; labs, M W 2-4:25.
M. A. Luckow.

A study of ferns and seed plants, their relationships, and their classification into families and genera, emphasizing cultivated plants. Particular emphasis is placed on gaining proficiency in identifying and distinguishing families and in preparing and using analytic keys. Attention is also given to the economic importance of taxa, to the basic taxonomic literature, and to the elements of nomenclature.]
BIOPL 244 Plant Physiology, Laboratory Spring. 2 credits. Prerequisite: concurrent enrollment in BIOPL 242. May not be taken for credit after BIOPL 344.

Disc and lab, M T W or R 12:20-4:25. C. Reiss.

Experiments exemplify concepts covered in BIOPL 242 and offer experience in a variety of biological and biochemical techniques, including use of small amounts of radioisotopes.

## BIOPL 245 Plant Biology

Summer (6-week session). 3 credits. Limited to 24 students.

Lecs, M-F 11:30-12:45; labs, M W 1:45 3:45. S. Williams.
Introductory botany, including plant identification. Emphasizes structure, reproduction, and classification of angiosperms. Much of the laboratory work is conducted outdoors in an area that surpasses most biological stations. Those who lack college-level biology are expected to work more closely with the instructor on supplemental instructional materials.

## BIOPL 246 Plants and Civilization

## Spring. 3 credits.

Lecs, T R 11:15; disc, T or W 1:25 or W or R 12:20. D. M. Bates.
A consideration of the role that plants have played and continue to play in the evolution of human cultures. Emphasis is on the interactions between humans and the plant environment, the nature of plants and manner in which humans use and integrate them into their cultures, and the problems and concerns related to contemporary and future use of plant resources.
BIOPL 248 Taxonomy of Vascular Plants Spring. 4 credits. Prerequisite: one year of introductory biology. May not be taken for credit after BIOPL 243. S-U grades optional.

Lecs, M W F 9:05; lab, W or R 1:25-4:25.
J. I. Davis.

An introduction to the classification of vascular plants, with attention to the goals of taxonomy, the processes of plant evolution, and the means of analyzing evolutionary relationships among plants. The laboratory concentrates on methods of plant identification and presents an overview of vascular plant diversity, with particular attention to the flowering plants.

## BIOPL 342 Plant Physiology, Lectures (formerly Bio \$ 341)

Spring. 3 credits. Prerequisites: one year of introductory biology, organic chemistry, and either concurrent enrollment in BIOPL 344 or written permission of instructor. May not be
taken for credit after BIOPL 242 unless written permission is obtained from instructor. Lecs, T R 10:10-11:25. A. T. Jagendorf, T. G. Owens.

The behavior, growth, transport processes, and environmental response of plants. Topics include membrane properties, solute and water transport, and function of osmotic forces; mineral and organic nutrition; stress resistance; growth and development controls; metabolism, including photosynthesis and respiration; and responses to environmental influences.

BIOPL 343 Molecular Biology and Genetic Engineering of Plants
Fall. 2 credits. S-U grades optional. Prerequisite: BIOGD 281 or PL BR 225 or permission of instructor.

Lecs, T R 11:15. M. E. Nasrallah. An introduction to current studies involving recombinant DNA technology and its application to the analysis of basic plant processes. The course emphasizes genetic transformation methodology, molecular genetic approaches to the study of selected plant systems, and prospects for plant improvement using biotechnology. The course is directed at undergraduates who wish to become familiar with plants as experimental organisms. Selected topics attempt to illustrate the uniqueness of plant life and how it differs from other systems.

## BIOPL 344 Plant Physiology, Laboratory (formerly Bio S 349)

Spring. 2 credits. Prerequisite: concurrent enrollment in BIOPL 342. May not be taken for credit after BIOPL 244. Similar to BIOPL 244 but at a more advanced level.

Lab, W 1:25-4:25; disc, W 12:20. C. Reiss. Experiments exemplify concepts covered in BIOPL 342 and offer experience in a variety of biological and biochemical techniques, including use of small amounts of radioisotopes.

## [BIOPL 345 Plant Anatomy

Fall. 4 credits. Limited to 15 students. Prerequisite: one year of introductory biology or a semester of botany. Offered altemate years. Not offered 1994-95.

Lecs, M W 9:05; labs, M W 2-4:25.
D. J. Paolillo.

A descriptive course with equal emphasis on development and mature structure. Lecture, laboratory, and reading are integrated in a study guide. The laboratory offers the opportunity to develop the practical skills required to make anatomical diagnoses and to write anatomical descriptions.]

## [BIOPL 346 Algal Physiology

Fall. 3 credits. Prerequisites: one year of introductory biology for majors and BIOPL 242 or 342 , or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

Lecs, T R 8:30-9:55. T. G. Owens. This course takes an interdisciplinary approach to the study of algae with an emphasis on the physiology, biochemistry, and ecology of this diverse group of organisms. The algal classes are briefly described with consideration of traditional and emerging criteria for classification of the algae. The majority of the course focuses on interactions of algae with the physical/chemical environment, uptake of inorganic compounds, algal photosynthesis, metabolic strategies, and population dynamics of planktonic algae and benthic macrophytes. There is no laboratory section with this course.]

BIOPL 347 Laboratory in Molecular Biology and Cenetic Engineering of Plants
Fall. 2 credits. Limited to 24 students. S-U grades optional. Prerequisite: BIOPL 343 or permission of instructor

Lab, W 12:25-4:25. M. E. Nasrallah.
The laboratory provides experience in handling and experimenting with the plant Arabidopsis thaliana. Selected experiments include the preparation and analysis of nucleic acids, methods used in the detection and isolation of plant genes, analysis of gene expression using antibody and nucleic acid probes, mutant isolation, and methods of gene transfer to plants.
[BIOPL 359 Biology of Grasses
Fall. 3 credits. Limited to 24 students. Prerequisite: one year of introductory biology or an introductory plant taxonomy course, or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

Lecs, T R 10:10; lab, T 1:25-4:25
J. I. Davis.

Systematics and ecology of the graminoid plant families (grasses, sedges, and rushes), with principal emphasis on grasses. Major topics include taxonomy, phylogenetics, physiology, reproductive biology, ecotypic variation, speciation, biogeography, and population biology. The role of graminoids as ecosystem dominants, weeds, and the origins of cultivated species are discussed. Laboratory concentrates on the diversity of grasses.]

## BIOPL 441 Crop Plant Evolution

Fall. 2 credits. Prerequisite: an advancedlevel course in the plant sciences with taxonomic content or permission of instructor Offered alternate years. Not offered 1994-95.

Lecs, T R 11:15. D. M. Bates.
An integrated study of the systematics and evolution of agronomic and horticultural species. Processes of domestication, the evolutionary history of selected cultigens, the nature of weeds and land races, classification and nomenclature as applied to cultivated plants, and underexploited plant resources are among the topics considered.]

## [BIOPL 443 Research Methods in Systematic Botany

Fall or spring. 2 credits. Limited to 10 students. Prerequisite: BIOPL 248 or equivalent Offered alternate years. Not offered 1994-95.

Lab, F 1:25-4:25; additional hours to be arranged. Bailey Hortorium staff. An introduction to the methodology of plant systematic research: field studies; sampling and collecting methods; preparation of taxonomic revisions and monographs; numerical methods of data analysis; and laboratory methods in cytogenetics, comparative anatomy, and comparative chemistry, as applied to problems in plant systematics.]

## BIOPL 444 Plant Cell Biology

Fall. 4 credits. Limited to 24 students Prerequisites: one year of introductory biology or permission of instructor Lecs, M W F 9:05; lab, M or W 1:25-4:25. R. O. Wayne.

Evidence from microscopy, physiology, biochemistry, and molecular biology is used to try to unravel the mystery of the living cell. The dynamics of protoplasm, membranes, and the various organelles are studied. The mechanisms of cell growth and division, the relationship of the cytoskeleton to cell shape and motility, the interaction of the cell with its
environment, and the processes that give rise to multicellular differentiated plants are investigated.

## BIOPL 445 Photosynthesis

Fall. 3 credits. Prerequisites: Chem 104 or 208, Math 106 or 111, and either Phys 102 or 208 or permission of instructor. Offered alternate years.

Lecs, M W F 10:10. T. G. Owens A detailed study of the processes by which plants use light energy to grow. Structure of the photosynthetic apparatus, light absorption and antenna processes, photochemistry, and electron transport are emphasized. The course incorporates biophysical, biochemical, physiological, and molecular aspects of photosynthesis. Photosynthetic carbon metabolism is not covered in detail. Discussions include relevant material in bacterial, algal, and higher-plant photosynthesis.

## [BIOPL 447 Molecular Plant Systematics

 Fall. 3 credits. Prerequisites: BIOPL 248, and BIOGD 281, or written permission of instructor. Offered alternate years. Not offered 1994-95.Lecs, T R 10:10-11:30. J. J. Doyle. The study of variation at the molecular level and its application to the taxonomy and evolution of plants, particularly angiosperms. Emphasis is on the use of molecular evidence, particularly DNA data, for reconstructing phylogenies. Theory and methods of phylogenetic reconstruction are discussed. The organization and evolution of nuclear, mitochondrial, and chloroplast genomes, genes, and gene products are described from the standpoint of their utility for addressing a diversity of evolutionary questions. These questions span the entire taxonomic spectrum, and include such issues as the origin of angiosperms, evolution of species related to important crop plants, and population studies of hybridization.]

## BIOPL 448 Plant Evolution and the Fossil

 RecordSpring. 3 credits. Prerequisite: BIOPL 241 or equivalent, or permission of instructor. Offered altemate years.

Lecs, T R 9:05; lab, R 12:20-2:15.
K. J. Niklas.

An introduction to evolution, surveying major changes in plants from the origin of life to the present. Emphasis is placed on plant form and function, adaptations to particular ecologic settings, and evolutionary theory as it relates to plants.

## [BIOPL 453 Principles and Practice of Historical Biogeography (also

 Entomology 453)Fall. 3 credits. S-U grades optional. Prerequisite: a course in systematics or permission of instructor. Not offered 1994-95.

Lecs, T R 10:10; lab/disc, R 2:30-4:25.
J. K. Liebherr, M. A. Luckow.

This course provides a comprehensive survey of the current methods and techniques used in historical biogeography, and the development of modern biogeographic theory in the context of classical and ecological methods of analysis. Brief summaries of geological and paleontological aspects of biogeography are presented, and large-scale biogeographic patterns discussed. The laboratories focus on hands-on computer applications of modern techniques and discussion of controversial issues in biogeography.!

## BIOPL 641 Laboratory In Plant Molecular

 BiologySpring. 4 credits. Prerequisites: BIOGD 281 or equivalent, BIOBM 330 or 331 or equivalent, and permission of instructor. S-U grades optional.

Lab, T 9:05-4:30. J. B. Nasrallah,
M. R. Hanson, S. D. Tanksley,
P. F. Palukaitis.

Selected experiments on genome organization, gene expression, and gene transfer in plants. The course emphasizes the application of molecular biology methodology to plant systems. Students may have additional lab time to complete assignments.

## BIOPL 642 Plant Mineral Nutrition (also

 Soil, Crop, and Atmospherlc Sciences 642)Spring. 3 credits. Prerequisite: BIOPL 342 or equivalent. Offered alternate years.

Lecs, M W F 10:10. L. V. Kochian,
R. M. Welch.

A detailed study of the processes by which plants acquire and use mineral nutrients from the soil. Topics include the uptake, translocation, and comparmentation of mineral elements; root-soil interactions; the metabolism of mineral elements; the involvement of mineral nutrients in various physiological processes; and the nutrition of plants adapted to extreme environmental stresses (e.g., acid soils). Specific mineral elements are emphasized to illustrate these topics

## BIOPL 643 Plant Physiology, Advanced

 Laboratory TechniquesFall. 4 credits. Prerequisites: organic chemistry, biochemistry, and a course in plant physiology. S-U grades only.

Lab, T or W 8-5; disc, M 4:30-5:30
A. T. Jagendorf and staff.

An introduction to some modern methods in experimental plant biology. A partial list of techniques used includes fluorescence measurements, infrared $\mathrm{CO}_{2}$ analysis, gel electrophoresis and Western blots, cellular electrode measurements, microtiter plate technology for enzyme assays, sensitive growth measurements, HPLC and GC-MS, and computer interfacing with laboratory equipment

## [BIOPL 644 Plant Growth and Development

Spring. 3 credits. Prerequisites: BIOPL 345 and either 242 or 342 or their equivalents, or written permission of instructor. Offered alternate years. Not offered 1994-95.

Lecs, M W F 9:05. P. J. Davies,
D. J. Paolillo.

Explores the changes that occur during plant growth and development and their control: morphological and anatomical changes in apices, tissue differentiation, organ formation, embryo development, gene regulation, hormone action and interaction, the influence of light in development, flowering, fruiting, dormancy, abscission, and senescence.]

## [BIOPL 645 Families of Tropical

 Flowering PlantsFall. 1 credit. Prerequisite: written permission of instructor. S-U grades only. Offered alternate years. Not offered 1994-95.

Lec and disc, F 11:15. K. C. Nixon. The families of flowering plants encountered solely or chiefly in tropical regions are considered in lectures, discussions, and demonstrations, with the aim of providing basic points of recognition for, and an understanding of, diversity and relationships
in these families for the student venturing into the tropics.]

## [BIOPL 646 Families of Tropical

 Flowering Plants: Field Laboratory Intersession. 3 credits. Limited to 20 students, with preference given to graduate students from member institutions of the Organization for Tropical Studies. Prerequisite: BIOPL 243 or 248 or equivalent. Recommended: BIOPL 645. S-U grades only. For more details and application, contact the L. H. Bailey Hortorium, 467 Mann Library. Offered alternate years. Not offered 1994-95.K. C. Nixon.

An intensive orientation to families of tropical flowering plants represented in forests of the American tropics. Emphasis on field identification combined with laboratory analysis of available materials in a "wholebiology" context.]

## BIOPL 647 Seminar in Systematic Botany

Fall or spring. 1 credit. May be repeated for credit. Prerequisite: written permission of course coordinator required for undergraduates. S-U grades optional.

Sem, T 11:15-1:10. Bailey Hortorium staff. Lectures and discussions led by staff, visitors, and students on topics of current importance to systematic botany

## BIOPL 648 Plant Biochemistry

Spring. 3 credits. Prerequisites: organic chemistry, biochemistry, and a course in plant physiology. Offered altemate years.

Lecs, M W F 9:05. A. T. Jagendorf and staff.
Selected areas of plant biochemistry are reviewed in the context of the plant life cycle and responses to the environment. Topics include metabolism of lipids, carbohydrates, organic acids, phenolic compounds, and proteins; nitrogen and sulfur assimilation; respiration; photosynthesis; development and replication of chloroplasts; and cell-wall composition and properties. Attention is paid to operation of control mechanisms.

## [BIOPL 649 Transport of Solutes and

 Water in PlantsFall. 3 credits. Prerequisite: BIOPL 342 or equivalent. Offered alternate years. Not offered 1994-95.

Lecs, T R 10:10-11:30. R. M. Spanswick. Transport of ions, water, and organic materials in plants; mechanisms of ion transport; relationships between ion transport and metabolism; ion uptake and transport in higher plants; phloem transport; and water relations of single cells and whole plants.]

## BIOPL 651 Quantitative Whole-Plant

 PhysiologyFall. 3 credits. Prerequisites: introductory physics, calculus, and plant physiology. S-U grades only. Offered alternate years.

Lecs, T R 10:10-11:30. R. M. Spanswick. An exploration of the extent to which physiological processes and their interactions can be formulated in a quantitative manner and integrated to describe various aspects of plant behavior, including growth and yield. Consideration is given to characterization of the plant environment, energy balance, gas exchange, water relations, photosynthesis, respiration, translocation, nutrient supply, and the timing of developmental events.

BIOPL 652 Plant Molecular Biology II
Spring. 1-4 credits (1 credit per section). Prerequisites: BIOGD 281, and BIOBM 330 or 332, or their equivalents. Recommended: BIOBM 331. S-U grades optional.
A series of four-week modules on specialized topics. Coordinator: S. H. Howell.

## Section 01 Molecular Plant-Pathogen Interactions (also Plant Pathology 662)

1 credit.
Lecs, M W F 10:10 (12 lecs) Jan. 25-Feb. 20. P. F. Palukaitis, O. C. Yoder,
A. R. Collmer.

An examination of the molecular properties that control the development of host-parasite interactions in both microorganisms (viruses, bacteria, and fungi) and higher plants. Contemporary theories describing the genetic mechanisms of pathogenesis and resistance are discussed.

## Section 02 Molecular Biology of Plant Organelles

1 credit. S-U grades optional.
Lecs, M W F 1:25 (12 lecs) Jan. 25-Feb. 20. M. R. Hanson (even years), D. B. Stern (odd years).
An in-depth examination of the molecular biology of plant mitochondria (even years) and plastids (odd years). Topics include the organization and expression of organelle genomes, RNA editing, organelle transformation, expression of nuclear genes for organelle proteins. Special topics include cytoplasmic male sterility and gene regulation during plastid development.

## Section 03 Molecular Aspects of Plant Development II

1 credit. S-U grades optional.
Lecs, M W F 10:10 (12 lecs) Feb. 22-Mar. 27. S. H. Howell.

A systems approach to the study of plant development from a molecular perspective. Topics include molecular genetics of flowering, embryogenesis, meristem function, vascular formation, root development; consideration of cell lineages and positional information.

## Section 04 Molecular Plant-Microbe

## Interactions

1 credit. S-U grades optional.
Lecs, M W F 10:10 (12 lecs) Mar. 29-Apr.
24. S. C. Winans.

Course focuses on the interactions of Agrobacteria and Rhizobia with plants. Topics on Agrobacterium-plant interactions include plant-microbe recognition mechanisms, T-DNA transfer process, oncogenesis and use of Agrobacterium to produce transgenic plants. Topics on Rhizobium-plant interactions include regulation of nitrogenase activity and expression, organization and function of the sym plasmid, nodule development, and plant genetics involved in plantmicrobe interaction.

## Section 05 Plant Gene Evolution 1 credit.

> Lecs, M W F 1:25 (12 lecs) Mar. 29-Apr. 24. J. J. Doyle.

Practical applications of molecular systematics/evolution for plant molecular biologists and other non-systematists. The course focuses on two basic issues: methods and principles for inferring relationships among genes and the use of data to hypothesize relationships among plants. Evolutionary patterns and processes of genes and gene families are discussed, as well as rates of
sequence evolution, paralogy and othology, the effects of recombination and concerted evolution of gene phylogenies, and the implications of using gene or allele phylogenies to infer organismal evolutionary patterns. The principles of distance and parsimony methods are described, and computer methods for reconstructing gene phylogenies are discussed.

## BIOPL 653 Plant Molecular Biology I

Fall. $1-4$ credits ( 1 credit per section) Prerequisites: BIOGD 281 and BIOBM 330 or 332, or their equivalents. Recommended: BIOBM 331. S-U grades optional.
A series of four-week modules on specialized topics. Coordinator: S. H. Howell.

## Section 01 Concepts and Techniques in Plant Molecular Biology

1 credit.
Lecs, M W F 10:10 (12 lecs) Aug. 31-Sept. 26. R. Wu, D. B. Stern.

A review and update on molecular biology concepts relevant to plant sciences including DNA synthesis, RNA transcription and processing, and protein structure and translation. Methods applicable to plant molecular biology are described including isolation of nucleic acids, gel electrophoresis, recombinant DNA techniques, mutant production, DNA-protein interactions, and use of antibodies.

## Section 02 Plant Biotechnology (also

 Plant Breeding 653 and Plant Pathology 663)
## 1 credit.

Lecs, M W F 10:10 ( 12 lecs) Aug. 31-Sept. 26. M. Zaitlin, E. D. Earle.

Applications of molecular biology and tissue culture to plant biotechnology are studied. Topics covered include gene introduction and tissue culture technologies; use of somaclonal variation; and use of cultured plant materials and transgenic plants to obtain resistance to insects, plant diseases, and herbicides, and to improve nutritional and food processing qualities. Regulatory and social issues relating to plant biotechnology are discussed.

## Section 03 Plant Genome Organization and Function (also Plant Breeding 653)

## 1 credit.

Lecs, M W F 10:10 (12 lecs) Oct. 3-Oct. 31. S. D. Tanksley.

Molecular structure and evolution of plant nuclear genomes are explored. Topics covered include mechanisms for packaging DNA into chromosomes, molecular structure of telomeres and centromeres, DNA replication and methylation, and molecular biology of plant transposons. Methods for genetic and physical mapping of plant genomes are discussed as well as applications of mapping tools for gene isolation and plant breeding.

## Section 04 Molecular Aspects of Plant

 Development I1 credit.
Lecs, M W F 10:10 ( 12 lecs) Nov. 2-Nov. 30. J. B. Nasrallah.

The module explores current approaches to the elucidation of molecular signals and signal transduction pathways as they relate to the establishment of the differentiated state of plant cells and organs. Topics include the use of classical and molecular genetics, gene tagging methods, and transgenic plants for the study of cellular differentiation, hormonal and light responses, and cell-cell signaling.
[BIOPL 654 Botanical Nomenclature
Fall. 1 credit. Prerequisite: written permission of instructor. S-U grades only. Offered alternate years. Not offered 1994-95.

Lec and disc to be arranged. R. P. Korf. An analysis of the International Code of Botanical Nomenclature and its application to various plant groups.]

## BIOPL 655 Seminar in Ethnobotany (also Anthropology 627)

Fall. 2 or 4 credits ( 4 credits with independent tutorial). Prerequisite: written permission of instructor for undergraduates.

Lec, W 1:25; disc, W 2:30. D. M. Bates,
C. R. Franquemont.

An exploration of ethnobotany, the study of the interrelationships of people and plants viewed from anthropological and botanical perspectives. Contemporary issues, theory, and methodology are considered. Topics include subsistence systems, crop domestication, traditional medicine, indigenous resource management, and preceptions of nature, among others.

## BIOPL 656 Topics in Paleobotany

Spring. 1 credit. Prerequisite: BIOPL 448 or equivalent background in evolution, or written permission of instructor.

Lab and disc to be arranged. K. J. Niklas. A series of selected topics to provide a background in plant evolution, paleobotanical literature, and evolutionary theory. Among the topics discussed are the origin of a terrestrial flora, the evolution of the seed plants, and the origin and adaptive radiation of the angiosperms.

## BIOPL 740 Plant Biology Seminar

Fall and spring. No credit (no official registration). Required of graduate students doing work in plant biology.

Sem, F 11:15. Staff.
Lectures on current research in plant biology, presented by visitors and staff.

## BIOPL 742 Current Topics in Plant

 Molecular BiologyFall or spring. 1 credit. Limited to 20 students. Primarily for graduate students, with preference given to majors or minors in plant molecular biology; written permission of instructor required for undergraduates. S-U grades only.

Sem, 1 hour each week to be arranged. Staff.
A seminar with critical presentation and discussion by students of original research papers concerning the molecular biology of plants. Staff direction varies each year and is announced a semester in advance.

## BIOPL 749 Graduate Research in Botany

Fall or spring. Variable credit. May be repeated for credit, S-U grades optional. Hours to be arranged. Staff.
Similar to BIO G 499 but intended for graduate students who are working with faculty members on an individual basis.

## BIOPL 840 Current Topics in Plant

 PhysiologyFall or spring. 2 credits. May be repeated for credit. S-U grades only.

Sem to be arranged. Staff.
Seminar reports by graduate students on current literature in experimental plant physiology or related areas.

## Related Courses in Other Departments

Introductory Mycology (Plant Pathology 309)
Marine Botany: Ecology of Marine Plants (Biological Sciences [BIOSM] 449)
Mycology Conferences (Plant Pathology 649)

## Phytomycology (Plant Pathology 709)

Plant Ecology and Population Biology, Lectures and Laboratory (Biological Sciences [BIOES] 463 and 465)
Plant Ecology Seminar (Biological Sciences [BIOES] 669)
Plant Cytogenetics Laboratory (Plant Breeding 446)
Teaching Experience (Biological Sciences [BIO G] 498)

Undergraduate Research in Biology (Biological Sciences [BIO G] 499)

## COURSES IN MARINE SCIENCE

Comell offers an extensive listing of undergraduate courses in marine science.
Undergraduates interested in pursuing studies in marine science are encouraged to explore the undergraduate specialization in Marine Biology and Oceanography offered through the Division of Biological Sciences and the summer program of courses offered by the Shoals Marine Laboratory. Further information on both can be found at the Comell Marine Programs Office, G14 Stimson Hall.

## Undergraduate Specialization in Marine

 Biology and OceanographyBiological Sciences majors in the ecology and evolutionary biology program of study have the option of specializing their program of study in the areas of marine biology and oceanography. In addition to fulfilling the major and the ecology and evolutionary biology program of study requirements, students in marine biology and oceanography are encouraged to enroll in the following courses:

1) BIOES 154, The Sea: An Introduction to Oceanography,
2) BIOES 364, Field Marine Science or a $400-$ level BIOSM field course at the Shoals Marine Laboratory,
3) BIOES 462, Marine Ecology.

Students in this specialization are exposed to an integrated program of study, emphasizing a natural progression of formal course work combined with ample opportunities for practical field experience.

## SHOALS MARINE LABORATORY (BIOSM)

## G14 Stimson Hall, 255-3717

The objective of the Shoals Marine Laboratory (SML) is to provide undergraduates, beginning graduate students, and other interested adults a unique opportunity to explore marine sciences in an island setting noted for its biota, geology, and history. SML has established a national reputation for excellence and has become North America's largest marine field station focusing on undergraduate education.

The summer population of Appledore Island is limited to about one hundred people at any one time. Participants and faculty members can literally and figuratively immerse themselves in their explorations, free from distractions common to most academic institutions. Because SML is a residential facility, a sense of community develops that makes courses and seminars at SML outstanding educational and intellectual experiences. Participants leam from and exchange ideas with a wide range of specialists whose primary interests are marine but whose perspectives often differ, providing fertile ground for lively discussions.
Credit courses at Shoals Marine Laboratory are full-time, intensive learning experiences. Courses may be taken sequentially, but not concurrently. A typical day combines lecture sessions, laboratory and field work, field trips to nearby islands and the mainland, and collecting and research excursions aboard the Laboratory's 47 -foot research vessel, Jobn M. Kingsbury. Field experience is an integral component of all courses, using Appledore's extensive intertidal zone, wading bird rookeries, and seabird colonies. Faculty, drawn from Cornell University, the University of New Hampshire, and other leading academic institutions, are selected not only based on their academic excellence, but also on their teaching ability in the field. In addition, numerous guest lecturers include engineers, coastal planners, and specialists from private industry, government, and the academic community,
The Ithaca campus functions of the Shoals Marine Laboratory are centered in the Cornell Marine Programs Office, G14 Stimson Hall. The office serves as an advising center for students interested in the marine sciences, maintains a browsing library with updated information on graduate study and career opportunities as well as on marine programs at other institutions, and administers the SEA Semester, a 17-credit program offered in cooperation with the Sea Education Association.
The following marine sciences courses are currently administered by the Cornell Marine Programs Office.

## BIOSM 160 The Oceanography of the Gulf of Maine

Summer. 4 credits. S-U grades optional. Limited to 24 students. A special 3 -week course offered aboard the SSV Corwith Cramer and at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall or the Sea Education Association office at P.O. Box 6, Woods Hole, MA 02543. Estimated cost (includes tuition, room and board aboard ship and on the island, and ferry transportation), $\$ 2,200$.

Daily lecs, labs, and fieldwork for 3 weeks.
SML faculty.
An exciting opportunity to explore the offshore and near-coastal environments of the Gulf of Maine for pre-college and first-year non-science majors. Students spend ten days aboard the Sea Education Association's SSV Corwith Cramer and sail from Woods Hole, Mass., to the Isles of Shoals via Georges Bank and the Gulf of Maine. Besides operating the ship, students study the many characteristics of this unique ocean environment. Following the sea component, students spend seven
days at the Shoals Marine Laboratory to collect data characteristic of the Isles of Shoals coastal environment

## BIOSM 161 Introduction to Field Marine Science

Summer. 4 credits. S-U grades optional. A special 2-week course offered at Comell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$1,700.

Daily lecs, labs, and fieldwork for 2 weeks SML faculty
This course allows students who are not biology majors to experience the breadth of the marine sciences under field conditions at an island laboratory. Aspects of biology, geology, earth science, chemistry, and physics are included. Specific topics include beach, salt marsh, tidal mud flat, tide pool, and benthic offshore environments; identification of marine plants and animals; chemical and physical oceanography; marine geology; and ecology of kelp beds and urchin barrens.

BIOSM 204 Biological Illustration
Summer. 2 credits. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, supplies, and ferry transportation), $\$ 850$.

Daily sessions for 1 week. SML faculty. General discussion of scientific publishing, illustration labeling, color techniques, and printing processes. The course provides the scientist or science student a chance to experience several illustration techniques with the goal of obtaining an overview of scientific and wildlife illustrations. The student may choose a single technique to explore in depth. Course size is limited so that individual
attention can be emphasized.

## BIOSM 309 Coastal Ecology and Bioclimates

Summer. 4 credits. Prerequisite: one year of college-level biology; background preferred in physics/physical geography. S-U grades optional. A special 2-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$1,650.

Daily lecs, labs, and fieldwork for 2 weeks. SML faculty
A study of the fundamentals of organismenvironment interaction developed through defining and measuring abiotic factors including solar radiation, temperature, atmospheric moisture, precipital wind, and currents. In-site exploration of the dynamics of meteorology and the role of abiotic and biotic factors in the life of coastal and marine plants and animals including humans.

## BIOSM 327 Neurobiology of Animal Behavior

Summer. 4 credits. Prerequisite: permission of instructor and successful performance in college-level introductory biology and chemistry courses with laboratories. Recommended: course work in neurobiology, psychology, and animal behavior. S-U grades optional. A special 2 -week course offered at Cornell's Shoals Marine Laboratory (SML) on
an island off the coast of Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $\$ 1,650$.

Daily lecs, labs, and fieldwork for 2 weeks. SML faculty
Neural mechanisms underlie all behaviors, from simple reflexes to complex social interactions. The functional elements of those mechanisms often are common to both vertebrate and invertebrate nervous systems. The course focuses on neural mechanisms of behavior in marine organisms, a topic that has produced significant biomedical discoveries. Students gain hands-on experience with a spectrum of modern research techniques for behavioral, systems, cellular, and molecular approaches. A visiting scientist program allows student interaction with research scientists.

BIOSm 329 Ecology of Animal Behavior Summer. 4 credits. Prerequisite: one year of introductory college biology. Recommended: course work in ecology, psychology, or behavior. S-U grades optional. A special 2-week course offered at Comell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$1,650.

Daily lecs and fieldwork for 2 weeks. SML faculty.
The ecological significance of behaviors of coastal organisms, with emphasis on field and laboratory research methods. Lectures and readings address the major subareas of behavior (communication, orientation, social behavior, foraging, predator avoidance, and sensory mechanisms). Each student engages in short-term behavioral observation and prepares a research proposal for studying a problem within the course subject area.
BIOSM 363 Marine Blology for Teachers Summer. 3 credits. Primarily for teachers, grades 6 through 12, but open to others with teaching experience. Prerequisite: one year of introductory college biology. S-U grades optional. A special 10-day course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$1,200.

Daily lecs, labs, and fieldwork for 10 days. SML faculty.
Designed to give an overview of living marine organisms (algae, invertebrates, fishes, marine mammals, and shorebirds) and of the environment they inhabit. Fieldwork is emphasized. Occasional lectures and films deal with additional topics such as coastalzone problems, marine fisheries, economics of marine organisms, and educational resources of the marine environment.

BIOSM 364 Field Marine Science
Summer. 6 credits. Prerequisite: one year of college biology. S-U grades optional. A special 4 -week course offered twice each summer at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML Office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$2,550.

Daily lecs, labs, and fieldwork for 4 weeks 3 core faculty members assisted by up to 15 visiting lecturers, including representatives of governmental agencies and commercial fishermen. SML faculty.
Designed for the student who desires an initial overview of the marine sciences, this course emphasizes living material in natural habitats. Most of the course work is concerned with the biology of intertidal plants and animals, biological oceanography, ichthyology, and fisheries. Attention is also given to introductory physical and chemical oceanography and marine geology. Marine ecology and the effects of human activity on the marine environment are included. Students apply this knowledge by conducting a transect study toward the end of the course

## BIOSM 365 Underwater Research

Summer. 4 credits. Prerequisites: one year of college-level biology, recognized scuba certification, and a medical examination. S-U grades optional. A special 2 -week course offered at Comell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$1,750.

Daily lecs and fieldwork for 2 weeks.
Team-taught by a diving-safety officer, two
faculty members, and guest lecturers. For competent divers only. Covers special problems of underwater research, including random sampling, use of dive tables, underwater instrumentation, special diving equipment, photographic techniques, integration with boat and shore facilities, and emergency procedures. Students are required to conduct a transect study on both soft and hard substrates.

## BIOSM 366-370 SEA Semester

In cooperation with the Sea Education Association (SEA), the Shoals Marine Laboratory office offers a semester-length sequence of courses designed to provide college undergraduates with a thorough academic, scientific, and practical understanding of the sea. This sequence is repeated approximately once every two months throughout the year. Students spend the first half of SEA Semester (the six-week shore component) in Woods Hole, Mass., receiving instruction in oceanography, nautical science, and maritime studies. The second half of SEA Semester (the six-week sea component) is spent at sea aboard the R/V Westward or the R/V Corwith Cramer. Enrollment is open to men and women judged capable of benefiting from SEA Semester; no specific prior training or study is required. Comell students enrolled in the SEA Semester must take the entire sequence.
For more information, consult the Shoals Marine Laboratory office, G14 Stimson Hall, or call SEA directly at 1-800-552-3633. Program costs are to be paid in place of regular Comell tuition and fees: tuition for entire 17 -credit SEA Semester, about $\$ 8,500$; room and board about $\$ 2,500$.
Instructors for the SEA Semester include faculty of the Sea Education Association and the Woods Hole Oceanographic Institution and others.

Shore Component (six weeks)
BIOSM 366 SEA Introduction to Oceanography
3 credits. Prerequisite: concurrent enrollment in BIOSM 367 and 368. A survey of the characteristics and processes of the global ocean. Oceanographic concepts are introduced and developed from their bases in biology, physics, chemistry, and geology Provides a broad background in oceanography with special attention to areas pertinent to the subsequent cruise. Guest lecturers from the Woods Hole research community interpret current trends and activities in this rapidly evolving field. Students develop individual projects to be carried out at sea

## BIOSM 367 SEA Introduction to Maritime Studies

3 credits. Prerequisite: concurrent enrollment in BIOSM 366 and 368. An interdisciplinary consideration of our relationship with the marine environment. Covers the elements of maritime history, law, literature, and art necessary to appreciate our marine heritage and to understand the political and economic problems of contemporary maritime affairs

## BIOSM 368 SEA Introduction to Nautical Science

3 credits. Prerequisites: concurrent enrollment in BIOSM 366 and 367. An introduction to the technologies of operation at sea. The concepts of navigation (piloting, celestial, and electronic), naval architecture, ship construction, marine engineering systems, and the physics of sail are taught from their bases in astronomy, mathematics, and physics.
Provides the theoretical foundation for the navigation, seamanship, and engineering that students employ at sea.

## Sea Component (six weaks)

Courses 369 and 370 take place aboard the R/V Westward, a 125 -foot steel auxiliarypowered staysail schooner built in 1961, or the R/V Corwith Cramer, a 134 -foot steel auxiliary-powered brigantine built in 1987 for SEA. Both ships normally put to sea with a ship's company of thirty-four. The professional staff of nine includes the captain, the chief scientist, three science watch officers, three deck watch officers, an engineer, and a steward. In addition, one or more visiting investigators are frequently aboard. Up to twenty-four students round out the complement.

## BIO8M 369 SEA Practical

 Oceanography I4 credits. Prerequisite: BIOSM 366. Theories and problems raised in the shore component are tested in the practice of oceanography at sea. Students are introduced to the tools and techniques of the practicing oceanographer. During lectures and watch standing, students are instructed in the operation of basic oceanographic equipment; in the methodologies involved in the collection, reduction, and analysis of oceanographic data; and in the attendant operations of a sailing oceanographic research vessel.

## BIOSM 370 SEA Practical

Oceanography II
4 credits. Prerequisites: BIOSM 368 and 369 Building on the experience of Practical Oceanography I, students assume increasing responsibility for conducting oceanographic research and overseeing operations of the vessel. The individual student is ultimately responsible directly to the chief scientist and
the master of the vessel for the safe and orderly conduct of research activities and related operations of the vessel. Each student undertakes an individual research project designed during the shore component.

## BIOSM 372 SEA Practical <br> Oceanography III

Summer. 3 credits. Prerequisites: BIOSM 366,367 , and 368 . Theories and problems raised in class are tested in the practice of oceanography at sea. During lectures and watch standing, students are instructed in the operation of basic oceanographic equipment, in the methodologies involved in the collection, analysis, and reduction of oceanographic data, and in the attendant operations of sailing an oceanographic research vessel. Group research projects are completed.

## BIOSM 402 Marine Pollution

Summer. 4 credits. Prerequisites: one year of college-level biology and chemistry or permission of instructor. S-U grades optional. A special 2 -week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$1,650.

Daily lecs, labs, and fieldwork for 2 weeks. SML faculty.
Dispersion modeling and the effects of pollutants (including oil, outfalls, solid wastes, sludge and dredge spoils, and radioactive wastes) are discussed from the perspectives of elementary physical oceanography and biological processes. Laboratories include basic methods for targeting and tracing wastewater, organic carbon determinations, and practical field projects.

## BIOSM 409 Ciliophorology

Summer. 2 credits. Prerequisite: permission of instructor. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$850

Daily lecs and labs for 1 week
SML faculty.
A special course that examines ciliophoran biology in depth through lectures and laboratory exercises. Topics include a detailed look at the ciliate faunules found in such diverse habitats as salt marshes, sandy sediment interstitial spaces, the Gulf Stream and the Sargasso Sea, marine caves, and benthic hydrothermal vents. Laboratory focuses on examining silver stained specimens, and covers staining techniques, as well as back scattered and secondary SEM and TEM methodologies.

## BIOSM 413 Adaptations of Marine

 OrganismsSummer. 6 credits. Prerequisite: BIOSM 364 or a course in physiological ecology. S-U grades optional. A special 3-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$2,250.

Daily lecs, labs, and fieldwork for 3 weeks SML faculty.

An introduction to the physiological ecology and functional morphology of marine plants and animals, with emphasis on selected algal and invertebrate examples from the Gulf of Maine. Topics covered include photosynthesis in the marine environment; respiration in intertidal organisms; carbohydrates, proteins, and lipids as nutrients in the sea; acclimation and tolerance of tide-pool biota; and biological responses to competition and grazing. Field and laboratory exercises explore principles and procedures used to characterize the physical, chemical, and biotic environment of intertidal and shallow subtidal organisms, including determination of temperature, light, salinity, oxygen and nutrient levels, and in vivo functional analyses of metabolic phenomena. The process of scientific investigation is the predominant theme of the course.

## BIOSM 449 Marine Botany: Ecology of

 Marine PlantsSummer. 4 credits. Prerequisite: BIOSM 364 or one year of introductory biology. S-U grades optional. A special 2-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$1,650.

Daily lecs, labs, and fieldwork for 2 weeks.
SML faculty.
An overview of the major marine algal groups, including aspects of anatomy, morphology, development, life histories, physiology, and use. Laboratories and fieldwork emphasize relationships between distribution and major environmental parameters and involve student projects.

## BIOSM 477 Marine Vertebrates

Summer. 6 credits. Prerequisites: permission of instructor and a course in vertebrate biology. S-U grades optional. A special 3 -week course offered at Comell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$2,250.

Daily lecs, labs, and fieldowork for 3 weeks. SML faculty.
Topics in marine vertebrate biology emphasizing laboratory studies, field collections or observations, and readings from the current literature. Topics covered include systematics of fishes of the Gulf of Maine, elasmobranch physiology, interpretation of life history and parameters from otolith microstructure, teleost skeletomuscular structure and function, population biology and the contemporary Gulf of Maine fishery, Mesozoic marine reptiles, the biology of sea turtles in cold water, coloniality in sea birds, avian adaptations to life at sea, evolution and systematics of marine mammals, diving physiology, and ecology and conservation of existing marine mammal populations. Dissection of vertebrate animals is a part of one or more laboratory sessions
AGEC The History and Economics of Whaling in North Amorlea (Agricultural Economics 454 and History 413)
Summer. 2 credits. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the

SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$850

Daily lecs, labs, and fieldwork for 1 week.
D. H. Usner, J. M. Conrad.

The whaling industry of nineteenth-century America presents a rich tapestry for studying the people, resources, and technology that contributed to the economic development of the United States. This course examines the species of whales on which that industry was based, aboriginal and colonial whaling, the golden era of the American fishery, whaling in the western Arctic, and the decline and demise of the industry in the early twentieth century. Social relationships, cross-cultural influences, markets, resource dynamics, and technical change are all evident in the rise and fall of this unique American industry.

## ARKEO Archaeology of Maritime

 Communities (Archaeology 300: Individual Study in Archaeology) Summer. 2 credits. Prerequisite: a strong interest in history or permission of instructor A special 1-week course offered at Comell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition room and board, and ferry transportation), $\$ 850$.Daily lecs, labs, and fieldwork for 1 week. SML faculty.
Fieldwork on various land sites and their adjacent offshore marine environments. Artifact analysis, preliminary conservation, and the proper recording of finds are emphasized. Methods of archaeological research, including the use of archives and historical materials, and publication methodologies as well as the larger questions in the discipline are discussed.

## ARKEO Archaeology Underwater

## (Archaeology 319)

Summer. 2 credits. Prerequisites: recognized scuba certification and a medical examination required for students engaging in underwater research; also open to non-divers. A special 1-week course offered at Comell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $\$ 950$.

Daily lecs, labs, and fieldwork for 1 week. SML faculty.
An introduction to the subject and a review of this contemporary subdiscipline of archaeology. The approach of the course is practical, with a strong potential for actual on-site experience in search, site recognition, survey, and recording. The course also covers the history and development of the subject, the legal aspects of underwater research, and the worldwide potential of the field. Since any archaeological research project involves a great deal more than digging, the course provides ample opportunities for those who are interested in the subject but are not divers or sufficiently experienced in scuba.

## GEOL Marine and Coastal Geology (Geological Sciences 213)

Summer. 2 credits. Prerequisite: an introductory course in geology or permission of instructor. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML
office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), \$850.

Daily lecs, labs, and fieldwork for 1 week. SML faculty.
With "the New England coast" defined as beginning at the -200 meter isobath and proceeding westward, this course examines specific geological events and processes important in shaping the area's bedrock and surficial sediments. Petrology, geophysics, and the Pleistocene geology of the region are investigated. Consideration of the geologic history of New England within the plate tectonic model is emphasized. Examination of insular geology is used to integrate micro-, meso-, and macroscale geological evolution of continental margins in general. Marine geology is approached through basic geophysical exploration and bottom-sediment collection followed by data analysis and interpretation. Experience aboard a coastal research vessel is an integral part of the course.

## NTRES Coastal and Oceanic Law and Policy (Natural Resources 306)

Summer. 2 credits. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $\$ 850$.

Daily lecs and discs for 1 week. SML faculty.
Intended for persons interested in careers in management of marine or coastal resources or in the natural sciences. Subjects include law and policy related to ocean dumping, marine sanctuaries, environmental impact statements, water and air pollution, fisheries management, offshore gas and oil production, and territorial jurisdiction. Lectures on the status and history of law are accompanied by discussion of relevant policy and analysis of the efficacy of various legal techniques. A case study that requires extensive use of the laboratory's library and personnel is assigned. The week concludes with a mock hearing.

## NTRES Wetland Resources (Natural Resources 417)

Summer. 2 credits. Prerequisite: one year of college-level biology. A special 1-week course offered at Comell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $\$ 850$.

Daily lecs, labs, and fieldwork for 1 week. SML faculty.
An examination of coastal and adjacent freshwater wetlands from historic, destruction, and preservation perspectives, including freshand salt-marsh ecology and management. Field trips to selected examples of the wetlands under discussion and follow-up laboratories emphasize successional features, plant identification and classification, and examination of the dominant insect and vertebrate associations.

## COURSES IN BIOPHYSICS

Biophysics is an interdisciplinary undergraduate and graduate program. Information on this independent option is available in the Office for Academic Affairs, 200 Stimson Hall.

Graduate study and research in biophysics are available through several Graduate Fields. Students interested in graduate study in any of the fields offering biophysics can inquire of the Biophysics Program in the Applied Physics Office, 210 Clark Hall. There is a concentration in biophysics available through the Field of Biochemistry, Molecular and Cell Biology. The following courses are available for students interested in biophysics:

## Advanced Concepts in Biological Engineering

 (Chemical Engineering 645)Biomedical Engineering (Chemical Engineering 481)

Biomechanical Systems-Analysis and Design (Mechanical and Aerospace Engineering 465)
Chemistry of Nucleic Acids (Chemistry 677)
Computer Interlacing for Neurobiologists (Biological Sciences [BIONB] 422)
Electron Microscopy for Biologists (Biological Sciences [BIO G] 401, 403. 405, 606, 608)

Electronics for Neurobiology (Biological Sciences [BIONB] 426)

Kinetics and Regulation of Enzyme Systems (Chemistry 672)
Enzyme Catalysis and Regulation (Chemistry 672)
Introduction to Bioprocess Engineering (Chemical Engineering 643)
Molecular Biophysics of Cellular Dynamics (Applied and Engineering Physics 615)

Membranes and Bioenergetics (Biological Sciences [BIOBM] 632)
Membrane Ion Channels (Biological Sciences [BIONB] 495)
Neurochemistry and Molecular Neurobiology (Biological Sciences [BIONB] 497)
Neuroethology (Biological Sciences [BIONB] 424)
Photosynthesis (Biological Sciences [BIOPL] 445)
Physical Chemistry of Proteins (Chemistry 686)
Principles of Neurophysiology (Biological Sciences [BIONB] 491)

Protein Structure and Function (Biological Sciences [BIOBM] 631)
Special Topics in Biophysical and Bioorganic Chemistry (Chemistry 782)
Transport of Solutes and Water in Plants (Biological Sciences [BIOPL] 649)

## FACULTY ROSTER

## New York State College of Agriculture and Life Sciences

Adler, Kraig K., Ph.D., U. of Michigan. Prof., Neurobiology and Behavior
Anderson, John M., Ph.D., New York U. Prof. Emeritus, Genetics and Development
Banks, Harlan P., Ph.D., Cornell U. Liberty Hyde Bailey Prof. of Botany Emeritus, Plant Biology
Barker, Robert, Ph.D., U. of California at Berkeley. Prof., Biochemistry, Molecular and Cell Biology/Center for the Environment
Bates, David M., Ph.D., U. of California at Los Angeles. Prof., Bailey Hortorium

Beyenbach, Klaus W., Ph.D., Washington State U. Prof., Physiology/Veterinary Physiology $\dagger$ Bruns, Peter J., Ph.D., U. of Illinois. Prof., Genetics and Development
Cade, Thomas J., Ph.D., U. of California at Los Angeles. Prof. Emeritus, Ecology and Systematics
Calvo, Joseph M., Ph.D., Washington State U. William T. Keeton Professor in Biological Sciences; Biochemistry, Molecular and Cell Biology
Chabot, Brian F., Ph.D., Duke U. Prof., Ecology and Systematics
Clayton, Roderick K., Ph.D., California Inst. of Technology. Prof. Emeritus, Plant Biology
Crepet, William L., Ph.D., Yale U. Prof., Bailey Hortorium
Daniel, Louise J., Ph.D., Cornell U. Prof. Emeritus, Biochemistry, Molecular and Cell Biology
Davies, Peter J., Ph.D., U. of Reading (England). Prof., Plant Biology*
Davis, Jerrold I., Ph.D., U. of Washington. Assoc. Prof., Bailey Hortorium
Delwiche, Eugene A., Ph.D., Comell U. Prof. Emeritus, Microbiology
Dondero, Norman C., Ph.D., Cornell U. Prof. Emeritus, Microbiology
Doyle, Jeffrey J., Ph.D., Indiana U. Assoc. Prof., Bailey Hortorium
Dress, William J., Ph.D., Comell U. Prof. Emeritus, Bailey Hortorium
Ealick, Steven E., Ph.D., U. of Oklahoma. Prof., Biochemistry, Molecular and Cell Biology
Eisner, Thomas, Ph.D., Harvard U. Jacob Gould Schurman Professor, Neurobiology and Behavior
Emlen, Stephen T., Ph.D., U. of Michigan. Prof., Neurobiology and Behavior
Feeny, Paul P., PhD., Oxford U. (England). Prof., Ecology and Systematics/Entomology
Fox, Thomas D., Ph.D., Harvard U. Prof., Genetics and Development
Ghiorse, William C., Ph.D. Rensselaer Polytechnic Inst. Prof., Microbiology
Gibson, Jane, Ph.D., U. of London (England). Prof., Biochemistry, Molecular and Cell Biology
Goldberg, Michael L., Ph.D., Stanford U. Assoc. Prof., Genetics and Development
Hanson, Maureen R., Ph.D., Harvard U. Prof., Genetics and Development
Harrison, Richard G., Ph.D., Comell U. Prof., Ecology and Systematics
Harris-Warrick, Ronald M., Ph.D., Stanford U. Prof., Neurobiology and Behavior
Harvell, C. Drew, Ph.D., U. of Washington. Assoc. Prof., Ecology and Systematics
Helmann, John D., Ph.D., U. of California at Berkeley. Asst. Prof., Microbiology
Hopkins, Carl D., Ph.D., Rockefeller U. Prof., Neurobiology and Behavior
Howarth, Robert W., Ph.D., Massachusetts Inst. of Technology/Woods Hole Oceanographic Institution. David R. Atkinson Professor in Ecology and Environmental Biology, Ecology and Systematics/Soil, Crop, and Atmospheric Sciences/Center for the Environment
Ingram, John W., Ph.D., U. of California at Berkeley. Prof. Emeritus, Bailey Hortorium
Jagendorf, Andre T., Ph.D., Yale U. Liberty Hyde Bailey Professor of Plant Physiology, Plant Biology
Keller, Elizabeth B., Ph.D., Cornell U. Prof. Emeritus, Biochemistry, Molecular and Cell Biology
Kemphues, Kenneth J., Ph.D., Indiana U. Assoc. Prof., Genetics and Development

Kingsbury, John M., Ph.D., Harvard U. Prof. Emeritus, Plant Biology
Lis, John T., Ph.D., Brandeis U. Prof., Biochemistry, Molecular and Cell Biology*
Loew, Ellis R., Ph.D., U. of California at Los Angeles. Assoc. Prof., Physiology/ Veterinary Physiologyt
Luckow, Melissa A., Ph.D., U. of Texas at Austin. Asst. Prof., Bailey Hortorium
MacDonald, Russell E., Ph.D., U. of Michigan. Prof. Emeritus, Biochemistry, Molecular and Cell Biology
MacIntyre, Ross J., Ph.D., Johns Hopkins U. Prof., Genetics and Development
Madsen, Eugene L., Ph.D., Cornell U. Asst. Prof., Microbiology
Marks, Peter L., Ph.D., Yale U. Prof., Ecology and Systematics*
McCune, Amy R., Ph.D., Yale U. Assoc. Prof., Ecology and Systematics
Mortlock, Robert P., Ph.D., U. of Illinois. Prof., Microbiology
Nasrallah, June B., Ph.D., Cornell U. Assoc. Prof., Plant Biology
Nasrallah, Mikhail E., Ph.D., Cornell U. Prof., Plant Biology
Naylor, Harry B., Ph.D., Cornell U. Prof. Emeritus, Microbiology
Niklas, Karl J., Ph.D., U. of Illinois. Prof., Plant Biology
Nixon, Kevin C., Ph.D., U. of Texas at Austin. Assoc. Prof., Bailey Hortorium
Owens, Thomas G., Ph.D., Cornell U. Assoc. Prof., Plant Biology
Paolillo, Dominick J., Jr., Ph.D., U. of California at Davis. Prof., Plant Biology
Parthasarathy, Mandayam V., Ph.D., Comell U. Prof., Plant Biology
Quaroni, Andrea, Ph.D., U. of Pavia (Italy). Assoc. Prof., Physiology
Reeve, H. Kern, Ph.D., Cornell U. Asst. Prof., Neurobiology and Behavior
Roberts, Jeffrey W., Ph.D., Harvard U. Robert J. Appel Professor of Molecular and Cell Biology, Biochemistry, Molecular and Cell Biology
Root, Richard B., Ph.D., U. of California at Berkeley. Prof., Ecology and Systematics/ Entomology
Russell, James B., Ph.D., U. of California at Davis. Prof., Microbiology
Seeley, Jr., Harry W., Ph.D., Cornell U. Prof. Emeritus, Microbiology
Shalloway, David I., Ph.D., Massachusetts Inst. of Technology. Greater Philadelphia Prof., Biochemistry, Molecular and Cell Biology
Shapleigh, James P., Ph.D., U. of Georgia. Asst. Prof., Microbiology
Spanswick, Roger M., Ph.D., U. of Edinburgh (Scotland). Prof., Plant Biology
Srb, Adrian M., Ph.D., Stanford U. Jacob Gould Schurman Prof. Emeritus, Genetics and Development
Steward, Frederick C., Ph D., U. of Leeds (England). Charles A. Alexander Prof. Emeritus, Biological Sciences
Stewart, Valley J., Ph.D., U. of Virginia. Assoc. Prof., Microbiology/Genetics and Development
Tye, Bik-Kwoon, Ph.D., Massachusetts Inst. of Technology. Prof., Biochemistry, Molecular and Cell Biology
Uhl, Charles H., Ph.D., Cornell U. Prof. Emeritus, Plant Biology
Uhl, Natalie W., Ph.D., Cornell U. Prof. Emeritus, Bailey Hortorium
Vogt, Volker M., Ph.D., Harvard U. Prof., Biochemistry, Molecular and Cell Biology
Walcott, Charles, Ph.D., Comell U. Prof., Neurobiology and Behavior/Laboratory of Ornithology

Wayne, Randy O., Ph.D., U. of Massachuserts. Assoc. Prof., Plant Biology
Winans, Stephen C., Ph_D., Massachusetts Inst. of Technology. Asst. Prof., Microbiology
Winkler, David W., Ph.D., U. of California at Berkeley. Assoc. Prof., Ecology and Systematics
Wu, Ray, Ph.D., U. of Pennsylvania. Prof., Biochemistry, Molecular and Cell Biology
Zahler, Stanley A., Ph.D., U. of Chicago. Prof., Genetics and Development
Zinder, Stephen H., Ph.D., U. of Wisconsin. Prof., Microbiology

## Other Teaching Personnel

Alexander, Renee R., Ph.D., Comell U. Sr. Lecturer, Biochemistry, Molecular and Cell Biology
Blankenship, James E., M.S., Cornell U. Lecturer, Biochemistry, Molecular and Cell Biology
Cordts, Marcia L., Ph.D., Cornell U. Sr. Lecturer, Microbiology
Ecklund, P. Richard, Ph.D., Oregon State U. Lecturer, Neurobiology and Behavior
Glase, Jon C., Ph.D., Cornell U. Sr. Lecturer, Neurobiology and Behavior
Griffiths, Joan M., Ph.D., Cornell U. Lecturer, Biochemistry, Molecular and Cell Biology
Heiser, John B., Ph.D., Cornell U. Sr. Lecturer, Ecology and Systematics
McFadden, Carol H., Ph.D., Cornell U. Sr. Lecturer, Physiology
Merkel, Susan, M.S., Cornell U. Lecturer, Microbiology
Rehkugler, Carole M., M.S., Comell U. Sr. Lecturer, Microbiology
Reiss, H. Carol, M.S., Cornell U. Sr. Lecturer, Plant Biology
Tyler, Bonnie M., Ph.D., Massachusetts Inst. of Technology. Lecturer, Biochemistry, Molecular and Cell Biology

## Joint Appointees

Bloom, Stephen E., Assoc. Prof., Poultry and Avian Sciences/Biological Sciences
Borror, Arthur C., Adjunct Prof., U. of New Hampshire/Biological Sciences
Butler, Walter R., Assoc. Prof., Animal Science/Physiology
Dhondt, André A., Edwin H. Morgens Prof. of Ornithology, Lab. of Ornithology/Ecology and Systematics
Edelstein, Stuart M., Adjunct Prof., U. of Geneva (Switzerland)/Biochemistry, Molecular and Cell Biology
Foote, Robert H., Jacob Gould Schurman Prof. Emeritus, Animal Science/Physiology
Greene, Charles H., Adjunct Asst. Prof., Center for the Environment/Ecology and Systematics
Howell, Stephen H., Adjunct Prof., Boyce Thompson Institute/Plant Biology
Kochian, Leon V., Adjunct Assoc. Prof., USDA Science and Education Administration/Plant Biology
Korf, Richard P., Prof., Plant Pathology/Bailey Hortorium
LaRue, Thomas A., Adjunct Prof., Boyce Thompson Institute/Plant Biology
Last, Robert L., Adjunct Assoc. Prof., Boyce Thompson Institute/Genetics and Development
Leopold, A. Carl, Adjunct Prof., Boyce Thompson Institute/Plant Biology
Liebherr, James K., Assoc. Prof., Entomology/ Bailey Hortorium
McCarty, Richard E., Adjunct Prof., Johns Hopkins U./Biochemistry, Molecular and Cell Biology

Moffar, J. Keith, Adjunct Prof., U. of Chicago/ Biochemistry, Molecular and Cell Biology
Pimentel, David, Prof., Entomology/Ecology and Systematics
Richmond, Milo E., Assoc. Prof., USDI Fish and Wildife Service/Natural Resources/ Ecology and Systematics
Rossman, Michael J., Adjunct Prof., Purdue U./ Biochemistry, Molecular and Cell Biology Stern, David B., Adjunct Asst. Prof., Boyce Thompson Institute/Plant Biology
Thompson, John F., Adjunct Prof., USDA Science and Education Administration/Plant Biology
van Tienhoven, Ari, Prof. Emeritus, Physiology
Via, Sara, Assoc. Prof., Entomology/Ecology and Systematics
Weeden, Norman F., Assoc. Prof., Horticultural Sciences/Bailey Hortorium
Wheeler, Quentin D., Assoc. Prof., Entomology/Bailey Hortorium

## College of Arts and Sciences

Aquadro, Charles F., Ph.D., U. of Georgia. Prof., Genetics and Development/Ecology and Systematics
Bass, Andrew H., Ph.D., U. of Michigan. Assoc. Prof., Neurobiology and Behavior
Blackler, Antonie W., Ph.D., U. of London (England). Prof., Genetics and Development
Booker, Ronald, Ph.D., Princeton U. Asst. Prof., Neurobiology and Behavior
Bretscher, Anthony P., Ph.D., Leeds U. (England). Assoc. Prof., Biochemistry, Molecular and Cell Biology
Brown, William J., Ph.D., U. of Texas Health Science Center at Dallas. Assoc. Prof., Biochemistry, Molecular and Cell Biology
Capranica, Robert R., Sc.D., Massachusetts Inst. of Technology. Prof. Emeritus, Neurobiology and Behavior
Dawson, Todd E., Ph.D., U. of Washington. Asst. Prof., Ecology and Systematics
Feigenson, Gerald W., Ph.D., California Inst. of Technology. Prof., Biochemistry, Molecular and Cell Biology
Geber, Monica A., Ph.D., U. of Utah. Asst. Prof., Ecology and Systematics
Gibson, Quentin H., Ph.D./D.Sc., Queen's U (Northem Ireland). Greater Philadelphia Professor Emeritus in Biological Sciences, Biochemistry, Molecular and Cell Biology
Gilbert, Perry W., Ph.D., Cornell U. Prof. Emeritus, Neurobiology and Behavior
Hairston, Nelson G., Jr., Ph.D., U. of Washington. Prof., Ecology and Systematics
Halpern, Bruce P., Ph.D., Brown U. Prof., Neurobiology and Behavior/Psychology
Hedin, Lars O., Ph.D., Yale U. Asst. Prof., Ecology and Systematics
Heppel, Leon A., Ph.D., U. of California at Berkeley. Prof. Emeritus, Biochemistry, Molecular and Cell Biology
Hess, George P., Ph.D., U. of California at Berkeley. Prof., Biochemistry, Molecular and Cell Biology
Hinkle, Peter C., Ph.D., New York U. Prof., Biochemistry, Molecular and Cell Biology
Howland, Howard C., Ph D., Comell U. Prof., Neurobiology and Behavior/Physiology
Hoy, Ronald R., Ph.D., Stanford U. Prof., Neurobiology and Behavior $\ddagger$
Huffaker, Tim C., Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Biochemistry, Molecular and Cell Biology
Karplus, P. Andrew, Ph.D., U. of Washington. Assoc. Prof., Biochemistry, Molecular and Cell Biology

Kennedy, Kenneth A. R., Ph.D., U. of California at Berkeley. Prof., Ecology and Systematics
Kondrashov, Alexey S., Ph D., Res. Computer Center and Inst. of Developmental Biology (Russia). Asst. Prof., Ecology and Systematics
Leonard, Samuel L., Ph.D., U. of Wisconsin. Prof. Emeritus, Genetics and Development
MacDonald, June M. Fessenden, Ph.D., Tufts U. Assoc. Prof., Biochemistry, Molecular and Cell Biology/Program on Science, Technology, and Society
Mark, Willie H., Ph.D., U. of Wisconsin at Madison. Asst. Prof., Genetics and Development
McClearn, Deedra K., Ph.D., Harvard U. Asst. Prof., Ecology and Systematics
McFarland, William N., Ph.D., U. of California at Los Angeles. Prof. Emeritus, Ecology and Systematics
Podleski, Thomas R., Ph.D., Columbia U. Prof., Neurohiology and Behavior
Power, Alison G., Ph.D., U. of Washington. Assoc. Prof., Ecology and Systematics/ Science and Technology Studies
Provine, William B., Ph.D., U. of Chicago. Charles A. Alexander Professor of Biological Sciences, Ecology and Systematics/History
Salpeter, Miriam M., Ph.D., Cornell U. Prof, Neurobiology and Behavior/Applied and Engineering Physicss
Schneiderman, Anne M., Ph.D., Harvard U Asst. Prof., Neurobiology and Behavior
Seeley, Thomas D., Ph.D., Harvard U. Prof., Neurobiology and Behavior
Sherman, Paul W., Ph.D., U. of Michigan. Prof., Neurobiology and Behavior
Silver, Robert B., PhD., U. of California at Berkeley. Assoc. Prof., Physiology
Turgeon, Robert, Ph.D., Carleton U. (Canada). Assoc. Prof., Plant Biology
Wilson, David B., Ph.D., Stanford U. Prof. Biochemistry, Molecular and Cell Biology
Wolfner, Mariana F., Ph.D., Stanford U. Assoc Prof., Genetics and Development

## Other Teaching Personnel

Albrecht, Genia S., Ph.D., U. of Washington. Sr. Lecturer, Biochemistry, Molecular and Cell Biology
Calvo, Rita A., Ph.D., Cornell U. Sr. Lecturer, Genetics and Development
Eberhard, Carolyn, Ph.D:, Boston U. Sr. lecturer, Plant Biology

## Joint Appointees

Adkins-Regan, Elizabeth, Prof., Psychology/ Neurobiology and Behavior
Levin, Simon A., Adjunct Prof., Princeton U./ Ecology and Systematics $\ddagger$
Likens, Gene E., Adjunct Prof., Institute of Ecosystem Studies/Ecology and Systematics

## New York State College of Veterinary Medicine

Corradino, Robert A., Ph.D., Cornell U. Prof., Physiology/Veterinary Physiology
Fortune, Joanne E., Ph.D., Cornell U. Prof., Physiology/Veterinary Physiology
Gasteiger, Edgar L., Ph.D., U. of Minnesota. Prof. Emeritus, Physiology
Gilmour, Robert F., Ph.D., SUNY Upstate Medical Center. Assoc. Prof., Physiologyt
Hansel, William, Ph.D., Cornell U. Liberty Hyde Bailey Prof. Emeritus, Physiology
Lengemann, Frederick W., Ph.D., U. of Wisconsin at Madison. Prof. Emeritus, Physiology

Robertshaw, David, Ph.D., Glasgow U. (Scotland). Prof., Physiology/Veterinary Physiology
Sirois, Jean, Ph.D., Comell U. Asst. Prof. Physiology
Tapper, Daniel N., Ph D., Cornell U. Prof., Physiology/Veterinary Physiology
Wasserman, Robert H., Ph.D., Cornell U. Prof., Physiology/Veterinary Physiology/ Nutritional Sciences* $\ddagger$

## Other Teaching Personnal

Concannon, Patrick W., Ph.D., Cornell U. Sr. Lecturer, Physiology

## Joint Appointees

Dobson, Alan, Prof., Veterinary Physiology/ Physiology
Houpt, Katherine A., Prof., Veterinary Physiology/Physiology
Houpt, T. Richard, Prof., Veterinary Physiology/Physiology
Nathanielsz, Peter W., Leading Prof., Clinical Sciences/Veterinary Physiology/Physiology
Sellers, Alvin F., Prof. Emeritus, Veterinary Physiology/Physiology
Wootton, John F., Prof., Veterinary Physiology/Physiology

## College of Engineering

## Joint Appointees

Cisne, John L., Assoc. Prof., Geological Sciences/Biological Sciences
Webb, Watt W., Prof., Applied and Engineering Physics/Biological Sciences

## Division of Biological Sciences

Stinson, Harry T., Jr., Ph.D., Indiana U. Prof., Biological Sciences/Genetics and Development*

## Division of Nutritional Sciences

## Joint Appointees

Arion, William J., Prof., Nutritional Sciences/ Biochemistry, Molecular and Cell Biology
Bensadoun, Andre, Prof., Nutritional Sciences/ Physiology
Kazarinoff, Michael N., Assoc. Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology
Wright, Lemuel D., Ph.D., Oregon State Coll. Prof. Emeritus, Nutritional Sciences/ Biochemistry, Molecular and Cell Biology
*Joint appointment with the College of Arts and Sciences.
Joint appointment with the College of Veterinary Medicine.
$\ddagger$ Joint appointment with the College of Agriculture and Life Sciences.
§oint appointment with the College of Engineering

## ADMINISTRATION

John E. Hopcroft, dean
Michael S. Isaacson, associate dean for research and graduate studies

Gerald Rehkugler, associate dean for undergraduate programs
Mark K. Spiro, associate dean for administration

Murray Death, assistant dean for development and alumni relations
Richard Hale, assistant dean and director of admissions

Claude J. Poux, director of minority programs Richard K. Mosher, registrar

## FACILITIES AND SPECIAL PROGRAMS

Most of the academic units of the College of Engineering are on the Joseph N. Pew, Jr. Engineering Quadrangle. Facilities for applied and engineering physics are located in Clark Hall on the College of Arts and Sciences campus, and facilities for agricultural engineering are centered in Riley-Robb Hall on the campus of the New York State College of Agriculture and Life Sciences.
Special university and college facilities augment the laboratories operated by the various engineering schools and departments, and special centers and programs contribute to opportunities for study and research.

Computing equipment, for example, is available through centers administered by the university and by the College of Engineering, as well as in laboratories run by schools, departments, or programs. The university facilities include personal computers for student use, terminals connected to the mainframe, computer-graphics equipment, and a supercomputer. The College of Engineering operates, in addition to several computing centers for student use, the Computer-Aided Design Instructional Facility, which provides advanced computer-graphics equipment used in course work throughout the college.
Cornell programs and centers of special interest in engineering include the following:
Center for Applied Mathematics. A crossdisciplinary center that administers a graduate program.
Center for the Environment. A sponsor of interdisciplinary programs that are currently in the areas of environmental law and policy, ecosystem research, remote sensing, water resources, the global environment, biological resources, waste management, and solid-waste combustion.

Center for Radiophysics and Space Research. An interdisciplinary unit that facilitates research in astronomy and the space sciences.

Center for Theory and Simulation in Science and Engineering. A national supercomputer facility used for advanced research in engineering and the physical and biological sciences.

Cornell Electronic Packaging Alliance. A cooperative venture involving Cornell and several corporations in the areas of computing and microelectronics, organized to undertake precompetitive, interdisciplinary research in electronic packaging.

Cornell High Energy Syncbrotron Source (CHESS). A high-energy synchrotron radiation laboratory operated in conjunction with the university's high-energy storage ring. Current research programs at CHESS are in areas of structural biology, chemistry, materials science, and physics.
Center for Manufacturing Enterprise. A joint venture of Cornell, industrial organizations, and the federal government to encourage the development and implementation of modern manufacturing systems.

Cornell Program in Power Systems Engineering. A research and instructional program centered in a laboratory that has a complete real-time model of an electric power system

Cornell Waste Management Institute. A research, teaching, and extension program within the Center for Environmental Research that addresses the environmental, technical, and economic issues associated with solid waste; one facility sponsored by the institute is the Combustion Simulation Laboratory in the Sibley School of Mechanical and Aerospace Engineering.
Institute for the Study of the Continents. An interdisciplinary organization that promotes research on the structure, composition, and evolution of the continents.
Laboratory of Plasma Studies. A center for interdisciplinary research in plasma physics and lasers.
Materials Science Center. An interdisciplinary facility with substantial support from the National Science Foundation, providing sophisticated equipment.
Mathematical Sciences Institute. An interdisciplinary program in applications of mathematics funded by the U.S. Army.
National Astronomy and Ionosphere Center. The world's largest radio-radar telescope facility, operated by Comell in Puerto Rico.
National Earthquake Engineering Research Center. A facility recently established by the National Science Foundation at a group of universities in New York State to study response and design of structures in earthquake environments.
National Institutes of Healtb/National Science Foundation Developmental Resource in Biophysical Imaging and Optoelectronics. A resource that develops novel measurement and optical instrumentation for solving biophysical problems.

National Nanofabrication Facility. A center that provides equipment and services for research in the science, engineering, and technology of structures (including electronic components) with dimensions as small as nanometers.
Program of Computer Graphics. An interdisciplinary research center that operates one of the most advanced computer-graphics laboratories in the United States.
Program on Science, Technology, and Society. A cross-disciplinary unit that sponsors courses and promotes research on the interaction of science, technology, and society.
SRC Center for the Program on Microscience and Technology. A center sponsored by the Semiconductor Research Corporation to promote research essential to the development of VLSI devices and circuits.
Statistics Center. Coordinates a universitywide program in statistics and probability.
Ward Laboratory of Nuclear Engineering. Irradiation, isotope production, and activation analysis facilities for interdisciplinary research
Programs sponsored by College of Engineering units include several for industrial affiliates. These are in the areas of injection molding, computer science, materials science, geologic study of the continents, and nanometer scale structures.

## DEGREE PROGRAMS

Cornell programs in engineering and applied science lead to the degrees of Bachelor of Science, Master of Engineering (with field designation), Master of Science, and Doctor of Philosophy.
General academic information concerning the Bachelor of Science degree is given here under the heading "Undergraduate Study." Curricula for major studies are described under the various academic areas.
Programs leading to the Master of Science and Doctor of Philosophy degrees are administered by the Graduate School. They are described in the Announcement of the Graduate School and the special announcement Graduate Study in Engineering and Applied Science. The professional Master of Engineering programs and cooperative programs with the Johnson Graduate School of Management are described below.

## UNDERGRADUATE STUDY

Bachelor of Science (B.S.) degrees are offered in the following areas:
Agricultural and biological engineering $\dagger$
Chemical engineering
Civil engineering
College program

Computer science
Electrical engineering
Engineering physics
Geological sciences
Materials science and engineering

## Mechanical engineering

Operations research and engineering
Students in the College of Engineering begin their undergraduate studies in the Common Curriculum, which is administered by the faculty members of the College Curriculum Governing Board (CCGB) through the associate dean for undergraduate programs and the Engineering Advising office. Subsequently most students enter field programs, which are described separately for each academic area. Alternatively students may enter the College Program (described below), which permits them to pursue a course of study adapted to individual interests.
Students interested in bioengineering may arrange a suitable curriculum with a bioengineering option within one of the field programs or through the College Program. Information about the bioengineering option is available in the Office of Undergraduate Programs, 221 Carpenter Hall. Students interested in environmental engineering may pursue the environmental tract offered by the School of Civil and Environmental Engineering.

- Agricultural and biological engineering, chemical engineering, civil engineering, electrical engineering, engineering physics, materials science and engineering, mechanical engineering, and operations research and engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.
$\dagger$ To major in agricultural and biological engineering students normally enroll in the College of Agriculture and Life Sciences for the first and second years, and jointly in that college and the College of Engineering for the third and fourth years. However, students enrolled in the College of Engineering for the first two years may affiliate with the field of agricultural and biological engineering and become jointly enrolled in the Colleges of Agriculture and Life Sciences and Engineering for the third and fourth years.


## Requirements for Graduation

To receive the Bachelor of Science degree, students must meet the requirements of the Common Curriculum, as set forth by the College of Engineering, including the requirements of the field program, as established by the school or department with which they become affiliated. The Common Curriculum has recently been revised, and currently there are two phases of degree requirements. Phase I pertains to students in the Classes of 1995, 1996, and 1997; Phase II begins with students entering the college in the Class of 1998.* The Common Curriculum is explained below with the differences in Phase I and Phase II indicated. (Further explanation of the revised Common Curriculum and field flow charts are provided in the 1994-95 edition of the Engineering Undergraduate Handbook.)
*Students in the Classes of 1995, 96, or 1997 may elect to pursue the course of study
available in Phase II with the permission of their field or department office.

## Phase I: Applicable through the Class of 1997

Course Category Credits

1) Mathematics 16
2) Physics 12
3) Chemistry 4
4) Freshman writing seminar 6
5) Computer programmingt 4
6) Engineering distribution ( 4 courses) 12
7) Liberal studies distribution ( 6 courses)
8) Electives:

Approved electives
9
Free electives
6
Technical electives
9) Field Program 30-46

## Phase II: Beginning with students in the Class of 1998

Course Category Credits

## 1) Mathematics

16
2) Physics 12
3) Chemistry
4) Freshman writing seminar*
5) Computer programmingt
6) Engineering distribution (3 courses)
a. One Introduction to Engineering
b. Two other distribution courses

6
7) Liberal studies distribution (6 courses) 18
8) Approved electives
9) Field program
a. Field required courses
$30 \mathrm{cr} . \mathrm{min}$.
b. Field approved electives
c. Courses outside the field
*One writing-intensive technical course or a course in technical or scientific writing must also be taken; this course may simultaneously satisfy some other requirement.
†One approved course in computing applications must also be taken; this course may simultaneously satisfy some other requirement, such as an engineering distribution course, an approved elective, or a field program course.
A minimum of 123 credit hours is required for graduation; the specific number of required credit hours will vary depending on which field program is chosen. (See field curricula for specific field requirements.) Two terms of physical education must be taken in the freshman year to satisfy a university requirement.

## Mathematics

The normal program in mathematics includes Mathematics 191,192, 293, and 294. Every student must attain a grade of at least C - in Mathematics 191, 192, 293, and 294, or other courses that may be approved as substitutes for these courses. If this requirement is not met the first time a course is taken, the course must be repeated immediately and a satisfactory grade attained before the next
course in the sequence may be taken. Courses that are taken a second time in order to meet this requirement do not yield additional credit toward a degree.

## Physles

The normal program in physics includes Physics 112, 213, and 214 or the corresponding honors courses (Physics 116, 217, and 218). Engineering students are required to have attained a minimum grade of C - in Mathematics 191 or equivalent hefore taking Physics 112. The same minimum grade is required in each subsequent mathematics course before taking the physics course for which it is a prerequisite ( e g., C - in Mathematics 192 before taking Physics 213, or C-in Mathematics 293 before taking Physics 214).
Students in the field programs of ABEN, CEE (environmental tract), or OR\&IE may substitute Chemistry 208 for Physics 214.

## Chemistry

Chemistry 211 or 207 is required for all students.
Chemistry 211 is a course designed for students who do not intend any further study in chemistry and may be taken either in the fall or spring of the freshman year.
In general, students intending to affiliate with the following departments and schools should take Chemistry 211: electrical engineering, operations research and industrial engineering, computer science, mechanical and aerospace engineering, applied and engineering physics (applied and engineering physics students should discuss this option with the field consultant), and civil engineering (not students in environmental engineering). Students in chemical engineering must take Chemistry 207 in the fall of their freshman year, to be followed by Chemistry 208 in the spring term. All students considering environmental engineering, materials science and engineering, geological sciences, or a health-related career such as medicine should take Chemistry 207.

## Freshman Writing Seminars

Each semester of their freshman year, students choose a freshman writing seminar from among more than seventy courses offered by over twenty different departments in the humanities, social sciences, and expressive arts. These courses offer the student practice in writing English prose. They also assure beginning students the benefits of a small class.

## Technical Writing

In addition to the two Freshman Writing Seminars required, engineering students entering in the fall of 1990 or later, and transfer students matriculating in the fall of 1992 or later, must take a course that includes a significant amount of technical and scientific writing. This course may be used to satisfy another graduation requirement. A student can fulfill the technical writing requirement by enrolling in an engineering course specifically designed to include a writing-intensive component or by taking a course in technical or scientific writing. Courses that currently satisfy this requirement are A\&EP 264, CHEM E 432, COMM $352^{\circ}$, COMM $360^{\circ}$, COMM $363^{\circ}$, COMM $365^{\circ}$, ELE E 315, ENGRC 350, ENGRC 435, M\&AE 427, MS\&E 435, and MS\&E 443444 if both courses are taken. Students
participating in the Engineering Cooperative Program may also arrange for a writingintensive co-op experience to satisfy this requirement. Additional courses are being reviewed. Updated information on these approved courses may be obtained from Engineering Advising, 167 Olin Hall.
"Note that there is limited enrollment in all Communications Department writing courses.

## Computing

In either the first or second term of their freshman year, students normally take COM S 100, Introduction to Computer Programming. Before graduation they must take an additional course with a significant amount of computing applications; this course may also be used to meet another graduation requirement. Courses that satisfy this requirement are ABEN 475, COM S 212, ENGRD 211, ENGRD 222, ENGRD 241, ENGRD 264, ELE E 423, M\&AE 389, M\&AE 489, M\&AE 575, M\&AE 578 , and M\&AE 670. The recommended choice for students intending to enter the Field Program in Engineering Physics is ENGRD 264; in Chemical Engineering, ENGRD 222 or 241; in Computer Science, ENGRD 211 or COM S 212; in Electrical Engineering, ENGRD 211; in Civil Engineering, ENGRD 241; in Mechanical Engineering, M\&AE 389, M\&AE 489, M\&AE 575, or M\&AE 670; and in Operations Research and Engineering, ENGRD 211.

## Engineering Distribution

## Phase I: Applicable through the Class of

 1997Four engineering distribution courses (12 credits) are required. These courses must be selected from four of the eight areas listed below. A student may use only one of the possible substitutions described.

## 1) Introduction to engineering

Several courses are offered to introduce freshmen to the various fields of engineering. Some of these courses, which begin with ENGRI 110, may not be included in this announcement. A full listing will be available in the Course and Room Roster at the time of registration.

## 2) Scientific computing

ENGRD 211, Computers and Programming
ENGRD 222, Introduction to Scientific Computing
ENGRD 241, Engineering Computation
Students in the Field Program in Computer
Science may substitute COM S 212 for ENGRD 211 (also COM S 211).
3) Materials science

ENGRD 261, Introduction to Mechanical Properties of Materials
ENGRD 262, Introduction to Electrical Properties of Materials
4) Mechanics

ENGRD 202, Mechanics of Solids ENGRD 203, Dynamics
Students in the Field Program in Engineering Physics may substitute A\&EP 333 for ENGRD 203.

## 5) Probability and statistics

ENGRD 260, Introduction to Engineering Probability

ENGRD 270, Basic Engineering Probability and Statistics

Students in the Field Program in Electrical Engineering may substitute ELE E 310 for ENGRD 260. Students in the Field Program in Engineering Physics may substitute ELE E 310 or Mathematics 471 for ENGRD 260. Students in the Field Programs in Civil Engineering and Agricultural Engineering may substitute CEE 304 for ENGRD 270.

## 6) Electrical sciences

ENGRD 210, Introduction to Electrical Systems
ENGRD 230, Introduction to Digital Systems
ENGRD 264, Computerized-Instrumentation Design
7) Thermodynamics and energy balances

ENGRD 219, Mass and Energy Balances
ENGRD 221, Thermodynamics
Students in the Field Program in Electrical Engineering may substitute ELE E 480 for ENGRD 221.

## 8) Earth and life sciences

ENGRD 201, Introduction to the Physics and Chemistry of the Earth

## Phase II: Beginning with students in the Class of 1998

Three engineering distribution courses ( 9 credits) are required. One course must be an Introduction to Engineering Course (designated by ENGRI), and the other two should be chosen from two different categories listed below.
The Introduction of Engineering course will introduce students to the engineering process and provide a substantive experience in an open-ended problem solving context. See the Introduction to Engineering Course listing for currently offered courses. (During the 1994-95 academic year, a freshman may petition to have another engineering course satisfy the Introduction to Engineering Course requirement.)

The other two distribution courses must be selected from two different categories listed below. A student may use any one of the possible substitutions described. (See Field Program curricula for recommended courses.)

1) Scientific computing

ENGRD 211, Computers and Programming
ENGRD 212, Modes of Algorithmic Expression
ENGRD 222, Introduction to Scientific Computing
ENGRD 241, Engineering Computation
2) Materials science

ENGRD 261, Introduction to Mechanical Properties of Materials
ENGRD 262, Introduction to Electrical Properties of Materials
3) Mechanics

ENGRD 202, Mechanics of Solids ENGRD 203, Dynamics
Students in the Field Program in Engineering Physics may substitute A\&EP 333 for ENGRD 203.

## 4) Probability and statistics

ENGRD 270, Basic Engineering Probability and Statistics
Students in the Field Program in Electrical Engineering may substitute ELE E 310 for ENGRD 270. Students in the Field Program in Engineering Physics may substitute ELE E 310 or Mathematics 471 for ENGRD 270. Students in the Field Programs in Civil Engineering and Agricultural and Biological Engineering may substitute CEE 304 for ENGRD 270.
5) Electrical sciences

ENGRD 210, Introduction to Electrical Systems
ENGRD 230, Introduction to Digital Systems
ENGRD 264, Computerized-Instrumentation Design
6) Thermodynamics and energy balances

ENGRD 219, Mass and Energy
Balances
ENGRD 221, Thermodynamics
7) Earth and life sciences

ENGRD 201, Introduction to the Physics and Chemistry of the Earth
8) Biology and chemistry

BIO S 101 and 103, Biological Sciences, Lecture and Laboratory
BIO S 105, Introductory Biology
BIO S 107, General Biology (summer only)
CHEM 389, Physical Chemistry I

## Liberal Studies Distribution

The six required liberal studies courses (totaling at least 18 credits) may be chosen from approved courses in four categories: (a) humanities or history, (b) social sciences, (c) foreign languages, and (d) expressive arts.

At least two courses must be chosen from category (a). No more than 3 credits toward this requirement may be taken in category (d) At least two courses in categories (a) or (b) must be from the same field of study. One of these courses must be at or above the 200level or be an explicit prerequisite of the other.
This new liberal studies distribution requirement affects engineering students graduating in 1994 or later. No combination of courses permitted under the previous rules should be excluded by the new rules,

No freshman seminar may be used to meet the liberal studies requirement.
Following each category is a list of approved courses. Every effort has been made to keep the lists up to date, but errors sometimes occur. Students who wish to use a course that seems to fit the category description but is not listed should contact the Engineering Advising Office.

## a) Humanitles or History

Architecture, 181, 182
Art 317, 318
Africana Studies, 202, 204, 205, 211, 219, 280, 285, 344, 350, 360, 361, 370, 381, 405, 422, $425,431,432,455,460,471,475,482,483,490$
Anthropology 290, 355, 356, 420
Archeology (courses in Old World Archeology and 493)

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Asian Studies (courses in Asian art, literature, religion or cultural history)
Classics (all courses except 356, 360, 361 and language courses)
Collective Bargaining, Labor Law and Labor History 100, 101, 303, 304, 305, 381, 384, 385, 386, 406, 482
Comparative Literature (all courses)
Economics 315, 323, 324, 325, 326
Engineering 250, 292
English (all courses except writing courses, whose numbers end in the 80s; e.g., 288, 289, 382, etc.
French Literature (all courses)
German Literature (all courses)
History (all courses)
History of Art (all courses)
International and Comparative Labor Relations 430
Italian Literature (all courses)
Jewish Studies 274, 351, 352
Labor Economics 448
Music (only introductory, music theory, and music history courses)
Natural Resources 407
Near Eastern Studies (courses listed under history, civilization, or literature)
Philosophy (all courses except courses in logic)
Religious Studies 101
Russian Literature (all courses)
Spanish Literature (all courses)
Theater Arts (only courses in Theater Studies, film analysis and history)
Women's Studies 227, 238, 273, 307, 336, 357 , 426

## b) Social Sciences

Africana Studies 171, 172, 190, 191, 231, 280, $290,301,302,344,345,346,352,382,400$, $410,420,451,460,481,484,485,495$
Agricultural Economics 100, 252, 332, 430 , 431, 450, 464, 492
Anthropology (all courses except 101 and courses in Biological and Ecological Anthropology)
Archeology (all courses except those in
Methodology and Technology)
Architecture 342
City and Regional Planning 100, 101, 218, 261, 314, 382, 404
Collective Bargaining, Labor Law and Labor History 384
Communication 116, 120, 314, 416
Consumer Economics and Housing (110, 111, 247 , and any course having one or more of these as a prerequisite)
Design and Environmental Analysis 150, 250
Economics (all courses except 105, 315, 317,
318, 319, 320, 326. Engineering students should generally take Economics 203-204 and not 101-102, unless they have had no calculus.)
Education, 210, 211, 212, 271, 310, 311, 317, 321, 322, 360, 378, 477

Engineering 360
Government (all courses)
Human Development and Family Studies (all courses)
Human Service Studies (all courses)
International and Comparative Labor Relations (all courses)
Labor Economics (all courses)
Linquistics (all courses)
Natural Resources 201
Organizational Behavior (all courses)
Psychology (all courses except 123, 307, 322,
$324,326,332,350,361,396,422,425,426$,
$429,465,470,471,472,473,475,476,478$, $479,492)$
Rural Sociology (all courses)
Sociology (all courses)
Textiles and Apparel 245
Women's Studies 210, 218, 220, 238, 244, 277, $281,297,305,321,353,362,365,366,372$, $406,408,425,428,438,450,454,463,468$, $479,480,493$

## c) Foreign Language

This category includes all foreign language courses; if two or more foreign language courses are used to fulfill part of the liberal studies requirement, then they must be a sequence of courses in the same language. The rules for placement and advanced placement credit in languages are those of the College of Arts and Sciences. Speakers of languages other than English may obtain up to 6 advanced placement credits according to these rules.

## d) Expressive Arts

Africana Studies 303, 425, 430
Art (studio courses)
Biological Sciences 208, 209
Communications (all courses)
Design and Environmental Analysis 101, 102, 114
Engineering (all Engineering Communications courses, which are designated ENGRC)
English (expository and creative writing
courses, whose numbers end in the 80 's, e.g., $288,289,382$, etc.)
Floriculture (courses in Freehand Drawing and Scientific Illustration)
Industrial and Labor Relations 452
Music (courses in musical performance and musical organizations and ensembles)
Theater Arts (all courses except those listed in category (a) above)

## Electives

## Phase I: Applicable through the Class of 1997

There are three kinds of electives: approved, free, and technical. Approved electives must be an appropriate part of an overall educational plan or objective.* This constraint allows flexibility for individual goals while maintaining a coordinated program. A free elective may be any course in the university, $\dagger$ although all course selections must be approved by the student's faculty adviser. Technical electives
are generally taken in the junior and senior years. They are usually upper-level courses in engineering, mathematics, or the physical sciences, but they also may be courses in other areas as designated by the student's field program.
Approved electives can help develop the skills of a broadly educated engineer, so students should give serious thought to their educational objectives and not propose approvedelective courses haphazardly. Advisers generally accept as approved electives: one introduction to engineering course, engineering distribution courses, courses stressing oral or written communication, upper-level engineering courses, advanced courses in mathematics, and rigorous courses in the biological and physical sciences. Courses in business, economics, and language are often approved by advisers when they serve a student's educational and academic objectives. In other cases, the student's interests are better served by approved electives that expand the field program or other parts of the curriculum, including the humanities and social sciences requirement.
-No ROTC courses may be used as approved electives unless they are co-listed by an academic department.
$\dagger$ Except supplementary courses and ROTC courses at the 100 and 200 level not colisted by an academic department. Up to 6 credits of ROTC courses at the 300 level or above may be used as free electives.
Additional ROTC courses not co-listed by an academic department may not be used to meet graduation requirements.
Phase II: Beginning with students in the Class of 1998
Six credits of approved electives are required. Approved electives can help develop the skills of a broadly educated engineer, so students should give serious thought to their educational objectives and not propose approvedelective courses haphazardly. Advisers generally accept as approved electives: one introduction to engineering course, engineering distribution courses, courses stressing oral or written communication, upper-level engineering courses, advanced courses in mathematics, and rigorous courses in the biological and physical sciences. Courses in business, economics, and language are often approved by advisers when they serve a student's educational and academic objectives. In other cases, the student's interests are better served by approved electives that expand the field program or other parts of the curriculum, including the humanities and social sciences requirement.*
In addition, nine credits of electives are determined by field approval. These electives are designated by the field program faculty and the field program faculty advisers. These electives are a part of a coordinated field curriculum, and students should refer to the Field Program curricula for descriptions of the field approved electives.
To ensure breadth of engineering studies, field programs also will include nine hours of courses outside the major.
Students are encouraged to take as many courses offered at the university in addition to the minimum engineering curriculum requirement as they wish.

No ROTC courses may be used as approved electives unless they are co-listed by an academic department

## Social Issues of Technology

It is important for engineers to realize the social and ethical implications of their work Consequently, in selecting their humanities, social sciences, approved electives, and free electives, students are urged to consider courses listed within the "Science, Technology, and Society" undergraduate area of concentration (see Interdisciplinary Centers and Programs section). These courses may provide students with an important perspective on their studies and their future careers.

## Engineering Advising Office

From the time that students enter the college as freshmen until they become affiliated with a major field or the College Program after the fall term of the sophomore year, they are under the administration of the Engineering Advising office, which implements the academic policies of the College Curriculum Governing Board. The office also offers general advising and counseling services, publishes a college newsletter, and serves as the primary resource center for undergraduate students in the college. The Engineering Minority Programs office and the Women's Programs in engineering office provide additional specialized services.

To remain in good standing, students in the College of Engineering must apply to affiliate with a field by the end of the first term of their sophomore year. Transfer students from outside Cornell usually affiliate with a field of study on matriculation

## Freshman Year

At the end of the freshman year, students are expected to have completed or received credit for at least eight courses, including Math 191 Math 192, Chemistry 211 or 207, Physics 112, COM S 100 , two terms of Freshman Writing Seminars, and an Introduction to Engineering course. In addition, students need to complete two terms of physical education during their first year. Many variations in the fresbman scbedule are possible, depending on the individual student's background, advanced placement credit, and career goals. Those receiving advanced placement for first term calculus may take Physics 112 in term one. Students with an interest in bioengineering may take biology in terms one and two as approved electives. Students preparing to study medicine should take one year of biology and Chemistry 207 and 208 in the first year

## Field Program

The specific program for each field is described in the following pages. Students with a grade-point average of at least 2.0 who are making normal progress toward their degree are expected to apply for affiliation with a field program by the end of the first term of their sophomore year. Change of field affiliation is permitted in the following terms. If the change occurs during the fifth term or later, however, completion of the field program may require an additional semester of study.
Some fields require a specific engineering distribution course as a prerequisite for the
upperclass course sequence. These require ments are:
Chemical Engineering: ENGRD 219
Civil Engineering: ENGRD 202, ENGRD 219 (for environmental tract)

Computer Science: ENGRD 211 or ENGRD 212

Electrical Engineering: ENGRI) 230
Materials Science and Engineering: ENGRD 261

Mechanical Engineering: ENGRD 202
Operations Research and Engineering: ENGRD 270

## College Program

Individually arranged courses of study under the College Program are possible for those well-qualified students whose educational objectives cannot be met by one of the regular field programs. Often the desired curriculum is in an interdisciplinary area. Each program is developed by the student in consultation with faculty advisers and must be approved by the College Program Committee, which is responsible for supervising the student's work.

Students apply to enter the College Program by the end of the first term of the sophomore year. A student should seek assistance in developing a coherent program from professors in the proposed major and minor subject areas. If approved, the program is the curricular contract to which the student must adhere. Normally, students applying to the College Program should have a 3.0 cumulative grade point average.
Every curriculum in the College Program, with the exception of certain faculty-sponsored programs, must comprise an engineering major and an educationally related minor The major may be in any subject area offered by schools or departments of the college; the minor may be in a second engineering subject area or in a logically connected nonengineering area. The combinations must clearly form an engineering education in scope and in substance and should include engineering design and synthesis as well as engineering sciences. In addition to 48 credits in the major and minor subjects, including at least 32 credits in engineering courses, each program includes the normally required courses in humanities and social sciences and approved electives.
Further information about the College Program may be obtained from the associate dean for undergraduate programs, 221 Carpenter Hall

## Bioengineering Option

Students who elect this option will graduate with a B.S. degree in one of the traditional fields and with an administrative note on their transcript formally recognizing their efforts in bioengineering.

The requirements for completion of the option are four courses ( 12 credit hours minimum) and one credit hour of Bioengineering Seminar (ENGRG 501). These courses can simultaneously satisfy other degree requirements and are not necessarily four additional courses. These four courses must be selected from two categories: science-based courses and bioengineering courses. At least one course must be from the science-based course list and at least two from the bioengineering
course list. Each student interested in the bioengineering option can request through the Engineering Advising Office a bioengineering adviser who would assist the student in course selection for this option. The bioengineering adviser is in addition to the student's regular academic adviser

A list of approved courses is available in 221 Carpenter Hall.

## International Programs

An international perspective, sensitivity to other cultures, and the ability to speak a second language are increasingly important to roday's engineers. The College of Engineering encourages students to study or work abroad during their undergraduate years to prepare for participation in the global marketplace. A special International Scholars College Program is available for students to minor in international studies and study abroad during their junior year. As with other College Programs (see above), students apply in the first semester of their sophomore year. For further information on the International Scholars College Program and study or work abroad, contact Professor Richard Lance, 322 Thurston Hall; telephone: 255-5064. Information on co-op programs abroad is available from the Engineering Co-op Office in 148 Olin Hall.

## Dual Degree Option

A special academic option, intended for superior students, is the dual degree program, in which both a Bachelor of Science and a Bachelor of Arts degree can be earned in about five years. Students registered in the College of Engineering or the College of Arts and Sciences may apply and, after acceptance of their application, begin the dual program in their second or third year. Those interested should contact the coordinator of dual degree programs, 172 Goldwin Smith Hall; the associate dean for undergraduate programs in 223 Carpenter Hall; or an adviser in Engineering Advising, 167 Olin Hall.

## Double Major in Engineering

The Double Major option, which makes it possible to develop expertise in two allied fields of engineering, generally requires at least one semester beyond the usual four years. Students affiliate with one field in the normal way and then petition to enter a second field before the end of their junior year. All the requirements of both fields must be satisfied. Further information is available from Engineering Advising, 167 Olin Hall, and the individual field consultant offices.

## Engineering Communications Program

The ability to communicate effectively is an essential aspect of successful professional practice. The Engineering Communications Program offers instruction in written, oral, and visual presentation. Engineering Communications (ENGRC 350) and Writing for Engineering Managers (ENGRC 435) are three-credit seminar courses designed for students who desire intensive work in these areas. Examples from real-life engineering contexts are analyzed, and many specific assignments are presented as professional case studies Students learn to address audiences having different levels of technical expertise and to investigate the social and ethical implications of written and oral communication. These courses fulfill the college's technical writing
requirement (see Requirements for Graduation). The program also offers courses on topics of special interest and independent studies or projects in technical/professional communications. In addition to offering freestanding communications courses, the program works with engineering fields to integrate communications into technical courses. The program's faculty also advises student publications, facilitates writing and oral presentation competitions, and arranges discussions of professional communications with students and alumni. For further information, contact the director, 205 Carpenter Hall.

## EngIneering Cooperative Program

A special program for undergraduates in most fields of engineering is the Engineering Cooperative Program, which provides an opportunity for students to gain practical experience in industry and other engineeringrelated enterprises before they graduate. By supplementing course work with carefully monitored, paid jobs, co-op students are able to explore their own interests and acquire a better understanding of engineering as a profession.
Sophomores in the upper half of their class are eligible to apply for the co-op program. (Students in computer science and agricultural and biological engineering are eligible, even though they may not be registered in the College of Engineering.) Applicants are interviewed by representatives of cooperating companies and select their work assignments from any offers they receive. Those students who are offered assignments and elect to join the program usually take their fifth-term courses at Cornell during the summer following their sophomore year and begin their first co-op work assignment that fall. They return to Cornell to complete term six with their classmates and then undertake a second work assignment with the same company the following summer. Co-op students return to campus for their senior year and graduate with their class.
Further information may be obtained from the Engineering Professional Programs office, 148 Olin Hall.

## MASTER OF ENGINEERING DEGREE PROGRAMS

One-year Master of Engineering (M.Eng.) programs are offered in thirteen fields. These programs are discussed in this announcement in connection with the corresponding upperclass engineering field programs because the curricula are integrated. Comell baccalaureate engineering graduates frequently continue their studies in the M.Eng. program, although the program is also open to qualified graduates of other schools. The M.Eng. degrees and the academic fields under which they are described are listed below.
M.Eng.(Aerospace): Mechanical and aerospace engineering

## M.Eng.(Agricultural and Biological): <br> Agricultural and biological engineering

M.Eng.(Chemical): Chemical engineering
M.Eng.(Civil \& Environmental): Civil and environmental engineering
M.Eng.(Computer Science): Computer sciences
M.Eng.(Electrical): Electrical engineering
M.Eng.(Engineering Physics): Applied and engineering physics
M.Eng.(Geology): Geological sciences
M.Eng.(Materials): Materials science and engineering
M.Eng.(Mechanical): Mechanical and aerospace engineering
M.Eng.(Engineering Mechanics): Theoretical and Applied Mechanics
M.Eng.(Nuclear): Nuclear science and engineering
M.Eng.(OR\&IE): Operations research and industrial engineering
Candidates for a professional master's degree who wish to specialize in areas related to manufacturing may avail themselves of two special programs. The manufacturing systems engineering option may be centered in any one of the fields listed above. The microelectronics manufacturing option is offered in the fields of electrical engineering, engineering physics, materials science and engineering, and chemical engineering. Both specializations are attested to by a Dean's Certificate in addition to a diploma at the time of graduation. An industrial internship program provides opportunities to combine on-campus education with off-campus industrial experience.
An M.Eng. option of potential interest to engineers from all fields is the program in engineering management, offered by the School of Civil and Environmental Engineering. This option is described in the section related to the M.Eng.(Civil \& Environmental) degree. A new management option in the M.Eng.(Chemical) degree program is also available.
Cornell engineering graduates in the upper half of their class will generally be admitted to M.Eng. programs; however, requirements for admission vary by field. Superior Cornell applicants who will be, at the time of matriculation, eight or fewer credits short of a baccalaureate degree may petition for early admission. Other applicants must have a baccalaureate degree or its equivalent from a college or university of recognized standing, in an area of engineering or science that is judged appropriate for the proposed field of study. They must also present evidence of undergraduate preparation equivalent to that provided by a Cornell undergraduate engineering education, a transcript, two letters of recommendation, and a statement of academic purpose. A candidate who is admitted with an undergraduate background that is judged inadequate must make up any deficiencies in addition to fulfilling the regular course requirements for the degree. Applicants from foreign universities must submit the results of the Graduate Record Examination aptitude tests and must have an adequate command of the English language. Financial aid providing partial support is available for very highly qualified candidates, primarily those who are residents of the U.S. Industrysponsored internships, which extend the program to two years, are also available to residents of the United States. Application forms and further information are available from the graduate field offices.

## Cooperative Programs with the Johnson Graduate School of Management

Two programs culminate in both Master of Engineering and Master of Business Administration degrees. One, which Comell students enter during their undergraduate career, makes it possible to eam the B.S., M.Eng., and M.B.A. in six years-one year less than such a program would normally require. The second program, which is available to students who already hold baccalaureate degrees from Cornell or other institutions, requires five semesters and leads to both the M.Eng. and M.B.A.

Undergraduate students at Cornell interested in the six-year program should seek advice and information from the department with whose field they intend to affiliate during their upperclass years. Information about admission to either program and about special scholarship aid may be obtained from the Engineering Professional Programs Office, 148 Olin Hall.

## ACADEMIC PROCEDURES AND POLICIES

## Advanced Placement Credit

The College of Engineering awards a significant amount of advanced placement (AP) credit to entering freshmen who demonstrate proficiency in the subject areas of introductory courses. Students may qualify for AP credit in one of two ways:

1) by receiving sufficiently high scores on advanced placement examinations given and scored by the College Entrance Examination Board (CEEB); or
2) by receiving sufficiently high scores on Cornell's departmental placement examinations, which are given during orientation week before fall-term classes begin. Advanced placement is granted only to first-term freshmen, and the placement examinations are scored before the students begin classes.
Advanced placement credit is intended to permit students to develop more challenging and stimulating programs of study. Students who receive AP credit for an introductory course may use it in three different ways.
3) They may enroll in a more advanced course in the same subject right away.
4) They may substitute an elective course from a different area.
5) They may enroll in fewer courses, using the AP credit to fulfill basic requirements.
A detailed description of the college's policies concerning advanced placement credit and its use in developing undergraduate programs may be found in the pamphlet Advanced
Placement and Transfer Credit for First-Year Engineering Students, which may be obtained from Engineering Advising, 167 Olin Hall.

## Transfer Credit

Entering freshmen and entering transfer students who have completed courses at recognized and accredited colleges may. under certain conditions, have credits for such courses transferred to Comell. Such courses
must represent academic work in excess of that required for the secondary school diploma. Courses deemed acceptable for transfer credit must be equivalent in scope and rigor to courses at Cornell.
College courses completed under the auspices of cooperative college and high school programs will be considered for advanced placement credit if students demonstrate academic proficiency by taking the appropriate CEEB or Comell departmental placement examination, as described above.
After matriculation no more than 18 credits of transfer or Cornell extramural credit may be used to satisfy bachelor's degree requirements. Summer session courses at Cornell are the only exception to this rule.
A more detailed description of the college's regulations governing transfer credit may be found in the pamphlet Advanced Placement and Transfer Cnedit for First-Year Engineering Students, available from Engineering Advising, 167 Olin Hall.

## Academic Standing

The requirements for good standing in the college vary slightly among the different divisions. First-term freshmen must have a grade point average of 1.7 or higher with no failing, unsatisfactory, or incomplete grades; must attain a minimum grade of C - in their common curriculum mathematics course; and must be making adequate progress toward the degree. Second-term freshman and sophomore requirements are the same, except that the grade-point average must be at least 2.0 . Upperclass requirements for good standing, graduation, and for satisfactory performance in courses that are prerequisite for field courses vary slightly for different fields of study, as specified in the following sections, the Engineering Undergraduate Handbook, or student handbooks prepared by the individual schools and departments.

## Dean's List

Dean's List citations are presented each semester to engineering students with exemplary academic records. The criteria for this honor, which are determined by the dean of the college, are a term average of 3.25 or higher with no failing, unsatisfactory, or incomplete grades (even in physical education) and 12 credits or more of letter grades. Students may earn Dean's List status retroactively if they meet these criteria after making up incompletes according to college rules.

## S-U Grades

The option of receiving a grade of "satisfactory" or "unsatisfactory" (S-U) in a particular course, rather than a grade on a graduated scale, may be selected only in the following circumstances. Students who want to take a course on an S-U basis must have completed at least one full semester of study at Cornell, and they may take only one course per semester on an S-U basis. Only courses in the liberal studies, approved electives, and free electives categories may be taken as S-U courses. Students may preregister for the S-U option. To change a grading option, a properly completed and approved add/drop form must be filed with the registrar of the College of Engineering by the end of the first three weeks of the semester. After this deadline, the grading option may not be
changed under any circumstances, even by petition, and no courses may be added with the S-U option selected.
The S-U policy does not apply to courses in physical education and other courses that are not taken to fulfill degree requirements.
When a particular course is offered only on an S-U basis, a student may petition to take a second S-U course in the same term.

## Residence Requirements

Candidates for an undergraduate degree in engineering must spend at least four semesters or an equivalent period of instruction as fulltime students at Cornell. They must also spend at least three semesters of this time affiliated with an engineering field program or with the College Program.
Students who are voluntarily not enrolled at Cornell as full-time students may take individual courses extramurally through the School of Continuing Education and Summer Sessions. Students who have been asked to take time off are permitted to register for courses extramurally only with the approval of their field (or the college, for unaffiliated students). No more than 18 credits earned through extramural study or acquired as transfer credit (or a combination thereof) may be used to satisfy the requirements for the bachelor's degree in engineering.
Degree candidates may spend periods of time studying away from the Cornell campus with appropriate authorization. Information on programs sponsored by other universities and on procedures for direct enrollment in foreign universities is available at the Comell Abroad office, 474 Uris Hall. Programs should be planned in consultation with Professor Richard Lance, 322 Thurston Hall, or with the staff of Engineering Advising, who can provide information on credit-evaluation policies and assist in the petitioning process.

## Transferring within Cornell

It is not uncommon for students to change their academic or career goals after matriculation in one college and decide that their needs would be better met in another college at Comell. While transfer between colleges is not guaranteed, efforts are made to assist students in this situation.
Students who wish to transfer into the College of Engineering can make application to the Office of Engineering Admissions-application forms are available in the Carpenter Hall Annex. Students who would enter the college as second-semester sophomores or upperclassmen must be accepted by a field program as part of the admission process. Others may be accepted into the college without the requirement of field affiliation.
Students who hope to transfer into engineering should take courses in mathematics, chemistry, computer science, and physics that conform to the requirements of the Common Curriculum. Interested students should discuss their eligibility with an adviser in Engineering Advising, 167 Olin Hall.

## Leave of Absence and Withdrawal

Students may interrupt their studies for a period of time by taking a leave of absence. A formal petition must be filed and written approval granted. Leaves of absence are granted for a minimum of six months, and
can be granted for a period of up to two years. Credit earned while on leave of absence is subject to the limitation placed on extramural and transfer credit.
Students who voluntarily withdraw from the engineering degree program sever all connection with the college, and if they subsequently want to return, they must make a formal application for readmission. Students who fail to register in the first three weeks of the semester, without having received a leave of absence or permission for study in absentia, may be classified, by action of the faculty, as having withdrawn.

## ENGINEERING CAREER SERVICES

Individual advising and group seminars are available for students who desire assistance in career and job-search matters. Also, interviews are arranged between students and more than 250 national companies that visit the campus to recruit technical graduates. A rêsumé referral service is also available. Both undergraduate and graduate students can use these services to pursue permanent or summer employment opportunities. Further information on all services is available from the Office of Engineering Placement and Career Services, 201 Carpenter Hall (255-5103).

## AGRICULTURAL AND BIOLOGICAL ENGINEERING

R. B. Furry, chair; L. D. Albright,
D. J. Aneshansley, J. A. Bartsch, S. G. Capps, J. R. Cooke, A. K. Datta, R. C. Derksen,
K. G. Gebremedhin, D. A. Haith, J. B. Hunter,
L. H. Irwin, W. J. Jewell, D. C. Ludington,
J.-Y. Parlange, R. E. Pitt, G. E. Rehkugler,
N. R. Scott, T. S. Steenhuis, M. B. Timmons,
L. P. Walker, M. F. Walter

## Bachelor of Science Curriculum

The Field Program in Agricultural and Biological Engineering prepares students for engineering practice in biological and physical systems represented in agriculture and its supporting industries and agencies, environmental or resource protection agencies, the biotechnological industries, the health industries, international enyineering, and the food industries. Engineering is applied to production, handling, storage, processing, distribution, and use of plant and animal products and biomass. Issues of environmental quality and safety and preservation of soil, water, and energy resources are important. Emerging areas of study include engineering aspects of biotechnology and animal and human health. Biological sciences are integrated into the field program along with engineering design and studies in the physical sciences. Areas of concentration include agricultural engineering, biological engineering, and environmental systems engineering.
The program is jointly administered by the College of Engineering and the College of Agriculture and Life Sciences. Students are enrolled only in the College of Agriculture and Life Sciences during their first four semesters and jointly in the College of Engineering in the remaining semesters. Engineering college tuition is required for one year and is typically
paid during the fifth and sixth semesters of study. Additional information about the program may be found in the section on the College of Agriculture and Life Sciences in this publication.
Graduates find employment in agricultural and food-related industries, environmentally related firms and agencies, and the biotechnology and health industries. Many graduates pursue a professional (Master of Engineering) or research (Master of Science or doctoral) degree. Agricultural and biological engineers are employed in private industry, consulting firms, government agencies, utility companies, and educational institutions. The unique blend of engineering and the biological sciences and the breadth of education of the agricultural and biological engineer is often attractive to employers.
For further details see the department's undergraduate programs publication, available at 104 Riley-Robb Hall, or contact the field's Coordinator of Instruction at 255-2499.
The field program requirements are outlined below
Basic Subjects Credits
Math 191, 192, 293, 294, Calculus for Engineers and Engineering Mathematics

Chem 211, General Chemistry, or equivalent
Phys 112, 213, 214, Physics I, II, and III (organic chemistry or biochemistry may be substituted for Physics 214)
Introductory biological sciences
ABEN 151, Introduction to
Computer Programming
ABEN 200, Undergraduate Seminar
Engineering distribution (two courses, including Mechanics of Solids)
Liberal studies (two freshman seminars and at least two courses in humanities or history)
Advanced and Applied Subjects
Engineering sciences in any field
(must include fluid mechanics and thermodynamics), plus ABEN 250 , 350 , and 496 (Engineering Applications in Biological Systems, Transport Principles, and Senior Design in Agricultural and Biological Engineering, respectively) and a minimum of three agricultural and biological engineering courses (at least 9 credits) chosen from courses numbered 450 to 495
Biological or agricultural sciences (at least 3 credits of biological sciences beyond the introductory level)
Approved electives (at least 3 credits in the College of Agriculture and Life Sciences)
Total (minimum)

## Master of Engineering (Agricultural and Biological) Degree Program

The program for the M.Eng. (Agricultural and Biological) degree is intended primarily for those students who plan to enter engineering practice. The curriculum is planned as an
extension of an undergraduate program in agricultural and biological engineering but can accommodate graduates of other engineering disciplines. The curriculum consists of 30 credits of courses intended to strengthen the students' fundamental knowledge of engineering and develop their design skills. At least three of the required 30 credits are earned for an engineering design project that culminates in a written and oral report.
A candidate for the M.Eng. (Agricultural and Biological) degree may choose to concentrate in one of the subareas of agricultural and biological engineering or take a broad program without specialization. The subareas include aquaculture, agricultural engineering, biological engineering, energy, environmental resource engineering, food engineering, structures and their environments, and highway engineering. Engineering electives are chosen from among subject areas relevant to agricultural and biological engineering, such as thermodynamics, heat transfer and fluid mechanics, process engineering, mechanical design and analysis, theoretical and applied mechanics, structural engineering, hydraulics, environmental engineering, soil engineering, waste management and treatment, machine vision, and sensor technology.

## APPLIED AND ENGINEERING PHYSICS

R. A. Buhrman, director; M. S. Isaacson, associate director; B. W. Batterman, J. D. Brock, T. A. Cool, H. G. Craighead, H. H. Fleischmann, A. L. Gaeta, B. R. Kusse, R. V. E. Lovelace, T. N. Rhodin (emeritus), J. Silcox, W. W. Webb, F. W. Wise; dual appointments: K. B. Cady, D. D. Clark, V. O. Kostroun, R. L. Liboff, R. N. Sudan, G. J. Wolga; adjunct faculty: D. H. Bilderback; senior research associate: E. J. Kirkland

## Bachelor of Science Curriculum

The undergraduate engineering physics curriculum is designed for students who want to pursue careers of research or development in applied science or advanced technology and engineering. Its distinguishing feature is a focus on the physics and mathematics fundamentals, both experimental and theoretical, that are at the base of modern engineering and research and have a broad applicability in these areas. By choosing areas of concentration, the students may combine this physics base with a good background in a conventional area of engineering or applied science.
The industrial demand for graduates with baccalaureates is high, and many students go directly to industrial positions where they work in a variety of areas that either combine, or are in the realm of, various more conventional areas of engineering. Recent examples include bioengineering, computer technology, electronic-circuit and instrumentation design, energy conversion, environmental engineering, geological analysis, laser and optical technology, microwave technology, nuclear technology, software engineering, solid-statedevice development, technical management, and financial consulting. A number of our graduates go on for advanced study in all areas of basic and applied physics, as well as in a diverse range of areas in advanced
science and engineering. Examples include applied physics, astrophysics, atmospheric sciences, biophysics, cell biology, computer science and engineering, electrical engineering, environmental science, fluid mechanics, geotechnology, laser optics, materials science and engineering, mechanical engineering, medical physics, mathematics, medicine, nuclear engineering, oceanography, and physics. The undergraduate program can also serve as an excellent preparation for medical school, business school, or specialization in patent law.
The engineering physics program fosters this breadth of opportunity because it both stresses the fundamentals of science and engineering and gives the student direct exposure to the application of these fundamentals. Laboratory experimentation is emphasized, and ample opportunity for innovative design is provided. Examples are A\&EP 110, The Laser and Its Applications in Science, Technology, and Medicine (a freshman Introduction to Engineering course); A\&EP 264, Computer-Instrumentation Design (a recommended sophomore engineering distribution course); A\&EP 363, Electronic Circuits (a sophomore/junior course); Physics 410, Advanced Experimental Physics; A\&EP 436, Physical and Integrated Optics (senior courses); and A\&EP 438, Computational Engineering Physics (a senior computer laboratory).
Undergraduates who plan to enter the Field Program in Engineering Physics are advised to arrange their Common Curriculum with their developing career goals in mind. Students are also encouraged to take Physics 112 or Physics 116 during their first semester (if their advanced placement credits permit) and are recommended to satisfy the computing applications or technical writing requirement with the engineering distribution course A\&EP 264. Engineering physics students need to take only two engineering distribution courses, since A\&EP 333, which they take in their junior year, counts as a third member of this category. Engineering Physics students are advised to take A\&EP 363 in the spring semester of the sophomore year. Students with a year of advanced placement in math may wish to enroll in A\&EP 321 and 322 in their sophomore year.
In addition to the requirements of the Engineering Common Curriculum,* the upperclass course requirements of the field program are as follows:
Course
Credits
A\&EP 333, Mechanics of Particles and Solid Bodies
A\&EP 355, Intermediate Electromagnetism
A\&EP 356, Intermediate Electrodynamics
A\&EP 361, Introductory Quantum Mechanics
A\&EP 363, Electronic Circuits 4
A\&EP 423, Statistical Thermodynamics 4
A\&EP 434, Continuum Physics
Physics 410, Advanced Experimental Physics
A\&EP 321, Mathematical Physics I;
Mathematics 421; or T\&AM 610
(applied mathematics)

A\&EP 322, Mathematical Physics II; Mathematics 422; or T\&AM 611 (applied mathematics)
Applications of quantum mechanics $\dagger$
3 or 4

## Four technical electives $\ddagger$

12-16
A third approved elective (in addition to the two required by the Common Curriculum)
Total field credits $=58$ credit hours minimum.
-The Engineering Common Curriculum allows students to take only 4 courses each semester of their freshman year if they so desire. This course load is fully consistent with the requirements of the EP major, but entering students with strong preparation are encouraged to consider taking an additional course during one or both semesters of the freshman year so that they may have additional flexibility in developing a strong, inctividualized educational program in their latter years, and for best maintaining such options as a semester or year abroad, or early graduation.
†Some courses (though the list is not allinclusive) that will satisfy this requirement are Physics 444, Nuclear and High-Energy Particle Physics; Physics 454, Introductory Solid-State Physics; A\&EP 436, Physical and Integrated Optics; A\&EP 438, Computational Engineering Physics; A\&EP 440, Quantum and Nonlinear Optics; A\&EP 609, Low-Energy Nuclear Physics; ELE E 430, Lasers and Optical Electronics; and ELE E 531, Quantum Electronics I.
$\ddagger$ If a scientific computing course was not selected as an engineering distribution course, one of these technical electives may be needed to satisfy the computing applications requirement. For students going on to graduate school a third course in mathematics is recommended.
Areas of concentration. A distinctive aspect of the Engineering Physics curriculum is the strong opportunity it provides students to develop individualized programs of study to meet their particular educational and career goals. These can include the pursuit of dual majors or the development of a broad expertise in one or more of a number of advanced technical and scientific areas. With at least seven technical and approved electives in the sophomore, junior, and senior years, Engineering Physics majors are encouraged to work closely with their adviser to develop a coherent academic program that is in accordance with those goals. For those students who look toward an industrial position after graduation, these electives should be chosen to widen their background in a specific area of practical engineering. A different set of electives can be selected as preparation for medical, law, or business school. For students who plan on graduate studies, the electives provide an excellent opportunity to explore upper-level and graduate courses, and to prepare themselves particularly well for graduate study in any one of a number of fields. Various programs are described in a special brochure available from the School of Applied and Engineering Physics, Clark Hall. Students interested in these options are advised to consult with their EP adviser, a professor active in their area of interest, or with the associate director of the school, Professor Michael S. Isaacson.
Electives need not be all formal course work: Qualified students are encouraged to
undertake informal study under the direction of a member of the faculty (A\&EP 490). This may include research or design projects in areas in which faculty members are active.
The variety of course offerings and many electives provide a sizable flexibility in scheduling. If scheduling conflicts arise, the school may allow substitution of courses nearly equivalent to the listed required courses.
The Engineering Physics program requires a minimum GPA of 2.7 in all physics and mathematics courses before entering the Engineering Physics field. Once in the field, the engineering physics student is expected to pass every course for which he or she is registered, to earn a grade of C - or better in specifically required courses, and to attain each term an overall grade point average of at least 2.3. In addition, students with a cumulative GPA of 3.5 or greater who elect to do an independent study project (A\&EP 490) are eligible for a degree "with honors."

## Master of Engineering (Engineering Physics) Degree Program

The M.Eng.(Engineering Physics) degree may lead directly to employment in engineering design and development or may be a basis for further graduate work. Students have the opportunity to broaden and deepen their preparation in the general field of applied physics, or they may choose the more specific option of preparing for professional engineering work in a particular area such as laser and optical technology, microstructure science and technology, device physics, materials characterization, or software engineering. A wide latitude is allowed in the choice of the required design project.
One example of a specific area of study is solid-state physics and chemistry as applied to microstructure science and technology. Core courses in this specialty include the microcharacterization of materials (A\&EP 661) and the microprocessing and microfabrication of materials (A\&EP 662). The design project may focus on such areas as semiconductor materials, device physics, microstructure technology, or optoelectronics. Another area of study may be applied optics where core courses can be chosen from applied physics, electrical engineering, and physics.
Each individual program is planned by the student in consultation with the program chair. The objective is to provide a combination of a good general background in physics and introductory study in a specific field of applied physics. Candidates may enter with an undergraduate preparation in physics, engineering physics, or engineering. Those who have majored in physics usually seek advanced work with an emphasis on engineering; those who have majored in an engineering discipline generally seek to strengthen their physics base. Candidates coming from industry usually want instruction in both areas. All students granted the degree will have demonstrated competence in an appropriate core of basic physics; if this has not been accomplished at the undergraduate level, subjects such as electricity and magnetism, or classical, quantum, and statistical mechanics should be included in the program.

The general requirement for the degree is a total of 30 credits for graduate-level courses or their equivalent, earned with a grade of C or better and distributed as follows:

1) a design project in applied science or engineering (not less than 6 nor more than 12 credits)
2) an integrated program of graduate-level courses, as discussed below ( 14 to 20 credits)
3) a required special-topics seminar course ( 4 credits)
The design project, which is proposed by the student and approved by the program chair, is carried out on an individual basis under the guidance of a member of the university faculty. It may be experimental or theoretical in nature; if it is not experimental, a laboratory physics course is required.
The individual program of study consists of a compatible sequence of courses focused on a specific area of applied physics or engineering. It is planned to provide an appropriate combination of physics and physics-related courses (applied mathematics, statistical mechanics, applied quantum mechanics) and engineering electives (such as courses in biophysics, chemical engineering, electrical engineering, materials science, computer science, mechanical engineering, or nuclear engineering). Additional science and engineering electives may be included. Some courses at the senior level are acceptable for credit toward the degree; other undergraduate courses may be required as prerequisites but are not credited toward the degree.
Students interested in the M.Eng.(Engineering Physics) degree program should contact Professor R. V. E. Lovelace.

## APPLIED MATHEMATICS

The Center for Applied Mathematics administers a broadly based interdepartmental graduate program that provides opportunities for study and research in a wide range of the mathematical sciences. For detailed information on opportunities for graduate study in applied mathematics, contact the director of the Center for Applied Mathematics, Engineering and Theory Center Building.
There is no special undergraduate degree program in applied mathematics. Undergraduate students interested in applicationoriented mathematics may select an appropriate program in the Department of Mathematics or one of the departments in the College of Engineering.
A list of selected graduate courses in applied mathematics may be found in the description of the Center for Applied Mathematics, in the section "Interdisciplinary Centers and
Programs."

## CHEMICAL ENGINEERING

W. L. Olbricht, director; A. B. Anton, P. Clancy, C. Cohen, T. M. Duncan, J. R. Engstrom, K. E. Gubbins, D. A. Hammer,
P. Harriott, D. L. Koch, R. P. Merrill,
A. Panagiotopoulos, F. Rodriguez,
M. L. Shuler, P. H. Steen, W. B. Streett

## Bachelor of Science Curriculum

The undergraduate Field Program in Chemical Engineering comprises a coordinated sequence of courses beginning in the sophomore year and extending through the fourth year. Special programs in biochemical engineering and polymeric materials are available. Students who plan to enter the field program take Chemistry 208 as an approved elective during the freshman year. The program for the last three years, for students who have taken two engineering distribution courses during the first year and entered Cornell before Fall 1994 is as follows:

## Term 3

Credits
Math 293, Engineering Mathematics 4
Phys 213, Electricity and Magnetism
Chem 389, Physical Chemistry
(approved elective)
CHEME 219 (engineering
distribution course)
Humanities or social sciences course 3
Term 4
Math 294, Engineering Mathematics
Phys 214, Optics, Waves, and Particles 4
Chem 290-390, Physical Chemistry
Engineering distribution course
Humanities or social sciences course

## Term 5

Chem 253, Organic Chemistry** 4
Chem 251, Organic Chemistry Laboratory 2
CHEMF. 313, Chernical Engineering Thermodynamics
CHEME 323, Fluid Mechanics
Humanities or social sciences course

## Term 6

Applied Science elective $\dagger$
CHEME 101, Nonresident Lectures
CHEME 324, Heat and Mass Transfer
CHEME 332, Analysis of Separation

## Processes

CHEME 390, Reaction Kinetics and Reactor Design
Humanities or social sciences course
Term 7
CHFME 432, Chemical Engineering
Laboratory

Electives*

Humanities or social sciences course 3
Term 8
CHEME 462, Chemical Process Design4
CHEME 472, Process Control ..... 3
Electives* ..... 3
Humanities or social sciences course ..... 3
*The electives in terms seven and eight comprise 6 credits of technical electives, and 3 credits of CHEME process or systems elective. CHEME process or systems electives include CHEME 564, Design of Chemical Reactors; CHEME 566, Systematic Methods for Process Design; CHEME 640, Polymeric Materials; CHEME 643, Introduction to Bioprocess Engineering; CHEME 656, Separations Using Membranes or Porous Solids; CHEME 661, Air Pollution Control.
${ }^{* *}$ Chemistry 357 may be substituted for CHEM 253. The applied science elective must then be CHEM 358.
$\dagger$ Applied science electives include Biological Sciences 290, General Microbiology Lectures; Biological Sciences 330 and 331, Principles of Biochemistry; CEE 654, Aquatic Chemistry; CHEME 640, Polymeric Materials; CHEME 673, Adsorption and Reactions on Chemically Reactive Solids; Food Science 409, Food Chemistry; MS\&E 331, Structure of Materials; MS\&E 332, Electrical and Magnetic Properties of Materials; MS\&E 441, Microprocessing of Materials; MS\&E 449, Introduction to Ceramics; MS\&E 452, Properties of Solid Polymers; any A\&EP course numbered 333 or above; any Chemistry course numbered 301 or above; any Physics course numbered 300 or above.
Students entering in Fall 1994 or later should contact the field office for a copy of the curriculum.

## Master of Engineering (Chemical) Degree Program

The professional master's degree,
M.Eng.(Chemical), is awarded at the end of one year of graduate study with successful completion of 30 credits of required and elective courses in technical fields including engineering, mathematics, chemistry, physics, and business administration. Courses emphasize design and optimization based on the economic factors that affect design alternatives for processes, equipment, and plants. General admission and degree requirements are described in the college's introductory section.
Specific requirements include

1) two courses in advanced chemical engineering fundamentals chosen from CHEME 711, 713, 731, 732, and 751
2) two courses in applied chemical engineering science chosen from CHEME $564,566,640,643,656$, and 661
3) a minimum of 3 credits of a design project, CHEME 565
Dean's certificate programs in Bioengineering, Engineering Management, Energy Engineering, and Manufacturing are available. A program offered jointly with the Food Science Department is also available, leading to both the Master of Engineering and the Master of Professional Studies degrees.

## CIVIL AND ENVIRONMENTAL ENGINEERING

A. H. Meyburg, director; M. J. Sansalone, associate director; J. F. Abel, J. J. Bisogni, Jr., W. H. Brutsaert, G. G. Deierlein, R. I. Dick, P. Gergely, J. M. Gossett, M. D. Grigoriu, D. A. Haith, K. C. Hover, A. R. Ingraffea, G. H. Jirka, F. H. Kulhawy, J. A. Liggett, L. W. Lion, P. L-F. Liu, D. P. Loucks, W. R. Lynn, L. K. Nozick, T. D. O'Rourke, T. Peköz, W. D. Philpot, R. E. Schuler, C. A. Shoemaker, J. R. Stedinger,
H. E. Stewart, M. A. Turnquist, R. N. White

## Bachelor of Science Curriculum

The School of Civil and Environmental Engineering offers an accredited undergraduate program in civil engineering and permits students to pursue one of two options leading to the degree of civil engineer: civil engineering or environmental engineering. Within civil engineering, students may emphasize structural engineering, technical engineering, hydraulics and hydrology, and transportation. The environmental engineering curriculum emphasizes study of environmental engineering, environmental and water resource systems, and hydraulics and hydrology. Sample curricula are available in the school office, 220 Hollister Hall.
Students planning to enter the Field Program in Civil and Environmental Engineering are required to take ENGRD 202, Mechanics of Solids, either before or during the sophomore year.
Required and Recommended Engineering Distribution Courses:

The recommended engineering distribution course for students planning to enter the environmental engineering curriculum is ENGRD 219, Mass and Energy Balances. Students entering the environmental curriculum who have not taken ENGRD 219 will be required to do so as part of the Field Program.
Recommended engineering distribution courses for students planning to enter the civil engineering curriculum are:
ENGRD 261, Introduction to Mechanical Properties of Materials, for students interested in structural engineering or hydraulics/ hydrology;
ENGRD 201, Introduction to the Physics and Chemistry of the Earth, for students interested in geotechnical engineering; or
ENGRD 211, Computers and Programming, for students interested in transportation.

## Field Program:

## Environmental Engineering

For the Field Program in Environmental
Engineering, students must take CHEM 208 in place of PHYS 214. The following courses are required in addition to those required for the Common Curriculum:
Courses Credits
ENGRD 241, Engineering Computation*
3
CEE 351, Environmental Quality
Engineering
CEE 331, Fluid Mechanics 4
CHEM 253, Elementary Organic Chemistry
BIO S 290, General Microbiology, Lectures

CEE 304, Uncertainty Analysis
in Engineering

## CEE 323, Engineering Economics

CEE 341, Introduction to Geotechnical Engineering
ABEN 475, Environmental System Analysis
Additional requirements include a set of three field approved electives and two design electives from an approved list of courses which is available in the school office. In addition, students must complete one technical communications course from among the courses designated ENGRC or approved Communications courses. If the technical communications course is taken as an expressive art, then students must take an additional approved elective.

## Civil Engineering

As of the priting of this Courses of Study, final details are unavailable on the Civil Engineering curriculum. The following is tentative, and final details may be obtained beginning in Fall 94 from the school office.
For the Field Program in Civil Engineering, students may elect to substitute CHEM 208 for PHYS 214. A set of courses from the following list of courses will be required in addition to those required for the Common Curriculum.

## Courses

Credits
ENGRD 241, Engineering Computation*
ENGRD 203, Dynamics
CEE 304, Uncertainty Analysis in Engineering $\dagger$

CEE 323, Engineering Economics

## CEE 331, Fluid Mechanics

CEE 341, Introduction to Geotechnical Engineering
CEE 351, Environmental Quality Engineering

CEE 361, Transportation Engineering

## CEE 371, Structural Behavior

Additional requirements include a set of three field approved electives and two design electives from an approved list of courses which is available in the school office. In addition, students must complete one technical communications course from among the courses designated ENGRC or approved Communications courses. If the technical communications course is taken as an expressive art, then students must take an additional approved elective from a department or school other than Civil and Environmental Engineering.
"ENGRD 241 can be used to satisfy both the computer application requirement and a field program requirement.
$\dagger$ ENGRD 270 may be accepted (on petition) as a substitute for CEE 304 in the field program, but only if ENGRD 270 is taken before entry into the field, or in some special cases where co-op or study abroad programs necessitate such a substitution.
These field program requirements will apply to all students in the Class of 1998, and students in the Class of 1997 are strongly encouraged to follow these new curriculum options as well.

## Master of Engineering (Civil) Degree Program

The M.Eng. (Civil) degree program is a $30-$ credit (usually ten-course) curriculum designed to prepare students for professional practice. There are two options in this program: one in civil and environmental engineering design and one in engineering management. Both options require a broadbased background in an engineering field. Applicants holding an ABET-accredited (or equivalent) undergraduate degree in engineering automatically satisfy this requirement. Those without such preparation will require course work beyond the graduate program's 30 -credit minimum to fulfill the engineering preparation requirement. Both options also require one course in professional practice and a two-course project sequence. The project entails synthesis, analysis, decision making, and application of engineering judgment. Normally it is undertaken in cooperation with an outside practitioner, and it includes an intensive, fulltime, three-week session between semesters. The general degree requirements and admissions information are described above in the section entitled "Master of Engineering Degree Programs." Each student's program of study is designed individually in consultation with an academic adviser and then submitted to the school's Professional Degree Committee for approval.

For the M.Eng. (Civil) program in civil and environmental engineering design options, the requirements are:

1) Three courses, one in professional engineering practice (CEE 503) and a twocourse design project (CEE 501 and 502)
2) Specialization in a major-three to five courses in either environmental engineering, environmental and public systems engineering, geotechnical engineering, hydraulic engineering, remote sensing, structural engineering, or transportation engineering
3) Two courses in a single related or minor area
4) Technical electives (up to two courses) Courses in the minor and electives may consist of graduate or advanced courses in fields related to the major, either inside or outside of the school.

For the M.Eng. (Civil) program in the engineering management option, the requirements are:

1) Five courses: Management Practice (CEE 590), Engineering Management Methods (CEE 593 and 594), and the Management Project (CEE 591 and 592).
2) One course in finance, accounting, or engineering economics, as appropriate given a student's background.
3) One course in individual and/or organizational behavior from a recommended list.
4) Three courses from a disciplinary or functional specialization, subject to adviser's approval
The School of Civil and Environmental Engineering cooperates with the the Johnson Graduate School of Management in two joint programs leading to both Master of Engineering and Master of Business Administration
degrees. See the introductory section under College of Engineering

Applications for the six-year B.S./M.Eng. M.B.A. program must be submitted at the beginning of the sixth term of study.

## COMPUTER SCIENCE

R. L. Constable, chair; K. Birman, B. Bloom, C. Cardie, T. Coleman, B. Donald, D. Gries, J. Hartmanis, T. Henzinger, J. E. Hopcroft,
D. Huttenlocher, D. Kozen, P. Pedersen,
K. Pingali, M. Rauch, R. A. Rubinfeld,
G. Salton, F. B. Schneider, B. Smith,
D. Subramanian, R. Teitelbaum, S. Toueg, N. Trefethen, C. Van Loan, S. Vavasis, T. vonEicken, R. Zabih

## Bachelor of Science Curriculum

The Field Program in Computer Science is intended for students who are interested in the computing process and in the fundamental structure of algorithms, data, and languages that underlie that process.
A student entering the Field Program in Computer Science must take COM S 211 or 212 and COM S 280 before beginning the upperclass sequence. Students who do not earn a grade of B - or better in both COM S 211 or 212 and COM S 280 are strongly advised against attempting the computer science field program. Students who have not maintained an average of at least 3.0 in the mathematics courses required by the Common Curriculum are also discouraged from entering the program. Apart from these requisites and those of the college, the courses required for the Field Program in Computer Science are:

## Course Work

Credits
Systems sequence
COM S 314, Systems and Organization
COM S 410, Data Structures
COM S 414, Systems Programming and Operating Systems

Theory sequence
8
COM S 381 or 481 , Theory of Computing
COM S 482, Analysis of Algorithms
Numerical Analysis
COM S 222, Scientific Computation, or
COM S 421, Numerical Solutions of Algebraic Equations

## Computer science electives

Two nonrequired computer science courses numbered 400 or above,* plus a laboratory project course (for example, COM S 413, 415, $418,433,463$, or 473).
Related electives 14-16
One mathematically oriented course plus three courses forming an upper-level concentration in mathematics, operations research, electrical engineering, or another technical area.
*Must be three or more credits.
For more information, refer to the Computer Science Undergraduate Handbook, available from 303 Upson Hall
The performance of students in the Field of Computer Science is reviewed each term. To remain in good standing with the department, they must have an overall term average of at least 2.3 with no courses failed and a term average for field program courses of at least 2.7 with no course grade less than $C$-, and
they must be making satisfactory progress in the field.

Note: Computer Science majors are expected to take COM S 280 and COM S 314. ELE E 230 will only be counted toward the course requirements of Computer Science majors who are double majoring with Electrical Engineering.

## Cooperative Program with the Johnson Graduate School of Management

Undergraduates majoring in computer science may be interested in a program that can lead, in the course of six years, to B.S.
M.Eng.(Computer Science), and M.B.A. degrees. This program, which is sponsored jointly by the College of Engineering and the Johnson Graduate School of Management, enables students to study several subjects required for the M.B.A. degree as part of their undergraduate curriculum. Planning must begin early, however, if all requirements are to be completed on schedule.

For further details and assistance in planning a curriculum, students should contact the assistant director of undergraduate programs in Upson Hall

## Master of Engineering (Computer Science) Degree Program

The one-year program leading to the degree of M.Eng. (Computer Science) admits forty to seventy students a year. A strong undergraduate background in computer science or a related field is required. Early admission is available for Comell seniors who apply in the fall semester

The emphasis of the curriculum can be on programming languages and systems or theory of algorithms and theory of computation or numerical analysis, artificial intelligence, or information processing, which includes databases and information organization and retrieval. The required design project could be, for example, the design of a compiler for a large subset of a general-purpose programming language, or the solution of a significant engineering problem using computer science techniques.

## ELECTRICAL ENGINEERING

J. S. Thorp, director; J. M. Ballantyne, T. Berger, A. W. Bojanczyk, G. M. Brown H.-D. Chiang, R. C. Compton,
H. G. Craighead, D. F. Delchamps,
L. F. Eastman, D. T. Farley, T. L. Fine, C. Heegard, C. R. Johnson, Jr., M. C. Kelley,
P. M. Kintner, R. Kline, J. P. Krusius,
M. E. Leeser, R. L. Liboff, Y.-H. Lo,
N. C. MacDonald, P. R. McIsaac, J. A. Nation,
N. F. Otani, T. W. Parks, A. Phillips Jr.,
C. R. Pollock, C. Pottle, A. P. Reeves,
C. E. Seyler, Jr., J. R. Shealy, R. N. Sudan,
C. L. Tang, R. J. Thomas, H. C. Torng,
C. B. Wharton, G. J. Wolga

## Bachelor of Science Curriculum

The undergraduate Field Program in Electrical Engineering provides a foundation that reflects the broad scope of this engineering discipline.
Concentrations include computer engineering; control systems; electronic circuit design; information, communication, and decision theory; microwave electronics; plasma
physics; power and energy systems; quantum and optical electronics; radio and atmospheric physics; and semiconductor devices and applications.

## New Curriculum (starting with Class of 1998)

Students planning to enter the Field Program in Electrical Engineering must take ELE E 230, Introduction to Digital Systems, as an engineering distribution course. The fall of the sophomore year is the preferred term for students without advanced standing in mathematics. Electrical engineering students with an interest in computer engineering are encouraged to take COM S 211 as an
engineering distribution course prior to entry into the field program. In addition, the field program begins normally in the spring of the sophomore year, as shown below. Many of these courses are taught only once a year, either spring or fall, as indicated in the course descriptions.

## Course

Credits

## Field Requined Courses

ELE E 210, Introduction to
Electrical Systems
ELE E 215, Electrical Systems Laboratory

## ELE E 301, Electrical Signals and

 Systems IELE E 303, Electromagnetic Waves and Fields I
ELE E 315, Electrical Laboratory 4
A choice of three courses from among: 12
ELE E 302, Electrical Signals and Systems II
ELE E 304 Electromagnetic Waves and Fields II
ELE E 306, Fundamentals of Quantum and Solid State Electronics

ELE E 308, Fundamentals of Computer Engineering
ELE E 310, Probability and Random Signals*

## Field Elective Courses

Electrical Engineering Approved Electivest
Electives Outside Field $\ddagger$ (3 courses)

## Total minimum field credits

*ELE E 310 can be taken in place of ENGRD 260 or 270 or TAM 310 to satisfy the college application of probability and statistics requirement.
$\dagger$ Must include two electrical engineering laboratory courses.
$\ddagger$ See Electrical Engineering Handbook for detailed definitions.

All students graduating with a B.S. degree must fulfill the engineering design require ment. To meet this requirement, students must demonstrate that they have completed courses that contain at least 16 credits of engineering design. A table listing the engineering design content of all relevant electrical engineering and computer science courses is available in the electrical engineering undergraduate program office.
At least one of the required electrical engineering laboratory courses must be selected from a list including ELE E 320, 425, $430,453,457,475$ and 530 . The other may be selected from the above list or from among

ELE E 423, 426, 433, 451, 452, 471, 472, 481, $526,536,539,554$, and 558 . Note, however, that ELE E 539 counts as one electrical engineering laboratory course.
Undergraduate specialization is achieved through the various electrical engineering elective courses, as well as other courses in related technical fields within engineering, mathematics, the physical sciences, and the analytical biological sciences. The School of Electrical Engineering offers more than thirty courses that are commonly taken as electives by undergraduates.

Maximum technical course scheduling flexibility in the field program is preserved only for those students who do not complete their 6 credits of college approved electives prior to entry into the field program. Accordingly, intended electrical engineering students are advised to consider course selection carefully during their first three terms in engineering.
An electrical engineering honors program also exists for those students who so desire and meet the program entrance requirements. The honors program requires additional courses, a required undergraduate research or design project, and an honors thesis. Details are available in the 1994-95 Electrical Engineering Handbook.

Students with advanced standing frequently take one or more graduate-level courses prior to graduation and may actually begin the Master of Electrical Engineering program in their last semester of undergraduate course work so long as 8 or fewer credits remain toward B.S. degree requirements and a 3.0 GPA has been maintained
All students majoring in electrical engineering are expected to meet the following academic standards:

1. Students must achieve a grade-point average of at least 2.3 every semester.
2. No course with a grade of less than Cmay be used to satisfy degree requirements in the field program or serve as a prerequisite for a subsequent electrical engineering course.
3. Students must complete satisfactorily ELE E 210, ELE E 215, MATH 294, and PHYS 214 by the end of the first semester in the Field Program of Electrical Engineering, and make adequate progress toward the degree in subsequent semesters.
4. Honors program students must meet the GPA and progress requirements specified in the Electrical Engineering Handbook to remain active participants.

## Former Curriculum (applicable through

 Class of 1997)Students planning to enter the Field Program in Electrical Engineering must take ELE E 210, Introduction to Electrical Systems, as an engineering distribution course. In addition, the field program requires twelve courses, as shown below. Many of these courses are taught only once a year, either spring or fall, as indicated in the course descriptions.

## Course

Credits
ELE E 230, Introduction to Digital Systems
ELE E 301, Electrical Signals and Systems I
ELE E 303, Electromagnetic Waves and Fields I

ELE E 315, Electrical Laboratory
A choice of three courses from among: ELE E 302, Electrical Signals and Systems II
ELE E 304, Electromagnetic Waves and Fields II
ELE E 306, Fundamentals of Quantum and Solid State Electronics ELE E 308, Fundamentals of Computer Engineering
ELE E 310, Probability and Random Signals
ELE E 310 can be taken in place of ENGRD
260, T\&AM 310, or ENGRD 270 to satisfy the college application of probability and statistics requirement.
Electrical engineering electives
with laboratory ( 3 courses)
Electrical engineering electives ( 2 courses) 6

## Total field credits

"Credits in excess of 46 may be used to fill approved-, technical-, or free-elective requirements of the College Curriculum.
All students graduating with a B.S. degree must fulfill the engineering design requirement. To meet this requirement, students must demonstrate that they have completed courses that contain at least 16 credits of engineering design. A table listing the engineering design content of all relevant electrical engineering and computer science courses is available in the undergraduate program office.
Electrical engineering electives may be selected from all courses taught in electrical engineering. At least one of the required electrical engineering electives with laboratory must be selected from a list including ELE E $318,320,425,430,453,457,475$, and 530. The other two may be selected from the above list or from among ELE E 423, 426, 433, 451, 452, 471, 472, 481, 526, 536, 539, 554, and 558. (If ELE E 539 is taken for 6 credits, it counts as two courses. One course will count as an ELE E elective with laboratory, and the other credits may be used as electrical engineering electives or to meet any other degree requirement that can be satisfied by a 500-level technical course credit.)
Specialization is achieved through the five electrical engineering elective courses, as well as other courses in electrical engineering or related subjects taken as technical, approved, or free electives. The School of Electrical Engineering offers more than thirty courses that are commonly taken as electives by undergraduates. Students with advanced standing frequently take one or more graduate-level courses prior to graduation.
Students majoring in electrical engineering are expected to meet the following academic standards:

1) Students must achieve a grade-point average of at least 2.3 every semester.
2) No course with a grade of less than Cmay be used to satisfy degree requirements in the field program or technical elective categories, or serve as a prerequisite for an electrical engineering course. (It may count as a free or possibly an approved elective, however, unless it must be repeated.)
3) Students must complete ELE E 301, 303, and 315 by the end of the first semester of
the junior year, and accumulate at least 10 credits each semester toward the remaining degree requirements in the field program and technical elective categories

## Master of Engineering (Electrical) Degree Program

The M.Eng.(Electrical) degree program prepares students either for professional work in electrical engineering and closely related areas or for further graduate study in a doctoral program. The M.Eng. degree differs from the Master of Science degree mainly in its emphasis on engineering design and analysis skills rather than basic research.
The program requires 30 credits of advanced technical course work, including a minimum of four courses in electrical engineering. An electrical engineering design project is also required and may account for 3 to 8 credits of the M.Eng. program. Occasionally, students take part in very extensive projects and may apply for a waiver of the 8 -credit maximum and increase the project component to 10 credits. Students with special career goals, such as engineering management, may apply to use up to 8 credits of approved courses that have significant technical content, but are taught in disciplines other than engineering, mathematics, or the physical sciences.
Although admission to the M.Eng. (Electrical) program is highly competitive, all wellqualified students are urged to apply. Further information is available from the Master of Electrical Engineering Program Office in 222 Phillips Hall.

## GEOLOGICAL SCIENCES

B. L. Isacks, chair; R. W. Allmendinger, K. Attoh, M. Barazangi, W. A. Bassett, J. M. Bird, A. L. Bloom, L. D. Brown,
L. M. Cathles, J. L. Cisne, T. E. Jordan,
D. E. Karig, R. W. Kay, S. Mahlburg Kay, F. H. T. Rhodes, W. B. Travers, D. L. Turcotte, W. M. White

## Bachelor of Science Curriculum

Study in geological sciences is offered for engineering students who are preparing for careers in solid-earth sciences and for those who want a broad background in the geological sciences as preparation for careers in other engineering fields. The Department of Geological Sciences is organized as an intercollege department in the College of Arts and Sciences and the College of Engineering. College of Arts and Sciences students should consult that college's section on geological sciences as well as the course listing here.
All geology majors take substantially the same set of upper-level geology courses regardless of their college affiliation. The difference between the curricula for students in engineering (B.S.-degree candidates) and those in arts and sciences (B.A.-degree candidates) is in their respective college requirements such as distribution courses, languages, social sciences, and humanities requirements. Both B.S.- and B.A.-degree programs stress a balanced overview of geology, without specialization. Within the B.S.-degree program, substantial specialization can be achieved by careful selection of field approved electives.

Students in the College of Engineering who may wish to affiliate with the Field Program of Geological Sciences may take ENGRI 122 as a distribution course. As a prerequisite for the major, they should take either GEOL 101 or 103 as a field approved elective or take GEOL 201 (ENGRD 201), preferably during their freshman or sophomore year. For those interested in geobiology, BIO S 101-103 and 102-104 are recommended. Chemistry 208 may be substituted for PHYS 214 with approval of the adviser.
Geological Sciences requires the following courses for the engineering major: GEOL $210,214,326,355,356,375$, and 388 . GEOL 210 plus 214 count as one course for purposes of graduation requirements. At least two field approved electives should be GEOL 300-, 400, or 600 -level courses. A summer field geology course is also required.
Core courses may be taken in any reasonable sequence, except that GEOL 355, which is offered in the fall, should be taken before GEOL 356, which is offered in the spring. GEOL 326, 355, 356, and 375 should be taken relatively early in the major program as preparation for the summer field camp, which usually follows the junior year. Students with adequate preparation may attend field camp at an earlier time.
It is recommended that students intending to specialize in geopbysics select most of their field approved electives from the appropriate advanced geology courses and the following courses or their equivalents; these guidelines also apply to the students' choice of other electives outside the major field.
A\&EP 333, Mechanics of Particles and Solid Bodies
A\&EP 355, Intermediate Electromagnetism
A\&EP 356, Intermediate Electrodynamics
A\&EP 434, Continuum Physics
Phys 410, Advanced Experimental Physics
T\&AM 310-311, Advanced Engineering Analysis I and II
It is recommended that students intending to specialize in geochemistry (including petrology and mineralogy) select most of their field approved electives from the appropriate advanced geology courses and the following courses or their equivalents; these guidelines also apply to the students' choice of other electives outside the major field.

## CEE 654, Aquatic Chemistry

Chem 207, 208, General Chemistry
Chem 287-288, Introductory Physical Chemistry
Chem 300, Quantitative Chemistry
Chem 301, Experimental Chemistry I
Chem 302, Experimental Chemistry II
Chem 303, Experimental Chemistry III
Chem 357-358, Introductory Organic Chemistry
Chem 389-390, Physical Chemistry I and II
MS\&E 331, Structural Characterization and Properties of Materials
MS\&E 335, Thermodynamics of Condensed Systems
It is recommended that students intending to specialize in geobiolog $y$ select most of their
field approved electives from the appropriate advanced geology courses and the following courses or their equivalents; these guidelines also apply to the students' choice of other electives outside the major field.

Bio S 241, Introductory Botany
Bio S 261, Ecoliogy and the Environment
Bio S 274, Functional and Comparative Morphology of Vertebrates
Bio S 371, Human Biology and Evolution Bio S 373, Biology of the Marine Invertebrates Bio S 448, Plant Evolution and the Fossil Record
Bio S 378, Evolutionary Biology
Chem 253, Elementary Organic Chemistry
It is recommended that students who want to pursue further training or immediate employment in applied geology (environmental and engineering geology, geohydrology, petroleum geology, or geological engineering) select most of their field approved electives from the appropriate advanced geology courses and the following courses or their equivalents, with two of the four from the same field; these guidelines also apply to the students' choice of other electives outside the major field.
GEOL 204 (also SCAS 371 and ABEN 371), Hydrology and the Environment
ABEN 475, Environmental Systems Analysis
ABEN 671, Analysis of the Flow of Water and Chemicals in Soils
SCAS 361, Genesis, Classification, and
Geography of Soils
SCAS 366, Soil Chemistry
SCAS 667, Soil Physics
CEE 331, Fluid Mechanics
CEE 332, Hydraulic Engineering
CEE 341, Introductory Soil Mechanics
CEE 351, Environmental Quality Engineering
CEE 611, Remote Sensing Applications
CEE 612, Physical Environment Evaluation
CEE 615, Digital Image Processing
CEE 633, Flow in Porous Media and Groundwater
CEE 640, Foundation Engineering
MS\&E 331, Structural Characterization and Properties of Materials
MS\&E 445, Mechanical Properties of Materials
OR\&IE 260, Introductory Engineering Probability
OR\&IE 370, Introduction to Statistical Theory with Engineering Applications
Students intending to specialize in economic geology or pursue careers in the mining industries or mineral exploration should consider including economics courses among their liberal studies distribution courses and should select most of their field approved electives from the groups of courses listed above for geochemistry and applied geology plus the following additional courses; these guidelines also apply to the students' choice of other electives outside the major field.
CEE 654, Aquatic Chemistry
CEE 741. Rock Engineering

Students who want a more general background or who want to remain uncommitted with regard to specialty must choose at least two of their field approved electives from the same field, at a level comparable to the courses listed above. The electives outside the field may be chosen from offerings in other science or engineering fields or the liberal arts, but should be at the 300 level or above. Students may request substitution of GFOL 491 and 492, Undergraduate Research, for a fourth-year field approved elective.
Students intending to pursue graduate study in geology are reminded that some graduate schools require proficiency in reading the scientific literature in one or two of the three languages, French, German, and Russian. Undergraduate preparation in foreign languages is advantageous for many careers, as well.

## Master of Engineering (Geological Sciences Degree Program)

The Master of Engineering (Geological Sciences) degree is intended to provide future professional geologists with the geological and engineering background they will need to analyze and solve engineering problems that involve geological variables and concepts. Students may choose a program from one of several options, or tailor a program to meet their special interests with the help of a faculty adviser.
The program requires 30 credits of postgraduate instruction, at least 10 of which must involve engineering design. Students must also complete a design project, worth between 3 and 12 credits, that has a significant geological component and results in substantial conclusions or recommendations.

General information on admission and degree requirements for the M.Eng. degree programs can be found in the college's introductory section.

## MATERIALS SCIENCE AND ENGINEERING

C. Y. Li, director; D. G. Ast, J. M. Blakely, R. Dieckmann, E. Giannelis, D. T. Grubb, E. J. Kramer, C. S. Nichols, C. Ober, R. Raj, A. L. Ruoff, S. L. Sass, M. O. Thompson

## Bachelor of Science Curriculum

Students majoring in materials science and engineering are required to take MS $\$ E 261$, Introduction to Mechanical Properties of Materials, or MS\&E 262, Introduction to Electrical Properties of Materials, before the end of their junior year. They are strongly urged to take it as an engineering distribution course during their sophomore year. Students in materials science and engineering must concentrate in a specialization which may cover areas such as materials science, solid state, metallic materials, ceramic materials, polymeric materials, or electronic materials. Specialization is achieved through the selection of technical electives in the junior and senior years. The materials science and engineering field program leading to the Bachelor of Science degree consists of

Courses
Credits
MS\&E 331, Structural Characterization of Materials 4
MS\&E 332, Electrical and Magnetic
Properties of Materials
3
Field-approved electives* 6
MS\&E 335 Thermodynamics of Condensed Systems 4
MS\&E 336, Kinetics, Diffusion, and Phase Transformations
MS\&E 441, Microprocessing of Materials 3
MS\&E 442, Macroprocessing of Materials 3
MS\&E 443/435, Senior Materials
Laboratory I or Senior Thesis I
MS\&E 444/435, Senior Materials
Laboratory II or Senior Thesis II
MS\&E 445, Mechanical Properties of Materials
MS\&E 447, Materials Design
Concepts I \& II
37/39
*These courses serve as two of the four required specialization courses. The other specialization courses are technical electives. Optional research involvement courses provide undergraduates with the opportunity to work with faculty members and their research groups on current projects.
Students without two semesters of chemistry must select a chemistry-related course as one of their specialization courses (e.g., MS\&E 414, MS\&E 452, CHEM 253). To continue in good standing in the Field of Materials Science and Engineering, students must

1) Maintain an overall 2.0 term average
2) Maintain an average of 2.3 , with no grade below $C$, in the department's basic curriculum.
3) Complete MS\&E 261 or 262 prior to the end of the junior year.
The department's basic curriculum consists of all the required MS\&E courses including MS\&E 261 and the four courses comprising the student's area of specialization.
An attractive and very challenging program combines the materials science and engineering curriculum with that of either electrical engineering or mechanical engineering, leading to a double major. The combination of materials science and engineering with electrical engineering is particularly well suited to students who will eventually be employed in the electronic materials industry. Mechanical engineers knowledgeable in materials science also will be well equipped for technical careers. Curricula leading to the double-major degree must be approved by both of the departments involved. Students are urged to plan such curricula as early as possible.

## Master of Engineering (Materiais) Degree Program

Students who have completed a four-year undergraduate program in engineering or the physical sciences can be considered for admission into the M.Eng.(Materials) program. This program consists of 30 credits, including course work and a master's design project.

The project, which requires individual effort and initiative, is carried out under the supervision of a faculty member. Twelve credits are devoted to the project, which is normally experimental in nature, although analytical projects are also possible.
Courses for the additional 18 credits are selected from the graduate-level classes in materials science and engineering and from other related engineering fields approved by the faculty. Typically half of the courses are from MS\&E. One 3 -credit technical elective must include advanced mathematics (modeling, computer application, or computer modeling), beyond the MS\&E undergraduate requirements.

## MECHANICAL AND AEROSPACE ENGINEERING

The Sibley School of Mechanical and Aerospace Engineering is concluding a complete review of course offerings and degree requirements. As this announcement goes to press, there are undetermined aspects of implementing the new curriculum requirements approved by the school and by the college. Students are strongly encouraged to check with their adviser and with the school office ( 112 Upson Hall) about new course offerings, modifications, and cancellations. It is likely that some courses will be offered in semesters other than indicated below.
D. A. Caughey, director; P. L. Auer,
C. T. Avedisian, D. L. Bartel, J. F. Booker, I. D. Boyd, A. H. Burstein, P. R. Dawson, P. C. T. deBoer, E. M. Fisher, A. R. George, F. C. Gouldin, S. Kannapan, S. Leibovich, M. Y. Louge, J. L. Lumley, M. P. Miller, F. C. Moon, F. K. Moore, R. M. Phelan, S. B. Pope, M. L. Psiaki, E. L. Resler, Jr., S.-f. Shen, D. L. Taylor, K. E. Torrance, H. B. Voelcker, K. K. Wang, Z. Warhaft, R. Warkentin, C. H. K. Williamson, N. Zabaras

Members of the faculty of the graduate Fields of Aerospace Engineering and Mechanical Engineering are listed in the Announcement of the Graduate School.

## Bachelor of Science Curriculum In Mechanical Engineering

The upperclass Field Program in Mechanical Engineering is designed to provide a broad background in the fundamentals of this discipline as well as to offer an introduction to the many professional and technical areas with which mechanical engineers are concerned. The program covers both major streams of the field of mechanical engineering.
Mechanical systems, design, and materials processing is concerned with the design, analysis, testing, and manufacture of machinery, vehicles, devices, and systems. Particular areas of concentration are mechanical design and analysis, vehicle engineering, biomechanics, and materials processing and precision engineering. Other topics covered are computer-aided design, vibrations, control systems, and dynamics.

Engineering of fluids, energy, and beattransfer systems is concerned with the efficient conversion of energy in electric power generation and aerospace and surface transportation, the environmental impact of
engineering activity (including pollutants and noise), and the experimental and theoretical aspects of fluid flow, heat transfer, thermodynamics, and combustion. Specific areas of concentration include aerospace engineering; heat, energy, and power engineering; and thermo-fluid sciences.
Affiliation: The Mechanical Engineering Program strongly encourages affiliation before sophomore pre-registration to optimize course selection and flexibility. The program is structured so that students affiliating as late as the first term of the sophomore year are not at a disadvantage.
The undergraduate program is a coordinated sequence of courses beginning in the sophomore year. During the fall term sophomore students who plan to enter the Mechanical Engineering Program take ENGRD 202 (also T\&AM 202) as an engineering distribution course. They also are urged to take ENGRD 221 (also M\&AE 221), which is a field requirement that may simultaneously satisfy Common Curriculum requirements as an engineering distribution course.
The requirements for the degree of Bachelor of Science in Mechanical Engineering are as follows:

1. Completion of the Common Curriculum. During the upperclass years this will typically mean earning credit for five humanities or social science courses.
2. Completion of the field requirements, which consist of eleven required courses (beyond ENGRD 202 already mentioned), and five elective courses ( 24 credits).
The eleven required courses are:
M\&AE 212, Mechanical Properties and Processing of Engineering Materials
M\&AE 221, Introduction to Thermodynamics
M\&AE 225, Mechanical Design and Synthesis
T\&AM 203, Dynamics
ELE E 210, Introduction to Electrical Systems M\&AE 323, Introduction to Fluid Mechanics M\&AE 324, Heat Transfer
M\&AE 325, Mechanical Design and Analysis
M\&AE 326, System Dynamics
M\&AE 427, Fluids/Heat Transfer Laboratory
M\&AE 428, Engineering Design
The five elective courses are chosen from lists approved by the faculty of the Sibley School of Mechanical and Aerospace Engineering. Students are urged to discuss elective choices with their adviser and to visit the undergraduate office in Upson 112 for more detailed description of restrictions and allowable courses. Because of recent changes in curriculum and early deadlines for printing, a complete description of the structure for electives cannot be included here.
One elective must be a mathematics course that is taken after T\&AM 294 and that includes statistics. Typically this mathematics elective is T\&AM 310 or OR\&IE 270.
The electives must include a design course chosen from a designated list and taken in the senior year.
The electives must include two courses that satisfy the requirements of one of the
upperclass concentrations. Typically these are two courses chosen from an appropriate subset of the school's upperclass offerings. A list of concentrations and courses is available in Upson 112.
An additional graduation requirement of the field program is proof of elementary comperence in technical drawing. The demonstration of competence is expected before completion of M\&AE 325, Mechanical Design and Analysis. This proof may be given in a number of ways, including satisfactory completion of
a. a technical drawing course in high school or in a community college,
b. ENGRG 101, Drawing and Engineering Design,
c. another technical drawing course at Cornell, or
d. a departmental examination.

The computer applications requirement of the Common Curriculum may be satisfied by several courses, including M\&AE 389.
The writing requirement of the Common Curriculum is satisfied by M\&AE 427.
Introduction to Electrical Systems (ELE E 210) may be replaced or supplemented by Introductory Electronics (PHYS 360).
A limited set of third-year courses is offered each summer under the auspices of the Engineering Cooperative Program.
Applicability: The curriculum requirements described above apply to the Class of '98 and beyond. Graduates of the Classes of '95, '96, and ' 97 may choose to complete their studies under the previous requirements or those described above. More detailed materials describing the Mechanical Engineering Program and possible concentrations may be obtained from the Sibley School of Mechanical and Aerospace Engineering, Upson Hall.

## Preparation in Aerospace Engineering

Although there is no separate undergraduate program in aerospace engineering, students may prepare for a career in this area by majoring in mechanical engineering and taking courses from the aerospace engineering concentration such as M\&AE 305, 506, and 507. Students may prepare for the graduate program in aerospace engineering by majoring in mechanical engineering, in other appropriate engineering specialties such as electrical engineering or engineering physics, or in the physical sciences. Other subjects recommended as preparation for graduate study include thermodynamics, fluid mechanics, applied mathematics, chemistry, and physics.

## Master of Engineering (Aerospace) Degree Program

The M.Eng.(Aerospace) degree program provides a one-year course of study for those who wish to develop a high level of competence in current technology and engineering design. This degree requires 30 credits of course work and is subject to the rules adopted by the Graduate Professional Program Committee. Because aerospace engineering is continually engaged in new areas, an essential guideline for the program is to reach beyond present-day practices and techniques. This is achieved by supplying the
student with the fundamental background and the analytical techniques that will remain useful in all modern engineering developments. Aerospace students register for 1 credit a term on an S-U basis in M\&AE Colloquium (M\&AE 799). All other courses must have letter grades. To fulfill the design project requirement, students register for M\&AE 592, Seminar and Design Project in Aerospace Engineering, for 2 credits per term. Other requirements are four aerospace core courses (minimum of 12 credits), two math courses ( 6 credits), and two technical electives ( 6 credits).

Changes in the requirements for the M.Eng. (Aerospace) degree are anticipated. Students should check with the field office ( 104 Upson Hall) to find out the current requirements.

## Aerospace Core Courses

3 credits:
M\&AE 459, Introduction to Controlled Fusion
M\&AE 506, Aerospace Propulsion Systems
M\&AE 507, Dynamics of Flight Vehicles
M\&AE 543, Combustion Processes
M\&AE 601, Foundations of Fluid Dynamics and Aerodynamics
M\&AE 602, Fluid Dynamics at High Reynolds Numbers
M\&AE 608, Physics of Fluids
M\&AE 651, Advanced Heat Transfer
M\&AE 670, Finite Elment Analysis for
Mechanical and Aerospace Design
M\&AE 732, Analysis of Turbulent Flows
M\&AE 733, Stability of Fluid Flow
M\&AE 734, Turbulence and Turbulent Flow
M\&AE 736, Computational Aerodynamics
M\&AE 737, Computational Heat Transfer and Fluid Mechanics
Nominations of Special Committee chair (adviser) must be filed with the Graduate School within three weeks of the start of classes. A formal selection of course work for the term must be filed within three weeks of the start of classes. A program of courses must be submitted for committee approval by the end of the first week of classes.
The school has particular strengths in the areas of fluid dynamics, aerodynamics, high temperature gasdynamics, turbulence, chemical kinetics, aerodynamic noise, sonic boom, nonlinear waves, atmospheric flows, combustion processes in low-pollution engines, and solution of flow problems by numerical methods. Professional design projects may be arranged in any of these areas.

## Master of Engineering (Mechanical) Degree Program

The M.Eng.(Mechanical) degree program provides a one-year course of study for those who wish to develop a high level of competence in current technology and engineering design.
The program is designed to be flexible so that candidates may concentrate on any of a variety of specialty areas. These areas include biomechanical engineering, combustion, energy and power systems, fluid mechanics, heat transfer, materials and manufacturing
engineering, mechanical systems and design, and CAD/CAM (computer-aided design/ computer-aided manufacturing). An individual student's curriculum includes a 4 -credit design course, a major consisting of a minimum of 12 credits, and sufficient technical electives to meet the degree requirement of 30 credits. It is highly recommended that students register for 1 credit per term on an S-U basis in M\&AE Colloquium (M\&AE 799). The design projects may arise from individual faculty interests or from collaboration with industry. All projects must have a mechanical engineering design focus and have the close supervision of a faculty member.
A coordinated program of courses for the entire year is agreed upon by the student and the faculty adviser. This proposed program, together with a statement of overall objectives and a statement of purpose for the major, is submitted for approval to the Master of Engineering Committee by the end of the first week of class. Any subsequent changes must also be approved by this committee.
The courses that constitute the major must be graduate-level courses in mechanical and aerospace engineering or a closely related field such as theoretical and applied mechanics. At least 24 credits of the total for the degree must be in mechanical engineering or related areas, and in general all courses must be beyond the level of those required in the undergraduate program in mechanical engineering. Credit may be granted for an undergraduate, upper-level first course in some subject area if the student has done little or no previous work in that area, but such courses must have the special approval of the Master of Engineering Committee.
The technical electives may be courses of appropriate level in mathematics, physics, chemistry, or engineering; a maximum of 6 credits may be taken in areas other than these if the courses are part of a well-defined program leading to specific professional objectives. It is expected that all students will use technical electives to develop proficiency in mathematics beyond the minimum required of Cornell engineering undergraduates if they have not already done so before entering the program. Courses in advanced engineering mathematics or statistics are particularly recommended.
Changes in the requirements for the M.Eng. (Mechanical) degree are anticipated. Students should check with the field office ( 104 Upson Hall) to find out the current requirements.
Students enrolled in the M.Eng.(Mechanical) program may take courses that also satisfy the requirements of the Cornell Manufacturing Engineering and Productivity Program (COMEPP), leading to a special dean's certificate in manufacturing engineering. The Energy Engineering option can also lead to a special dean's certificate.

## NUCLEAR SCIENCE AND ENGINEERING

Faculty members in the graduate Field of Nuclear Science and Engineering who are most directly concerned with the Master of Engineering (Nuclear) curriculum include K. B. Cady (faculty representative), D. D. Clark, H. H. Fleischmann, D. A. Hammer, V. O. Kostroun, and S. C. McGuire

## Undergraduate Study

Although there is no special undergraduate field program in nuclear science and engineering, students who intend to enter graduate programs in this area are encouraged to begin specialization at the undergraduate level. This may be done by choice of electives within regular field programs (such as those in engineering physics, materials science and engineering, and civil, chemical, electrical, or mechanical engineering) or within the College Program.

## Master of Engineering (Nuclear) Degree Program

The two-term curriculum leading to the M.Eng.(Nuclear) degree is intended primarily for individuals who want a terminal professional degree, but it may also serve as preparation for doctoral study in nuclear science and engineering. The course of study covers the basic principles of nuclear reactor systems with a major emphasis on reactor safety and radiation protection and control. The special facilities of the Ward Laboratory of Nuclear Engineering are described in the Announcement of the Graduate School.
The interdisciplinary nature of nuclear engineering allows students to enter from a variety of undergraduate specializations. The recommended background is (1) an accredited baccalaureate degree in engineering, physics, or applied science; (2) physics, including atomic and nuclear physics; (3) mathematics, including advanced calculus; and (4) thermodynamics. Students should see that they fulfill these requirements before beginning the program. In some cases, deficiencies in preparatory work may be made up by informal study during the preceding summer. General admission and degree requirements are described in the college's introductory section.
The following courses are included in the 30 credit program:

## Fall term

NS\&E 509, Nuclear Physics for Applications
A\&EP 612, Nuclear Reactor Theory
A\&EP 633, Nuclear Engineering
Technical elective

## Spring term

A\&EP 651, Nuclear Measurements Laboratory
Technical elective
Engineering design project
Mathematics or physics elective
Engineering electives should be in a subject area relevant to nuclear engineering, such as energy conversion, radiation protection and control, feedback control systems, magnetohydrodynamics, controlled thermonuclear fusion, and environmental engineering. The list
below gives typical electives.
M\&AE 651, Advanced Heat Transfer
ELE E 581, Introduction to Plasma Physics
ELE E 582, Advanced Plasma Physics
ELE E 589, Magnetohydrodynamics
ELE E 471, Feedback Control Systems
ELE E 472, Digital Control Systems
A\&EP 636, Seminar on Thermonuclear Fusion Reactors
A\&EP 638, Intense Pulsed Electron and Ion Beams: Physics and Technology
NS\&E 484, Introduction to Controlled Fusion: Principles and Technology
NS\&E 637, Advanced Topics in Plasma Diagnostic Techniques
MS\&E 459, Physics of Modern Materials Analysis

## Energy Engineering Option

Nuclear Science and Engineering is one of the M.Eng. fields participating in the Energy Engineering Option. Two energy-conversion courses, an environmental-consequences course, and NS\&E 545, the Energy Seminar, are required. The courses are to be chosen from approved lists.

## Program for Applications of Nuclear Analytical Methods (PANAM)

This new program was initiated in 1993-94. It provides for specialization by Ph.D. candidates with either a major or a minor in NS\&E. For those with majors in non-nuclear fields who expect to use nuclear analytical methods in their research, the sequence NS\&E 509-$551-590$ forms a suitable minor in NS\&E. The laboratory course 551 has been offered since spring 1989. The lecture course 509, offered for the first time in 1993, covers nuclear physics without requiring quantum mechanics as a prerequisite. For NS\&E majors, PANAM offers the opportunity to extend and develop new nuclear-analytical methods, for example, uses of cold neutrons and neutron-depth profiling with conversion electrons. They would normally follow the M.Eng. program in the first year, continue with advanced courses in the second year (including a full quantummechanical treatment of nuclear physics), and begin, as early as possible, independent projects as precursors to thesis research.

## OPERATIONS RESEARCH AND INDUSTRIAL ENGINEERING

J. A. Muckstadt, director; S. I. Resnick, L. I. Weiss, associate directors; L. J. Billera, R. G. Bland, D. C. Heath, P. L. Jackson, W. L. Maxwell, J. Renegar, R. Roundy, D. Ruppert, G. Samorodnitsky, L. W. Schruben, D. B. Shmoys, E. Slate, E. Tardos, M. J. Todd, L. E. Trotter, Jr., B. W. Turnbull

## Bachelor of Science Curriculum in Operations Research and Engineering

The program is designed to provide a broad and basic education in the techniques and modeling concepts needed to analyze and design complex systems and to provide an introduction to the technical and professional
areas with which operations researchers and industrial engineers are concerned. Exceptional students interested in pursuing graduate studies are encouraged to speak with their faculty advisers concerning an accelerated program of study.
A student who plans to enter the Field
Program in Operations Research and
Engineering should take Basic Engineering Probability and Statistics (ENGRD 270). For a student who has not taken ENGRD 270, entry into the field program in OR\&E is possible only by permission of the associate director for undergraduate studies. In addition, it is recommended that Computers and Programming (COM S 211 or Engr 211) be taken before entry into the OR\&E field program. Early consultation with a faculty member of the school or with the associate director for undergraduate studies can be helpful in making appropriate choices. The required courses for the OR\&E field program and the typical terms in which they are taken are as follows:
Term 5
Credits
OR\&IE 320, Optimization I
OR\&IE 350, Cost Accounting, Analysis, and Control

OR\&IE 360, Engineering Probability and Statistics II
A course in humanities and social sciences
A non-OR engineering course
Term 6
OR\&IE 321, Optimization II
OR\&IE 361, Introductory Engineering Stochastic Processes
OR\&IE 410, Industrial Systems Analysis
Behavioral science $\dagger$
Course in humanities and social sciences
$\dagger$ The behavioral science requirement can be satisfied by any one of several courses, including Graduate School of Management (GSM) NCC 504 (offered only in the fall), which is recommended for those contemplating the pursuit of a graduate business degree, and Industrial and Labor Relations 170, 171, 320, and 461. The adviser must approve the selection in all cases.
The basic senior-year program, from which individualized programs are developed, consists of the following courses:

## Minimum credits

OR\&IE 580, Digital Systems Simulation 4
Three upperclass OR\&E electives as described below

## Two non- OR electives

Two courses in humanities and social sciences
Two approved electives
Available OR\&E electives are as follows:
Manufacturing and distribution systems: OR\&IE 416, 417, 451, 516, 525, and 562 and GSM NBA 601 and 641*
Optimization methods: OR\&IE 431, 432, and 435
Applied probability and statistics: OR\&IE 462, 475 ( 2 credits), 476 ( 2 credits), 561, 563, 575, and 577
*No more than one course in the Graduate School of Management may be taken as an OR\&E elective.
Scholastic requirements for the field are a passing grade in every course, an overall average of at least 2.0 for each term the student is enrolled in the school, an average of 2.0 or better for OR\&E field courses, and satisfactory progress toward the completion of the degree requirements. The student's performance is reviewed at the conclusion of each term.

## Master of Engineering (OR\&IE) Degree Program

This one-year professional degree program stresses applications of operations research and industrial engineering and requires completion of a project. The course work centers on additional study of analytical techniques, with particular emphasis on engineering applications, especially in the design of new or improved man-machine systems, information systems, and control systems.
General admission and degree requirements are described in the introductory "Degree Programs" section. The M.Eng.(OR\&IE) program is integrated with the undergraduate Field Program in Operations Research and Engineering. Also welcome are requests for admission from Cornell undergraduates in engineering programs other than OR\&E or from qualified non-Comellians. To ensure completion of the program in one calendar year, the entering student should have completed courses in statistics and in computer programming (Pascal or C). Students interested in the manufacturing engineering option should obtain further information regarding program requirements from the office of the Center for Manufacturing Enterprise, 103 Engineering and Theory Center Building. Information concerning industrial internships can be obtained from the Master of Engineering Program Office, 148 Olin Hall.
I. For matriculants with preparation comparable to that provided by the undergraduate Field Program in Operations Research and Engineering:

Fall term

Credits

OR\&IE 516, Case Studies 1
OR\&IE 893, Applied OR\&IE Colloquium
OR\&IE 599, Project
1
Three technical electives
Spring term
OR\&IE 894, Applied OR\&IE Colloquium 1
OR\&IE 599, Project minimum of 4 Three technical electives 9
The electives specified above will normally be chosen from graduate courses offered by the School of Operations Research and Industrial Engineering. A minimum of 30 credits must be taken to complete the program.
II. For matriculants from other fields who minimally fulfill the prerequisite requirements (students who bave the equivalent of OR\&IE 520, 523, and 570 will take technical electives in their place):

Fall term
Credits
OR\&IE 570, Introduction to Statistical
Theory with Engineering Applications
OR\&IE 520, Operations Research I
OR\&IE 516, Case Studies
OR\&IE 580, Digital Systems Simulation
OR\&IE 893, Applied OR\&IE Colloquium
OR\&IE 599, Project
Spring term
OR\&IE 523, Introduction to Stochastic Modeling

OR\&IE 894, Applied OR\&IE Colloquium 1
OR\&IE 599, Project minimum of 4
Two technical electives
Students fulfill the project requirement by working as part of a group of no more than four students on an operational systems problem that actually exists in some organization. Appropriate problems are suggested by manufacturing firms, retailing organizations, service organizations, government agencies, and educational institutions.

## Cooperative Program with the Johnson Graduate School of Management

Undergraduates majoring in operations research and engineering may be interested in a cooperative program at Cornell that leads to both Master of Engineering and Master of Business Administration (M.B.A.) degrees. With appropriate curriculum planning such a combined B.S./M.Eng./M.B.A. program can be completed in six years.
An advantage for OR\&E majors is that they study, as part of their undergraduate curriculum, several subjects that are required for the M.B.A. degree. (This is because modern management is concemed with the operation of production and service systems, and much of the analytical methodology required to deal with operating decisions is the same as that used by systems engineers in designing these systems.) An early start on meeting the business-degree requirements permits students accepted into the cooperative program to earn both the M.Eng.(OR\&IE) and M.B.A. degrees in two years rather than the three years such a program would normally take.
The details of planning courses for this program should be discussed with the admissions office of the Johnson Graduate School of Management.
In accordance with this program the candidate would qualify for the B.S. degree at the end of four years, the M.Eng.(OR\&IE) degree at the end of five years, and the M.B.A. degree at the end of six years.

Further details and application forms may be obtained at the office of the School of Operations Research and Industrial Engineering, Engineering and Theory Center Building, and at the admissions office of the Johnson Graduate School of Management.

## STATISTICS CENTER

The Cornell Statistics Center coordinates university-wide activities in statistics and probability. Students interested in graduate
study in statistics and probability should apply to the Field of Statistics or to one of the other graduate fields that offer related coursework.

A list of courses in statistics and probability suitable for graduate students in the Field of Statistics is given under the heading "Statistics Center" in the section "Interdisciplinary Centers and Programs" at the front of this book. Further information can be obtained from the director of the Statistics Center, Professor S. R. Searle, or from the field representative for statistics, Professor M. Wells, both at 482 Caldwell Hall.

## THEORETICAL AND APPLIED MECHANICS

J. T. Jenkins, chair; J. A. Burns, H. D. Conway, J. M. Guckenheimer, E. W. Hart, T. J. Healey,
C. Y. Hui, R. H. Lance, S. Mukherjee,
Y. H. Pao, S. L. Phoenix, R. H. Rand,
P. Rosakis, A. L. Ruina, W. H. Sachse,
A. Zehnder

## Undergraduate Study

The Department of Theoretical and Applied Mechanics is responsible for courses in engineering mechanics and engineering mathematics, some of which are part of the Common Curriculum.

## College Program in Engineering Science

A student may enroll in the College Program in Engineering Science, which is sponsored by the Department of Theoretical and Applied Mechanics. The College Program is described in the section on undergraduate study in the College of Engineering.

## Master of Engineering (Engineering Mechanics) Degree Program

Composite materials designed to meet specific requirements of weight, strength, and rigidity are used increasingly in the manufacture of everyday structures and components. The Master of Engineering (Engineering Mechanics) degree program focuses on the mechanical behavior of advanced composite materials and structures and prepares students to play a role in the development of this new technology. Students from diverse engineering backgrounds, such as mechanics, structures, and materials, as well as aerospace and biomedical engineering, can normally complete the requirements for the professional Master of Engineering degree in one year.

Students usually select courses totaling 20 credits, which may be chosen from four different departments. These courses explore the nature of modern composite materials, provide a background in the fundamentals of these materials and their mechanics, and introduce techniques that will be useful in subsequent work. The program offers a series of topical, four-week mini courses on specialized subjects related to composites, taught by experts in the field. The degree program requires satisfactory completion of 30 credits of course work, including 12 credits of courses that involve analysis, computation, design, or laboratory experience. Of these 12 credits, at least 6 must be earned in T\&AM 501, 502 (Topics in Composites I; II), 555
(Introduction to Composite Materials), or 655 (Advanced Composite Materials and Struclures). Up to 10 credits will be awarded for an individual project involving composites. The balance of the required credits may be earned in elective courses chosen from those in the course listing below or others approved by the student's adviser.

The Department of Theoretical and Applied Mechanics has several laboratories equipped for the fabrication and mechanical testing of composite materials and structures. Extensive computing resources are available for numerical computations, design, or other numerical- or simulation-research activities related to composites. The Materials Science Center, the Center for Theory and Simulation in Science and Engineering, and the Com-puter-Aided Design Instructional Facility provide additional state-of-the-art laboratories and computer resources. Core courses in the M.Eng.(Engineering Mechanics) program are:

Course
Credits
T\&AM 555, Introduction to Composite Materials

3
T\&AM 655, Advanced Composite Materials and Structures
T\&AM 663, Solid Mechanics I
T\&AM 501, Topics in Composites I 1-3
Selected from the following:
Analysis of Composite Structures
Mechanical Testing of Composite Constituents Fracture Testing of Composites
Reliability Models for Composites
Design Principles for Composite Structures
Biological Composites
T\&AM 502, Topics in Composites II $1-3$ Selected from the following:

Effective Properties of Composites
Interface Failure and Fracture Processes in Composites
Boundary-Element Methods for Composites
Nondestructive Testing of Composites
Software for Composite Design
Novel Composite Structures
T\&AM 591, Master of Engineering Design
Project I 3-5

T\&AM 592, Master of Engineering Design Project II
Complementary courses from other departments include:

MS\&E 450, Physical Metallurgy
MS\&E 452, Properties of Solid Polymers
MS\&E 605, Plastic Flow and Fracture of Materials

3
M\&AE 465, Biomechanical Systems-Analysis and Design

3
M\&AE 569, Mechanical and Aerospace Structures

M\&AE 670, Mechanical and Aerospace Structures II- Finite-Element Methods
CEE 770, Engineering Fracture Methods
4

CEE 772, Finite-Element Analysis
3
3

## ENGINEERING COURSES

Courses offered in the College of Engineering are listed under the various departments and schools.

Courses are identified with a standard abbreviation followed by a three-digit number.
Introduction to Engineering ENGRI
Engineering Distribution
ENGRD
Engineering General Interest ENGRG
Engineering Communications ENGRC
Agricultural and Biological Engineering ABEN
Applied and Engineering Physics A\&EP
Chemical Engineering CHEME
Civil and Environmental Engineering CEE
Computer Science COM S
Electrical Engineering ELE E

Geological Sciences GEOL

Materials Science and Engineering MS\&E
Mechanical and Aerospace Engineering M\&AE
Nuclear Science and Engineering
NS\&E
Operations Research and Industrial
Engineering
OR\&IE
Theoretical and Applied Mechanics
T\&AM

## ENGINEERING COMMON COURSES

## Courses of General Interest

Courses in this category are of general interest and cover technical, historical, and social issues relevant to the engineering profession. These courses may also include seminar or tutorial type courses.

## ENGRG 101 The Computer Age lalso COM 8 101)

Fall, summer. 3 credits. Not offered every year. Credit is granted for both COM S 100 and 101 only if 101 is taken first.
An introduction to computer science and programming for students in nontechnical areas. The aims of the course are to acquaint the student with the major ideas in computer science and to develop an appreciation of algorithmic thinking. Topics may include the history of computation; microtechnology; the retrieval and transmission of information; scientific computing; computer graphics, art, and music; robotics, natural-language processing, and machine intelligence. Students become acquainted with the notion of an algorithm by writing several programs in Pascal or Scheme and testing them on microcomputers. The amount of programming is about half that taught in Engr 100.

## ENORG 102 Drawing and Engineering

## Design (also MaAE 102)

Fall, spring. 1 credit. Half-term course offered twice each semester. Enrollment limited to thirty students each half term. Recommended for students without previous mechanical drawing experience. S-U grades optional.

2 lecs, 1 lab.
Introduction to sketching, drawing, and graphic techniques useful in design, analysis, and presentation of ideas. Use of computeraided drafting software is introduced in the final design project.

ENGRG 150 Engineering Seminar
Fall, spring. 1 credit. First-year students only. S-U grades only.
Weekly discussion of academic and nonacademic topics of interest to selected engineering faculty advisers and their students. Topics may include engineering applications of mathematics and science, recent science and engineering developments, such as
supercomputing and superconductors, or career opportunities in engineering and related fields. Some opportunity for visits to academic and research facilities on campus.

## ENGRG 185 Art, Archaeology, and Analysis (also ARKEO 285, ART 272, CLASS 285, ENGL 285, MSAE 285, NS\&E 285, and PHYS 200)

Spring, 3 credits.
3 lecs.
An interdepartmental course on the application of techniques of physical sciences and engineering to issues in cultural research. In each portion of the course, several archaeological artifacts or works of art will be discussed with a focus on the historical and technical aspects of their creation and on their analysis by modern methods including microscopic, infra-red, and x-ray examination and by techniques using neutrons. Determination of chemical composition and/or spatial patterns and images are used to identify pigments, inks, clays, etc., to deduce geographical origins; to date and authenticate the objects; and to assess their state for purposes of conservation.

## ENGRG 250 Technology in Western Society (also ELE E 250)

Fall. 3 credits. Meets humanities distribution requirement.
R. Kline.

An investigation of the history of technology in Western society from ancient Egyptian times to the present, focusing on Western Europe up to the British industrial revolution in the late eighteenth century, and on the United States thereafter. Topics include the economic and social aspects of industrialization; the myths of heroic inventors like Morse, Edison, and Ford; the government's promotion and regulation of technology through such measures as the patent system, the funding of research and development, and regulatory legislation; the origins of modern systems of mass production; and the spread of the automobile and microelectronics cultures in the United States

## ENGRG 290 Engineering in Europe

Spring. 2 credits. Open only to participants in the Semester in Europe Program. S-U grades only.
A specially designed field-trip course consisting of weekly two-hour seminars associated with approximately ten weekly field trips to engineering sites in and around Hamburg, Germany. Students will be required to maintain written journals of field trips and associated readings, as well as present oral reports on selected industries prior to class visits.

## [ENGRG 292 The Electrical and

 Electronic Revolutions (also ELE E 292)Spring. 3 credits. Approved for humanities distribution, not for ELE E or as a technical elective. Not offered 1994-95.
R. Kline.

Explores the history of electricity in society from the 1830 s to the present by considering
the technical and social history of telecommunications, the electric-power industry, microelectronics, radio, television, and computers. Emphasis is placed on the changing relationship between science and technology, the institutional context of research and development, the economic aspects of innovation, and the social relations of this technology.]

## ENQRQ 323 Engineering Economics and

 Management (also CEE 323) Spring. 3 credits. Primarily for juniors and seniors.D. P. Loucks.

Introduction to engineering and business economics and to project management. Intended to give students a working knowledge of money management and how to make economic comparisons of alternative engineering designs or projects. The impact of inflation, taxation, depreciation, financial planning, economic optimization, project scheduling, and legal and regulatory issues are introduced and applied to economic investment and project-management problems.

## ENGRG 356 Women in Engineering

 Career Planning SeminarSpring. 1 credit. Limited to 25 students. S-U grades only. Open to juniors and seniors in engineering and related fields.

1 sem. M. Fish.
Covers aspects of transition to the engineering profession and related issues especially of interest to women. Topics include career and life planning, the job-search process, interviewing strategies, juggling career and family, graduate education, sexual harassment and sexism in the workplace, professionalism, and networking. Corporate professionals and Comell faculty and staff participate in class discussions.

## [ENGRG 360 Ethical Issues in Engineering

Spring. 3 credits. A social-science elective for engineering students. Open to juniors and seniors. Not offered 1994-95.

3 lecs.
A discussion of ethical issues encountered in engineering practice, such as the rights of engineers in corporations, responsibility for harmful actions, whistleblowing, conflicts of interest, and decision making based on costbenefit analysis. Codes of ethics of professional engineering societies and ethical theory will be used to help sort out conflicting obligations the engineer may feel toward public safety, professional standards, employers, colleagues, and family. Students will present a case study to the class, along the lines of the Space-Shuttle Challenger disaster, the Kansas City Hyatt-Regency Hotel walkway failure, or the Comell computer "worm."]

## ENGRG 461 Engineering for Entrepreneurs

## Fall. 3 credits.

R. Warkentin.

Intent is to provide students with the tools and skills necessary to identify, evaluate, and undertake new business ventures. A major course project will be the development of a business plan for an innovative new venture and will require the detailing of manufacturing, support, and information systems as well as staffing and cost data. Intended for juniors and seniors in the College of Engineering, this course is open to all undergraduates.

## ENGRG 501 Bioengineering Seminar

 Fall, spring. 1 credit. Primarily for juniors, seniors, and graduate students.M. L. Shuler and staff.

Broad survey of all aspects of bioengineering, including biomedical, bioprocess, biological, and bioenvironmental engineering and aspects of biotechnology. Sessions may be technical presentations or discussions.

## ENGRG 600 Teaching Engineers

Fall, spring. 1-3 credits.
Staff
For graduate students and advanced undergraduates who may be teaching assistants or who are interested in careers in universities. Lectures will cover a variety of topics aimed at helping students become effective teachers. Particular attention will be given to how to develop students' problem-solving skills, make learning challenging and exciting, teach in a culturally diverse environment, and teach in an electronic classroom or laboratory.

## Engineering Communications Courses

Courses in this category, offered by the
Engineering Communications Program, develop writing and communications skills relevant to engineers.

## ENGRC 233/433 Topics in Engineering Communications

TBA. 3 credits.
Topics vary as the need and interest arise. Offerings might include: introductory technical communications, graphic presentation of engineering material, desktop publishing, information technologies, advanced problems in engineering communications, technology and the law. Fulfills the college technical writing requirement

## ENGRC 234/434 Independent Study in Engineering Communications

 TBA. Variable credits (1-3). Credit and course level (234 or 434 ) determined by the amount and intellectual level of the work. Students work closely with a Communications Program instructor to pursue an aspect of professional communications not available through regular course work. Projects may involve writing technical documentation, creating user manuals, analyzing and producing technical graphics, or reading and writing about problems in engineering practice. Interested students should contact the Engineering Communications Program.
## ENQRC 301 Writing in Engineering

TBA. 1 credit. Prerequisite: Permission of instructor. Can be used to satisfy requirements in expressive arts as a free or approved elective. This course can only be taken in conjunction with a "uriting-intensive" engineering class.
Some "writing-intensive" engineering classes may require students to enroll in this supplementary course. Instructors from the Engineering Communications Program work with engineering faculty members to prepare students for writing assignments. Intended to strengthen understanding of the course content while enhancing communications skills. May be taken more than once, with different engineering courses.

## ENGRC 350 Engineering

## Communications

Fall, spring, summer. 3 credits. Limited to 20 students per section.
P. Beebe, S. Hubbard, S. Youra.

Emphasizes technical and professional writing; also includes oral and graphic presentation. Communications in real-life engineering contexts are analyzed, with case studies and assignments modeled on professional situations. Students learn to adapt language and formats-letters, memoranda, instructions, definitions, proposals, reports-to audiences having different needs and levels of technical expertise. Students also consider the social and ethical implications of the communications they encounter and produce. Taught as a workshop, with ample time for discussion. The goal throughout is clear, well-organized, responsible, and forceful professional communication. Lab fee: $\$ 10$ to cover photocopying costs. Fulfills the college technical writing requirement.

## ENGRC 435 Writing for Engineering Managers

3 credits. Limited to 20 students per section. For juniors and seniors.
S. Hubbard.

Guidance and practice in professional writing and in developing effective responses to case studies that replicate actual problems in industry. Learn techniques for planning and organizing action; controlling and monitoring progress; motivating, leading, coaching, and appraising co-workers; handling organizational power and politics, and managing conflict. Focus on issues such as writing successful proposals, managing engineering teams and projects, and communicating with lawyers, regulators, and the general public. Fulfills the college technical writing requirement. Ten-dollar lab fee to cover photocopying costs.

## Introduction to Engineering Courses

Courses in this category are freshman-level courses intended to introduce students to various aspects of engineering. They have no prerequisites and are always cross-listed with a department.

## ENGRI 110 The Laser and its

 Applications in Science, Technology, and Medicine (also A\&EP 110)
## Fall, spring. 3 credits.

2 lecs, 1 lab.
The principles of laser action, types of laser systems, elements of laser design, and applications of lasers in science, technology, and medicine are discussed. In the laboratory students build and operate a nitrogen laser and a tunable dye laser. Demonstration experiments with several types of lasers illustrate phenomena such as holography, laser processing of materials, Raman spectroscopy, optical filtering, and interferometry.

## ENGRI 111 Elements of Materials Science and Engineering (also MS\&E 111)

Fall. 3 credits.
Explores the relationship between atomic structure and macroscopic properties of such diverse materials as metals, ceramics, polymers, and semiconductors. Hands-on project involves dissecting and analyzing various consumer products like a disposable camera, portable cassette player, or CD player. Emphasis is placed on materials identification and their selection to perform an engineering function.

ENGRI 112 Introduction to Chemical Engineering (also CHEME 112)
Fall, spring, 3 credits. Limited to freshmen.
2 lecs, 1 rec. T. M. Duncan, P. Clancy. Design and analysis of processes involving chemical change. Strategies for design, such as creative thinking, conceptual blockbusting, and (re)definition of the design goal, in the context of contemporary chemical engineering. Methods for analyzing designs, such as mathematical modeling, empirical analysis by graphics, and dynamic scaling through dimensional analysis, to assess product quality, economics, safety, and environmental issues.

## ENGRI 113 Environmental Systems

 Engineering (also CEE 113)Fall. 3 credits. Not open (without instructor's permission) to upper-division engineering students, who should take CEE 120 instead.

2 lecs, 1 sec. W. Lynn.
Analysis and management of environmental systems. Introduction to physical, chemical, and biological processes affecting environmental quality. Environmental modeling and the use of interactive computer graphics. Specific topics include management of water resources, flood control, waste management, ecosystems, and water quality in surface and ground waters.
[ENGRI 114 An Introduction to Engineering Design
Spring. 3 credits. Not offered 1994-95. 2 lecs, 1 lab. R. Compton.
Students work on a series of linked projects in the areas of computer-aided-design,
electromechanics, multimedia, robotics, electronics, and mechanical design. Laboratory fee required.]

## ENGRI 115 Engineering Application of Operations Research (also OR\&IE 115)

Fall, spring. 3 credits.
2 lecs, 1 lab.
An introduction to the problems and methods of Operations Research and Industrial
Engineering focusing on problem areas (including inventory, network design, and resource allocation), the situations in which these problems can be found, and several standard solution techniques. In the computer laboratory, students will encounter problem simulations and use some standard software packages.

## ENGRI 116 Modern Structures (also CEE

 116)Fall, spring. 3 credits.
2 lecs, 1 sec. Fall, M. Sansalone; spring,
G. Deierlein.

An introduction to the basic principles of structural engineering and to structural forms. Emphasis is placed on how various types of structures carry loads. Concepts are illustrated by a series of case studies of major structures such as spacecraft, skyscrapers, bridges, shell structures, and dams. The philosophy of engineering design and lessons learned from structural failures are discussed. The Computer-Aided Design Instructional Facility (CADIF) and the Craig Miller Laboratory for Structural Modeling in Hollister Hall are used to demonstrate how engineering materials and structures behave under load. A semester project involves the design and construction of a small balsa-wood bridge.

## ENGRI 117 Introduction to Mechanical Engineering (also M\&AE 117)

Fall. 3 credits
An introduction to topics of current interest in mechanical engineering. Specific topics vary from offering to offering. Students are urged to check in Upson 112 for details. In 1993, the course was "The Engine and the Atmosphere." This course discussed engines and their design including constraints imposed by the laws of thermodynamics, the combustion process, and the products of the exhaust. This led to a discussion of local and global environmental problems, including greenhouse warming. The dilemma of productivity versus environmental degradation and the engineer's role in this was also discussed. This offering was intended for students wishing to study mechanical engineering as well as environmental, chemical, and civil engineering
ENGRI 118 Design Integration: A Portable CD Player (also MSEE 118)
Spring. 3 credits.
3 lecs. M. Thompson.
This course will examine the roles of various engineering disciplines on the design of a portable compact disc (CD) player. Students will be introduced to elements of mechanical, electrical, materials, environmental, manufacturing, and computer engineering as related to the CD player. Laboratory sessions and demonstrations will be used to illustrate the principles of design.

## ENGRI 121 Fission, Fusion, and

 Radiation (also NS\&E 121)Spring. 3 credits
2 lecs, 1 lab demonstration. A lecture, demonstration, and laboratory course on (1) the physical nature and biological effects of nuclear radiation; (2) the benefits and hazards of nuclear energy; (3) light-water reactors, breeder reactors, and fusion reactors; and (4) the uses of nuclear radiation in physical and biological research. The laboratory work and demonstrations involve criticality and the control of Cornell's two research reactors; detection of, and protection against, nuclear radiation; neutron activation analysis using gamma-ray spectroscopy; and plasma sources and devices.

## ENQRI 122 Earthquake! (also GEOL 122)

 Fall. 3 credits.2 lecs, 1 lab. L. D. Brown.
The science of natural hazards and strategic resources is explored in a series of geophysical exercises involving: Earthquakes-an obscure scientists predicts a major earthquake for Los Angeles. Join a disaster task force as it attempts to evaluate the predicton and its social consequences. Oil-participate in a simulated cruise to probe with sound waves for oil deep beneath the Gulf of Mexico. Water-a toxic spill occurs near a housing complex in Ithaca, New York. Use seismic instruments to map the shallow subsurface and identify potential routes of contamination.

## ENORI 123 Sensors and Actuators

Fall. 3 credits.
2 lecs, 1 lab.
A sensor or an actuator is the element by which information is converted from one form of energy to another. It is the key component in all measurement and control systems. This course will focus on the operational features of a wide variety of sensors and actuators that are used in scientific and engineering metrology, in industrial process control
applications, and in consumer products. The devices may be based on electrical, mechanical, acoustical, optical, and thermal phenomena. Students will measure the parameters of various thermo-mechanical sensors and actuators and they will be expected to design, fabricate, and verify the operation of a sensor meeting specific design objectives.

## ENGRI 172 Introduction to Artificial

Intelligence (also COM $\$ \mathbf{1 7 2}$ )
Spring. 3 credits. Recommended: COM S 100 or 101 , or equivalent computer experience. Enrollment may be limited. Not offered every year.

3 lecs, 2 evening exams.
A hands-on introduction to concepts in artificial intelligence. Topics may include heuristic search, game playing, automated theorem proving, natural-language processing, expert systems, neural networks and/or machine learning. Students will use workstation environments to gain software laboratory experience. Interested students need not be proficient programmers to take this class.

ENGRI 181 Engineering in Context lalso Science and Technology Studies 181)

Fall. 3 credits. No prerequisites. Illustrated lecs; multimedia lab.
Fundamental engineering principles designed to introduce engineering and other majors to the traditions and practices of the engineering profession and their effects on our culture (Engineering literacy for non-engineers.) Development of scientific and engineeringdesign principles in a variety of technological contexts. Overview of the development of engineering as a profession and the evolution of the design process. The relationship between science, technology, and engineering. Civil, mechanical, electrical, chemical, and other engineering project case studies. The implications and uses of information technologies in society.

## Engineering Distribution Courses

Courses in this category are sophomore-level courses cross-listed with a department. These courses are intended to introduce students to more advanced concepts of engineering and may require pre- or co-requisites.

## ENGRD 201 Introduction to the Physics and Chemistry of the Earth (also GEOL 201)

Spring. 3 credits. Prerequisites: Mathematics 191 and Physics 112.

2 lecs; 1 rec, lab, or field trip.
L. M. Cathles.

Formation of the solar system: accretion and evolution of the earth. The rock cycle radioactive isotypes and the geological time scale, plate tectonics, rock and minerals, earth dynamics, mantle plumes. The hydrologic cycle: runoff, floods and sedimentation, groundwater flow, contaminant transport Weathering cycle: chemical cycles, $\mathrm{CO}_{2}$ (weathering), rock cycle, controls on global temperature ( $\mathrm{CO}_{2}$ or ocean currents), oil and mineral resources.

## ENGRD 202 Mechanics of Solids (also

 T\&AM 202)Fall, spring. 3 credits.
2 lecs, 1 rec, 4 labs each semester, evening exams.
Principles of statics, force systems, and equilibrium; frameworks; mechanics of deformable solids, stress, strain, statically indeterminate problems; mechanical proper-
ties of engineering materials; axial force, shearing force, bending moment, plane stress; Mohr's circle; bending and torsion of bars; buckling and plastic behavior.

ENGRD 203 Dynamics (also T\&AM 203)
Fall, spring. 3 credits. Prerequisite: T\&AM
202, coregistration in Mathematics 294, or permission of instructor.

2 lecs, 1 rec, 4 labs each semester, evening exams.
Newtonian dynamics of a particle, systems of particles, a rigid body. Kinematics, motion relative to a moving frame. Impulse, momentum, angular momentum, energy. Rigid-body kinematics, angular velocity, moment of momentum, the inertia tensor. Euler equations, the gyroscope.

ENGRD 210 Introduction to Electrical Systoms (also ELE E 210)
Fall, spring. 3 credits. Prerequisites or corequisites: Mathematics 294 and Physics 213.

3 lecs and optional tutorial secs. Circuit elements and laws, analysis techniques, operational amplifiers. Response of linear systems, with an introduction to complex frequency and phasors, forced response, average power, transfer function, pole-zero concepts, and the frequency spectrum.
ENGRD 211 Computers and Programming (also COM S 211) Fall, spring, summer. 3 credits. Credit will not be granted for both COM S 211 and 212 . Prerequisite: COM S 100 or equivalent programming experience.

2 lecs, 1 rec, 2 evening exams Intermediate programming in a high-level language and introduction to computer science. Topics include program development, proofs of program correctness, program structure, recursion, abstract data types, object-oriented programming data structures, and analysis of algorithms. Pascal is the principal programming language.

## ENGRD 212 Modes of Algorithmic <br> Expression (also COM $\mathbf{5}$ 212)

Fall, spring. 4 credits. Credit will not be granted for both COM S 211 and 212. Prerequisite: COM S 100 or equivalent programming experience.

2 lecs, 2 recs, 2 evening exams. A challenging introduction to programming languages and computer science that emphasizes alternative modes of algorithmic expression. Topics include recursive and higher-order procedures, performance analysis of algorithms, proofs of program correctness, probabilistic algorithms, symbolic hierarchical data, abstract data types, polymorphic functions, object-oriented programming, infinite data types, simulation, and the interpretation of programs. Programs are written in Scheme, a dialect of LISP
ENGRD 219 Mass and Energy Balances (also CHEME 219)
Fall. 3 credits. Co-requisite: physical or organic chemistry or permission of instructor. C. Cohen.

Engineering problems involving material and energy balances. Batch and continuous reactive systems in the steady and unsteady states. Introduction to phase equilibria for multicomponent systems. Humidification processes.

## ENGRD 221 Thermodynamics (also

 M\&AE 221)Fall, spring. 3 credits. Prerequisites:
Mathematics 192 and Physics 112.
3 lecs.
The definitions, concepts, and laws of thermodynamics. Applications to ideal and real gases, multiphase pure substances, gaseous reactions. Heat-engine and heatpump cycles, with an introduction to energyconversion systems.

## ENGRD 222 Introduction to Scientific Computation (also COM $\mathbf{S}$ 222)

Spring. 3 credits. Prerequisites: COM S 100 and prerequisite or corequisite of Mathematics 221 or 293.

2 lecs, 1 rec, 2 evening exams.
An introduction to elementary numerical analysis and scientific computation. Topics include interpolation, quadrature, linear and nonlinear equation solving, least-squares fitting, and ordinary differential equations. The MATLAB computing environment is used. Vectorization, efficiency, reliability, and stability are stressed. Special lectures on parallel computation and high-performance FORTRAN.

## ENGRD 230 Introduction to Digital Systems (also ELE E 230)

Fall, spring. 4 credits. Prerequisite: COM S 100.

2 lecs, 1 lab.
An introduction to basic principles and design techniques for digital systems such as computers and communications systems. Includes Boolean algebra, switching circuits, finite state machines, and system design methodology.

## ENGRD 241 Engineering Computation

 (also CEE 241)Spring. 3 credits. Prerequisites: COM S 100 and Mathematics 293. Co-requisite: Mathematics 294.

2 lecs, 1 rec, 2 evening exams. P.L.-F Liu, J. F. Abel.

This course introduces the discipline of numerical methods while developing programming and graphics proficiency with MATLAB and spreadsheets. Numerical analysis topics considered are accuracy, precision, Taylor-series approximations, truncation and round-off errors, condition numbers, operation counts, convergence, and stability. Included are numerical methods for solving engineering problems, which entail roots of functions, simultaneous linear equations, regression, interpolation, numerical differentiation and integration, and ordinary differential equations. The context and solution of partial differential equations are broached. Applications are drawn from different areas of engineering.
ENGRD 261 Introduction to Mechanical Properties of Materials (also MS\&E 261)

Fall, spring. 3 credits.
2 lecs, 1 rec or lab.
The relationship of elastic deformation, plastic deformation, and fracture properties to structure and defects on a microscopic scale in metals, ceramics, polymers, and composite materials. Design and processing of materials to achieve high modulus, damping capacity, hardness, fracture strength, creep resistance, or fatigue resistance. Flaw-tolerant design methods using fracture mechanics.

## ENGRD 262 Introduction to Electrical Properties of Materials (also MS\&E 262)

Spring. 3 credits. Prerequisite: co-registration in PHYS 213 or electricity and magnetism in high school physics.

2 lecs, 1 rec or lab.
Electrical and structural properties of semiconductors, the operation of $p-n$ junctions and transistors, and the processing methods used to form modern integrated circuits.
Electrical conduction in metal films, semiconductors, bipolar and field-effect transistors and light-emitting diodes. Diffusion, ion implantation, oxidation, metallization, and other process steps in fabricating semiconductor devices. Interplay between structural and electrical properties and their application to the design of semiconductor devices and integrated circuits.

## ENGRD 264 Computer-Instrumentation

 Design (also A\&EP 264)Fall, spring. 3 credits. Prerequisites: Engr 100 or COM S 100.

1 lec, 1 lab.
This course covers the use of a small computer in an engineering or scientific research laboratory. Various experiments will be performed using an IBM-AT style computer ( 25 MHz 80386 , color graphics) running MSDOS. The experiments and devices to be investigated include: input and output ports, analog-to-digital converters (ADC), digital-toanalog converters (DAC), thermistors, optical sensors, temperature control, least-squares curve fitting of experimental data, stepping motors, thermal diffusion, and viscosity of fluids. Computer control, data acquisition, and data analysis (graphical and numerical) will be investigated in these experiments using Pascal and machine language programming as well as commercial graphics program packages. At the level of IBM-PC in the Laboratory, by B. G. Thompson and A. F. Kuckes.

## ENORD 270 Basic Engineering

 Probability and Statistics (also OR\&IE 270)Fall, spring. 3 credits. Prerequisite: first-year calculus.

3 lecs, evening prelims.
This course should give students a working knowledge of basic probability and statistics and their application to engineering. Computer analysis of data and simulation are emphasized. Topics include random variables, probability distributions, expectation, estimation, testing, experimental design, quality control, and regression.

## AGRICULTURAL AND BIOLOGICAL ENGINEERING

Courses in agricultural and biological engineering will be found in the section listing the offerings of the College of Agriculture and Life Sciences.

## APPLIED AND ENGINEERING PHYSICS

## A\&EP 110 The Laser and Its Applications in Science, Technology, and Medicine (also ENGRI 110)

Fall, spring. 3 credits. This is a course in the Introduction to Engineering series.

2 lecs, 1 lab.
For description see Engineering Common Courses.

## A\&EP 264 Computer-Instrumentation Design (also ENGRI 264)

Fall, spring. 3 credits. Prerequisites: Engr 100 or COM S 100.

1 lec, 1 lab.
For description see Engineering Common Courses

## A\&EP 303 Introduction to Nuclear Science and Engineering I (also NS\&E 303)

Fall. 3 credits. Prerequisite: Physics 214 or Mathematics 294

3 lecs.
For description see NS\&E 303.

## A8EP 320 Engineering Blophysics: The Physics of Life

Spring. 3 credits. Prerequisites: freshman and sophomore chemistry, physics, math. 2 lecs, 1 lab.
Most phenomena in engineering have analogies in biological systems. Examples include information storage by DNA, signal transduction in nerve cells, neural networks in the brain, and systems integration in ecosystems among others. This course examines the physics of these phenomena. Emphasis is on modern instrumentation as it pertains to biophysical measurements. This course is considered a foundations course for those interested in biophysics and bioengineering.
A8EP 321 Mathematical Physics I
Fall, summer. 4 credits. Prerequisite: Math 294. Intended for upper-level undergraduates in the physical sciences.

4 lecs.
Review of vector analysis; complex variable theory, Cauchy-Rieman conditions, complex Taylor and Laurent series, Cauchy integral formula and residue techniques, conformal mapping; Fourier Series; Fourier and Laplace transforms; ordinary differential equations; separation of variables. Texts: Mathematical Methods for Pbysicists, by Arfken; Mathematical Physics, by Butkov.
A\&EP 322 Mathematical Physics II Spring. 4 credits. Prerequisite: A\&EP 321 Second of the two-course sequence in mathematical physics intended for upper-level undergraduates in the physical sciences. 4 lecs.
Partial differential equations, Bessel functions, spherical harmonics, separation of variables, wave and diffusion equations, Laplace, Helmholtz and Poisson's Equations, transform techniques, Green's functions; integral equations, Fredholm equations, kernals; complex variables, theory, branch points and cuts, Riemann sheets, method of steepest descent; tensors, contravariant and covariant representations; group theory, matrix representations, class and character. Texts: Mathematical Metbods for Physicists, by Arfken; Mathematical Physics, by Butkov.

## AzEP 333 Mechanics of Particles and

 Solid BodiesFall, summer. 4 credits. Prerequisites: Physics 112 or 116 and coregistration in A\&EP 321 or equivalent or permission of instructor. 3 lecs, 1 rec
Newton's mechanics; linear oscillations; Lagrangian and Hamiltonian formalism for generalized coordinates; non-inertial reference systems; central-force motion; motion of rigid bodies; small vibrations in multi-mass systems; nonlinear oscillations; basic introduction to relativistic mechanics. Emphasis on mathematical treatments, physical concepts, and applications. (On the level of Classical Dynamics, by Marion)

## A\&EP 355 Intermediate

 ElectromagnetismFall, summer. 4 credits. Prerequisites: PHYS 214 or 217 and coregistration in A\&EP 321 or equivalent, or permission of instructor. 3 lecs, 1 rec.
Topics: vector calculus, electrostatics, analytic and numerical solutions to Laplace's equation in various geometries, electric and magnetic materials, energy in fields, quasistatics and magnetic circuit design. Emphasis is on developing proficiency with analyical and numerical solution techniques in order to solve real-world design problems

A8EP 356 Intermediate Electrodynamics Spring. 4 credits. Prerequisite: A\&EP 355 and coregistration in A\&EP 322 or equivalent, or permission of instructor.

3 lecs, 1 rec.
Topics: electromagnetic waves, waveguides, transmission lines, dispersive media, radiation, special relativity, interference phenomena. Emphasis on physical concepts and developing ability to design/analyze microwave circuits and antenna arrays

## A\&EP 361 Introductory Quantum

 MechanicsSpring. 4 credits. Prerequisites: A\&EP 333 or Physics 318; coregistration in A\&EP 322 or equivalent and in A\&EP 356 or Physics 326. 3 lecs, 1 rec
A first course in the systematic theory of quantum phenomena. Topics include the harmonic oscillator, the Dirac formalism, angular momentum, the hydrogen atom, and perturbation theory

## A\&EP 363 Electronic Circuits (also Physics 360)

Fall, spring, summer. 4 credits. Prerequisite: Physics 208 or 213 or permission of instructor; no previous experience with electronics is assumed. EP students without AP credit are encouraged to take this in the spring of their sophomore year.

1 lec, 2 labs
Analyze, design, build, and test circuits used in scientific and engineering instrumentation (with discrete components and integrated circuits). Analog circuits: resistors, capacitors operational amplifiers (linear amplifiers, oscillators, comparators and Schmitt triggers), filters, diodes and transistors. Digital circuits: combinatorial and sequential logic (gates, flipflops, counters, shift registers, timers, one shots). Computer interfacing introduced and used to investigate digital-to-analog (DAC) and analog-to-digital conversion (ADC) techniques. DOS, Pascal, and machine language used. At the level of The Art of Electronics, by Horowitz and Hill

A\&EP 423 Statistical Thermodynamics
Fall. 4 credits. Prerequisite: Introductory three-semester physics sequence plus one year of junior-level mathematics

3 lecs, 1 rec.
Quantum statistical basis for equilibrium thermodynamics, microcanonical, canonical and grand canonical ensembles, and partition functions. Classical and quantum ideal gases, paramagnetic and multiple-state systems. Maxwell-Boltzmann, Fermi-Dirac, and BoseEinstein statistics and applications. Introduction to systems of interacting particles. At the level of Thermal Pbysics, by Kittel and Kroemer, and Statistical Pbysics, by Rosser

## A\&EP 434 Continuum Physics

Spring. 4 credits. Prerequisites: A\&EP 333 and 356 or equivalent

3 lecs, 1 rec.
Local conservation laws; stress, strain, and rate-of-strain tensors; equations of motion for elastic and viscous response; waves in solids and fluids; dislocations; ideal fluids, potential flow, Bernouli's equation, vorticity and circulation, lift; viscous incompressible flow and the Navier-Stokes equations, Reynolds number, Poiseuille flow in a pipe, Stokes drag on a sphere; boundary layers, Blasius equations; flow instabilities, Rayleigh-Benard convection and the onset of chaotic flow Introduction to turbulent flow.

## [A\&EP 436 Physical and Integrated

 Optics4 credits. Prerequisites: A\&EP 355, A\&EP 361, or equivalent or co-registration in A\&EP 361. Not offered 1994-95.

3 lecs, 1 lab.
The fundamentals of optics: diffraction, polarization, interference, birefringence, scattering, Fourier optics. Applications to optical waveguides, nonlinear optics, integrated optics, optical storage, coherent detection, optical communications. Emphasis on hands-on experimental laboratory demonstrations and computer synthesis of optical phenomena.]

## A8EP 438 Computational Engineering

 PhysicsSpring. 3 credits. Prerequisites: COMS 100, A\&EP 321, 333, 355, 361, or equivalent, or permission of instructor; co-registration in 361 permitted.

2 lecs, plus computer lab.
Numerical computation (derivatives, integrals, differential equations, matrices, boundaryvalue problems, relaxation, Monte Carlo methods, etc.) will be introduced and applied to engineering physics problems that cannot by solved analytically (three-body problem, electrostatic fields, quantum energy levels, etc.). Computer programming required (in C or optionally $\mathrm{C}++$, FORTRAN, or Pascal). Some prior exposure to programming assumed but no previous experience with $C$ assumed.

## AsEP 440 Quantum and Nonlinear Optics

Spring. 4 credits. Prerequisites: A\&EP 356, A\&EP 361 or equivalent.

3 lecs.
An introduction to the fundamentals of the interaction of laser light with matter. Topics include the propagation of laser beams in bulk media and in guided-wave structures, the origins of optical nonlinearities, harmonic generation, self-focusing, optical bistability, solitons, optical phase conjugation, optical resonance and two-level atoms, stimulated
absorption and emission, atom cooling and trapping, multiphoton processes, spontaneous and simulated scattering, mechanisms of ultrashort pulse generation, ultra intense lasermatter interactions.

AREP 484 Introduction to Controlled Fusion: Principles and Technology (also ELE E 484, M\&AE 559, and NS8E 484)
Spring. 3 credits. Not offered every year.
Prerequisites: Physics 112,213 , and 214 , or equivalent background in electricity and magnetism and mechanics, and permission of instructor. Intended for seniors and graduate students.

3 lecs.
For description see NS\&E 484.

## A\&EP 490 Independent Study in

 Engineering PhysicsCredit to be arranged.
Laboratory or theoretical work in any branch of engineering physics under the direction of a member of the faculty. The study can take a number of forms; for example, design of laboratory apparatus, performance of laboratory measurements, computer simulation or software developments, theoretical design and analysis. Details to be arranged with respective faculty member.
A\&EP 606 Introduction to Plasma Physics (also ELE E 581)
Fall. 4 credits. First-year graduate-level course; open also to exceptional seniors with permission of instructor. Prerequisites: A\&EP 355 or 356 , or EE 303 and 304, or equivalent. 3 lecs.
Plasma state; motion of charged particles in fields; drift-orbit theory; coulomb scattering, collisions; ambipolar diffusion; elementarytransport theory; two-fluid and hydromagnetic equations; plasma oscillations and waves; hydromagnetic stability; elementary applications to space physics and controlled fusion.

## A\&EP 607 Advanced Plasma Physics

 (also ELE E 582)Spring. 4 credits. Prerequisite: A\&EP 606 ELE E 581.

3 lecs.
Boltzmann and Vlasov equations; dielectric tensor; waves in hot magnetized plasma; Landau and cyclotron damping; microinstabilities; drift waves, low-frequency stability; test particles, Cerenkov emission; fluctuations; collisional effects; applications.
[A\&EP 609 Low-Energy Nuclear Physics Fall. 4 credits. Prerequisite: an introductory course in modern physics, including quantum mechanics. Offered alternate years. Not offered 1994-95.

3 lecs.
The nuclear interaction. Properties of ground and excited states of nuclei; models of nuclear structure; alpha, beta, gamma radioactivity; low-energy nuclear reactions-resonant and nonresonant scattering, absorption, and fission. At the level of Introduction to Nuclear Pbysics, by Enge.]

## AREP 612 Nuclear Reactor Theory

Fall. 4 credits. Prerequisites: a year of advanced calculus and some nuclear physics. 3 lecs.
Physical theory of fission reactors. Fission and neutron interactions with matter; theory of neutron diffusion; slowing down and thermalization; calculations of criticality and neutron-flux distribution in nuclear reactors.

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Reactor kinetics. At the level of Nuclear Reactor Theory, by Lamarsh.

A\&EP 615 Molecular Biophysics of Cellular Dynamics
To be arranged. 3 credits. Prerequisite: Graduate or senior level in either physical or biological science, or engineering.

2 lecs.
Current problems in the molecular biophysics of cell function, the nervous system and immunology: supramolecular organization of cells through spontaneous self assembly and physical basis of mesoscopic cellular structure; dynamics of receptor function, molecular mobility and motility; statistical thermodynamics of single ion channel molecules and neurotransmitter receptors in neuroscience; methods of imaging and measuring molecular dynamics of cellular function.

## A\&EP 633 Nuclear Engineering

Fall. 4 credits. Prerequisite: introductory course in nuclear engineering. The fundamentals of nuclear reactor engineering, reactor siting and safety, fluid flow and heat transfer, control, environmental effects, and radiation protection.

## A\&EP 634 Nuclear Engineering Design

 SeminarSpring. 4 credits. Prerequisite: A\&EP 633. A group design study of a selected nuclear system. Emphasis is on safety, siting, and radiation protection in the design of nuclear systems.

A\&EP 638 Intense Pulsed Electron and Ion Beams: Physics and Technology Spring. 2 credits. Prerequisites: A\&EP 606 (ELE E 581) and 607 (ELE E 582) or equivalent, or permission of instructor. Offered when demand warrants.
Topics include (1) theoretical aspects of intense electron and ion beams, such as equilibria and stability; (2) technology of intense beam production, such as pulsedpower generator principles, and electron and ion diode operation; and (3) applications of intense beams, such as to controlled fusion, microwave generation, and laser pumping. Extensive discussion of experimental results.

## A\&EP 651 Nuclear Measurements

 LaboratorySpring. 4 credits. Prerequisite: A\&EP 609 or equivalent. Primarily for graduate students in nuclear fields. A less-intensive related course, NS\&E 551, is intended for students in nonnuclear fields in which nuclear methods are used.

One one-hour lecture and two two-and-a-half-hour labs. D. D. Clark. Lectures on interaction of radiation with matter, radiation protection, and nuclear instruments and methods. About fifteen experiments are available in radiation detection, attenuation, and measurement; electronic instrumentation, including computerized systems; activation analysis; neutron radiography; neutron moderation and reactor physics; neutron diffraction; and lowenergy nuclear physics with neutron beams. The TRIGA reactor and the Zero Power Reactor critical facility are used. Students select seven or eight experiments to meet their interests and needs. At the level of Radiation Detection and Measurement, by Knoll.

A\&EP 661 Microcharacterization Fall. 3 credits. Prerequisites: introductory three-semester physics sequence or an introductory course in modern physics. At the senior/first-year graduate level.
The basic physical principles underlying the many modern microanalytical techniques available for characterizing materials from volumes less than a cubic micron. Discussion centers on the physics of the interaction process by which the characterizatation is performed, the methodology used in performing the characterization, the advantages and limitations of each technique, and the instrumentation involved in each characterization method.

## A\&EP 662 Micro/Nano-fabrication and Processing

Spring. 3-4 credits ( 3 credits plus 1 credit for optional laboratory)

Several field trips.
An introduction to the fundamentals of micro and nano-fabricating and patterning thin-film materials and surfaces, with emphasis on electronic materials. Vacuum and plasma thin-film deposition processes. Photon, electron, X-ray, and ion-beam lithography. Techniques for pattern replication by plasma and ion processes. Emphasis is on understanding the physics and materials science that define and limit the various processes. At the level of Brodie and Muray.

## A\&EP 681-689 Special Topics in Applied Physics

Topics, instructors, and credits to be announced each term. Typical topics include quantum superconducting devices, physics of submicron conductors, nonlinear fluctuators, biophysical processes, molecular fluorescence.

## A\&EP 711 Principles of Diffraction (also

 MS\&E 610)Spring. 4 credits. Offered alternate years. Introduction to diffraction phenomena as applied to solid-state problems. Scattering and absorption of neutrons, electrons, and X-ray beams, with particular emphasis on synchrotron radiation X-ray sources. Diffraction from two- and three-dimensional periodic lattices. Fourier representation of scattering centers and the effect of thermal vibrations. Diffraction from almost periodic structures, surface layers, gases, and amorphous materials. Survey of dynamical diffraction from perfect and imperfect lattices. Several laboratory experiments will be conducted.

## A8EP 751/752 Project

751 , fall and spring. $6-12$ credits to be arranged. Required for candidates for the M.Eng. (Engineering Physics) degree. Independent study under the direction of a member of the university faculty. Students participate in an independent research project through work on a special problem related to their field of interest. A formal and complete research report is required.

## AREP 753 Special Topics Seminar in Applied Physics

Fall. 4 credits. Prerequisite: undergraduate physics. Required for candidates for the M.Eng. (Engineering Physics) degree and recommended for seniors in engineering physics.
Special topics in applied science, with focus on areas of applied physics and engineering that are of current interest. Subjects chosen are researched in the library and presented in a seminar format by the students. Effort is
made to integrate the subjects within selected subject areas such as atomic, biological, computational, optical, plasma, and solid-state physics, or microfabrication technology, as suggested by the students and coordinated by the instructor.

## CHEMICAL ENGINEERING

## CHEME 101 Nonresident Lectures

Spring. 1 credit.
1 lec. F. Rodriguez and guest lecturers. Given by lecturers invited from industry and from selected departments of the university to assist students in their transition from college to industrial life.
CHENE 112 Introduction to Chemical Engineering lalso ENGRI 112)
Fall, spring. 3 credits. Limited to freshmen. 2 lecs, 1 rec. T. M. Duncan, P. Clancy. For description see Engineering Common Courses.

## CHEME 219 Mass and Energy Balances

 (also ENGRD 219)Fall. 3 credits. Corequisite: physical or organic chemistry or permission of instructor.

3 lecs. 1 computing session. C. Cohen.
For description see Engineering Common Courses.

## CHEME 313 Chemical Engineering

 ThermodynamicaFall. 4 credits. Corequisite: physical chemistry.

4 lecs, 1 computing session. P. Clancy, K. E. Gubbins. A study of the first and second laws, with application to batch and flow processes. Thermodynamic properties of fluids; applications of thermodynamics to compressors, power cycles, refrigeration; thermodynamic analysis of processes. Thermodynamics of mixtures, phase equilibria and phase diagrams. Estimation methods. Heat effects, chemical equilibria.

## CHEME 323 Fluid Mechanics

Fall. 3 credits. Prerequisites: CHEME 219 and engineering mathematics sequence.

3 lecs, 1 computing session.
W. L. Olbricht.

Fundamentals of fluid mechanics. Macroscopic and microscopic balances. Applications to problems involving viscous flow.
CHEME 324 Heat and Mass Transfor Spring. 3 credits. Prerequisite: CHEME 323. 3 lecs, 1 computing session. P. H. Steen, W. B. Streett.

Fundamentals of heat and mass transfer. Macroscopic and microscopic balances. Applications to problems involving conduction, convection, and diffusion.

## CHEME 332 Analyais of Separation Processes

Spring. 4 credits. Prerequisites: CHEME 313 and 323.

3 lecs, 1 computing session. P. Harriott,
K. E. Gubbins.

Analysis of separation processes involving phase equilibria and mass transfer; some use of the digital computer. Phase equilibria; binary and multicomponent distillation; liquidliquid extraction; gas absorption, absorption, membrane separations.

CHEME 390 Reaction Kinetics and Reactor Design
Spring. 3 credits. Prerequisites: CHEME 313 and 323.

3 lecs, 1 computing session.
T. M. Duncan.

A study of chemical reaction kinetics and principles of reactor design for chemical processes

## CHEME 432 Chemical Engineering

 LaboratoryFall. 4 credits. Prerequisites: CHEME 323, 324, 332, and 390.

3 lecs, 1 lab. F. Rodriguez and staff. Laboratory experiments in fluid dynamics, heat and mass transfer, kinetics, other operations. Correlation and interpretation of data. Technical report writing.
CHEME 462 Chemical Process Design Spring. 4 credits. Prerequisite: CHEME 432. Staff.
A consideration of process and economic alternatives in selected chemical processes; design and assessment.

## CHEME 472 Process Control

Spring. 3 credits. Prerequisites: CHEME 324 and 390.

3 lecs, 1 lab. J. R. Engstrom.
Analysis of the dynamics of chemical processes and design of feedback and feedforward control systems. Laplace tranform techniques; stability analysis; frequency-response analysis. An introduction to multivariable control. The laboratory includes experiments on transient response, frequency response, controller tuning, and discussions of typical process instrumentation.

## CHEME 481 Biomedical Engineering

Fall. 3 credits. Prerequisite: CHEME 324 or equivalent or permission of instructor.

3 lecs. D. A. Hammer.
Special topics in biomedical engineering, including cell separations, blood flow, design of artificial devices, biomaterials, image analysis, biological transport phenomena, pharmacokinetics and drug delivery, biomedical transducers (ECG and pace makers), and analysis of physiological processes such as adhesion, mobility, secretion, and growth.

## CHEME 490 Undergraduate Projects in

 Chemical EngineeringFall, spring. Variable credit.
Research or studies on special problems in chemical engineering.
CHEME 520 Chemical, Pharmaceutical, and Food Processing
Spring. Variable to 3 credits. Prerequisite: seniors or M.Eng. students with one term of college chemistry.
C. Cohen, R. Finn, and S. Mulvaney. This course consists of three equal parts, each worth one credit. The chemical part is open to non-chemical engineers only and covers process fundamentals, design, and control of continuous large-scale chemical processes. Pharmaceutical processing covers fermentation, purification, and sterilization. Food processing emphasizes food preservation principles and technology.

CHEME 564 Design of Chemical Reactors
Spring. 3 credits. Prerequisite: CHEME 390 or equivalent.

3 lecs. P. Harriott.

Design, scale-up, and optimization of chemical reactors with allowance for heat and mass transfer and nonideal flow patterns. Homework problems feature analysis of published data for gas-solid, gas-liquid, and three-phase reaction systems.

## CHEME 565 Design Project

Fall, spring. 3 or 6 credits. Required for students in the M.Eng.(Chemical) program. Staff.
Design study and economic evaluation of a chemical processing facility, alternative methods of manufacture, raw-material preparation, food processing, waste disposal, or some other aspect of chemical processing.

## [CHEME 566 Systematic Methods for

 Process DesignSpring. 3 credits. Prerequisite: CHEME 332 or equivalent. Not offered 1994-95. 3 lecs.
An introduction to the synthesis and use of computer systems for steady-state simulation of chemical processes. Systematic design methods for vapor-liquid processes, including synthesis methods for separation systems and heat exchanger networks.]

## CHEME 590 Special Projects in Chemical Engineering

Fall, spring. Variable credit. Limited to graduate students.
Non-thesis research or studies on special problems in chemical engineering.

## CHEME 640 Polymeric Materials

Fall. 3 credits.
3 lecs. F. Rodriguez.
Chemistry and physics of the formation and characterization of polymers. Principles of fabrication.

## CHEME 642 Polymeric Materials Laboratory

Spring. 2 or 3 credits. Prerequisite: CHEME 640.

> F. Rodriguez.

Experiments in the formation, characterization, fabrication, and testing of polymers.

## CHEME 643 Introduction to Bioprocess

 EngineeringFall. 3 credits. Prerequisite: CHEME 390 or permission of instructor. No prior background in the biological sciences required.

3 lecs. M. L. Shuler.
A discussion of principles involved in using microorganisms, tissue cultures, and enzymes for processing. Application to food, fermentation, and pharmaceutical industries and to biological waste treatment.

## [CHEME 645 Advanced Concepts in Biological Engineering

Spring. 3 credits. Prerequisite: CHEME 643 or equivalent or permission of instructor. Not offered 1994-95.

3 lecs. D. A. Hammer.
Fundamentals of biochemical and biomedical engineering, with additional emphasis on cell and membrane biophysics. Topics include cell-surface receptor phenomena, protein diffusion, cell adhesion, membrane biophysics, cell motility and growth, mathematical immunology, virus binding and infection, enzyme catalysis, bioseparation, and genetically modified organisms.]

## [CHEME 648 Polymers in Electronics and Related Areas

Spring. 3 credits. Prerequisite: 640 or permission of instructor. Not offered 1994-95.

3 lecs. F. Rodriguez
Applications of polymers as resists for microlithography, as insulators, and as conductors. Radiation effects, polymer synthesis, and surface characterization. Additional special topics may be covered.]

## [CHEME 650 Reaction and Transport in Gas-Solid Systems

Spring. 3 credits. Prerequisite: CHEME 390 or permission of instructor. Not offered 1994 95.

3 lecs. J. R. Engstrom and A. B. Anton. Analysis of processes for materials synthesis and modification that involve gas-solid interactions, including chemical-vapor deposition, plasma etching, and heterogeneous catalysis. Focuses on the physiochemical processes that underlie these technologies, including mechanisms of vapor transport; energy and heat transfer; thermodynamic relationships between the vapor, adsorbed and solid phases; and both homogeneous and heterogeneous reaction kinetics.]

## [CHEME 656 Separations Using

Membranes or Porous Solids
Spring. 3 credits. Prerequisites: ChemE 324 and 332. Not offered 1994-95.

3 lecs. P. Harriott.
Diffusion of small molecules in gases, liquids, and solids. Membrane separation processes including gas separation, pervaporation, reverse osmosis, and ultrafiltration. Purification of gases and liquids by adsorption, ion exchange, and chromatography.]

## CHEME 661 Air Pollution Control

Fall. 3 credits.
3 lecs. P. Harriott.
Origin of air pollutants, U.S. emission standards, dispersion equations. Design of equipment for removal of particulate and gaseous pollutants formed in combustion and chemical processing.

## [CHEME 673 Adsorption and Reactions on Chemically Reactive Solids

Fall. 3 credits. Not offered 1994-95.
3 lecs. R. P. Merrill.
The physics and chemistry of reactions at solid surfaces are presented in molecular detail. The emphasis is on the use of modern spectroscopic techniques to determine the geometric structure, electronic properties, and reaction sequences on well-defined surfaces. Examples from the preparation of optoelectronic materials and from catalysis will be given to illustrate the concepts and principles presented.]

## CHEME 675 Synthetic Polymer Chemistry (also MS\&E 671 and Chemistry 671)

Fall. 4 credits. Prerequisites: Chem 359-360 or equivalent or permission of instructor. MS\&E 620 is recommended.

3 lecs. J. M. J. Frechet.
For description see Chemistry 671

## [CHEME 681 Dynamics of Colloidal

 SystemsFall. 3 credits. Prerequisite: basic understanding of thermodynamics and fluid dynamics. Offered alternate years. Not offered 1994-95. 3 lecs. A. Z. Panagiotopoulos and W. L. Olbricht.

Fundamental descriptions of colloidal systems under equilibrium and non-equilibrium conditions. Phase equilibria of surfactant systems, thermodynamics of micelle formation, forces between colloidal particles,
electrokinetic phenomena, flocculation and aggregation, transport of surfactant in interfacial systems, stability of emulsions, and dynamics of thin films. Open to advanced undergraduates and graduate students from all fields.]

## CHEME 711 Advanced Chemical

 Engineering Thermodynamics Fall. 3 credits. Prerequisite: CHEME 313 or equivalent.3 lecs. A. Panagiotopoulos Postulatory approach to thermodynamics. Legendre transformations. Equilibrium and stability of general thermodynamic systems. Applications of thermodynamic methods to advanced problems in chemical engineering Introduction to statistical mechanical ensembles, phase transitions, Monte Carlo methods, and theory of liquids.

CHEME 713 Chemical Kinetics and Dynamics
Fali. 3 credits. Prerequisite: CHEME 390 or equivalent.

3 lecs. J. R. Engstrom
Microscopic and macroscopic viewpoints Connections between phenomenological chemical kinetics and molecular reaction dynamics. Reaction cross sections, potential energy surfaces, and dynamics of bimolecular collisions. Molecular beam scattering. Transition state theory. Unimolecular reaction dynamics. Complex chemically reacting systems: reactor stability, multiple steady states, oscillations, and bifurcation. Reactions in heterogeneous media. Free-radical mechanisms in combustion and pyrolysis

## CHEME 721 Thermodynamics and Phase

 Change Heat Transfer (also M\&AE 652)Spring. 4 credits. Prerequisite: graduate standing or permission of instructor.
C. T. Avedisian

For description see M\&AE 652.
CHEME 731 Advanced Fluid Mechanics and Heat Transfer
Fall. 3 credits. Prerequisites: CHEME 323 and 324 or equivalent.

3 lecs. D. L. Koch.
Derivation of the equations of motion for Newtonian fluids. Low Reynolds number fluid dynamics, lubrication theory, inviscid fluid dynamics. Boundary layer theory. Convective and conductive heat transfer

CHEME 732 Diffusion and Mass Transfor
Spring. 2 credits. Prerequisite: CHEME 731 or equivalent.

2 lecs. D. L. Koch
Conservation equations in multicomponent systems, irreversible thermodynamics, dispersion, and Brownian diffusion. Mass transfer for convective diffusion in liquids. Application to a variety of problems such as coagulation of aerosols, diffusion through films and membranes, liquid-liquid extraction, chemical vapor deposition, polymer rheology and diffusion, and reaction-diffusion systems

## CHEME 734 Fluid Mechanics of

 SuspensionsSpring. 3 credits. Prerequisites: CHEME 731, M\&AE 601, or equivalent. Offered alternate years. Not offered 1994-95
Relationship between macroscopically observed transport and rheological behavior of suspensions and composites, and underly ing transport processes occurring on the particle-length scale. Methods of treating interparticle hydrodynamic interactions.

Derivation of macroscopic properties using ensemble averages, renormalization, and dynamic simulations. Applications will include free suspensions of solid spheres, fibers, and bubbles; composite solids; and porous media.]

## CHEME 741 Selected Topics in Biochemical Engineering

Fall. 1 credit (may be repeated for credit). Prerequisite: CHEME 643 or permission of instructor.
M. L. Shuler.

Discussion of current topics and research in biochemical engineering for graduate students.

CHEME 745 Physical Polymer Science I
Fall. 3 credits. Prerequisite: CHEME 711 or equivalent. Offered alternate years C. Cohen.

Thermodynamic properties of dilute, semidilute, and concentrated solutions from both classical and scaling approaches. Characterization techniques of dilute solutions osmometry, light scattering, viscometry, and sedimentation. Rubber elasticity; mechanical and thermodynamic properties of gels. Polymer melts: equations of state and glass transition phenomena

## CHEME 751 Mathematical Methods of

 Chemical Engineering AnalysisFall. 4 credits
3 lecs. P. H. Steen.
Application of advanced mathematical techniques to chemical engineering analysis. Mathematical modeling, scaling, regular and singular perturbation, multiple scales, asymptotic analysis. Linear and nonlinear ordinary differential equations, partial differential equations.

## [CHEME 753 Analysis of Nonlinear

 Systems: Stability, Bifurcation, and ContinuationFall. 3 credits. Prerequisite: CHEME 751 or equivalent. Offered alternate years. Not offered 1994-95

3 lecs. P. H. Steen.
Elements of stability and bifurcation theory Branch-following techniques. Stability of discrete and continuous systems. Application to elasticity, reaction-diffusion, and hydrodynamic systems using software for continuation problems.]
CHEME 772 Theory of Molecular Liquids Spring. 3 credits. Prerequisite: CHEME 711 or equivalent. Offered alternate years
K. E. Gubbins.

Theory of intermolecular forces, and equilibrium statistical mechanics for nonspherical molecules. Distribution functions. Applications to thermodynamics of such fluids using integral equation and perturbation theory techniques. Mixture properties, phase diagrams for mixtures with polar or quadrupolar components. Surface properties.

## [CHEME 774 Atomistic Simulation of

 MaterialsSpring. 3 credits. Prerequisite: Competence in FORTRAN, PASCAL, or C. Prior knowledge of statistical mechanics helpful. Offered alternate years. Not offered 1994-95

2 lecs, 1 computer lab
A. Panagiotopoulos.

The statistical mechanical theory behind Monte-Carlo and Molecular-Dynamics computer-simulation techniques. Strong emphasis is placed on students writing their
own MC and MD code. Calculation of distribution functions, thermodynamic, kinetic and structural properties. Introduction to the application of computer graphics to simulation. Interparticle forces and application of atomistic simulation of systems containing metals, semiconductors, and biological materials. Issues of code efficiency and vectorization.]

## CHEME 790 Seminar

Fall, spring. 1 credit each term.
J. R. Engstrom.

General chemical engineering seminar required of all graduate students in the Field of Chemical Engineering

## CHEME 792 Advanced Seminar in

 ThermodynamicsFall, spring. 1 credit.
P. Clancy, A. Panagiotopoulos

A forum for talks by graduate students and faculty members on topics of current interes in thermodynamics and statistical mechanics.

CHEME 793 Advanced Seminar in Applied Spectroscopy
Fall, spring. 1 credit.
T. M. Duncan.

A forum for talks by graduate students, faculty members, and visiting scientists on topics of current interest in applied spectroscopy.

## CHEME 890 Thesis Research

Fall, spring. Variable credit
Thesis research for the M.S. degree in
chemical engineering
CHEME 990 Thesis Research
Fall, spring. Variable credit.
Thesis research for the Ph.D. degree in chemical engineering.

## CIVIL AND ENVIRONMENTAL ENGINEERING

## General

CEE 113 Environmental Systems Engineering (also ENQRI 113
Fall. 3 credits
2 lecs, 1 sec. W. Lynn.
For description see Engineering Common Courses

CEE 116 Modern Structures (also ENGRI 116)

Fall, spring, 3 credits
2 lecs, 1 sec . Fall: M. Sansalone; spring
G. G. Deierlein

For description see Engineering Common Courses.
[CEE 120 Readings on the Environment
Spring. 1 credit. Not offered 1994-95 C. A. Shoemaker.

A reading course from an introductory environmental text. Topics include structure and dynamics of ecosystems, water habitats and communities, water resources, toxic-waste pollution of surface and groundwater, international water-pollution problems, energy resources, nuclear-waste disposal, hydroelectric power, environmental carcinogens. Not available to students receiving credit for ENGRI 113 or Natural Resources 201.]

CEE 241 Engineering Computation (also ENGRD 241)
Spring. 3 credits. Prerequisites: COM S 100 and Math 293. Corequisite: Math 294.

2 lecs, 1 rec, 2 evening exams. Staff. For description see Engineering Common Courses.

## CEE 304 Uncertainty Analysis in Enginearing

Fall. 4 credits. Prerequisite: first-year calculus.
J. Stedinger or M. Grigoriu An introduction to probability theory, statistical techniques, and uncertainty analysis, with examples drawn from civil, environmental, agricultural, and related engineering disciplines. The course covers data presentation, probability theory, commonly used probability distributions, parameter estimation, goodness-of-fit tests, confidence intervals, hypothesis testing, simple linear regression, and nonparametric statistics. Examples include structural reliability, models of vehicle arrivals, analysis of return-period calculations, total quality management, and distributions describing wind speeds, floods, pollutant concentrations, and soil and material properties

## CEE 309 Special Topics in Clvil and

 Environmental EngineeringFall, spring. $1-6$ credits.
Staff.
Supervised study by individuals or groups of upper-division students on an undergraduate research project or on specialized topics not covered in regular courses.
CEE 400 Senior Honors Thesis
Fall, spring. Variable credits.
Staff.
Available to students admitted to the CEE Honors Program. Supervised research or project work resulting in an honors thesis.

## CEE 501 Civil and Environmental

 Engineering Design Project I Fall. 3 credits. Required for students in the M.Eng.(Civil) program.School faculty and visiting engineers. Design of major civil engineering project Planning and preliminary design in fall term; final design in January intersession (CEE 502)

CEE 502 Civil and Environmental Engineering Design Project II Spring (work done during January intersession). 3 credits. Required for students in the M.Eng.(Civil) program. Prerequisite: CEE 501 School faculty and visiting engineers. A continuation of CEE 501.

## CEE 503 Professional Practice in Engineering

Spring. 3 credits. Required for and limited to students in the M.Eng.(Civil) program. W. R. Lynn.

Financial, legal, regulatory, ethical, and business aspects of engineering practice are examined in detail. Students are expected to develop their understanding of the interrelations among the physical, social, economic, and ethical constraints on engineering design.

## CEE 601 Water Resources and

 Environmental Engineering SeminarFall. 1 credit. Staff.
Presentation of topics of current interest

## Remote Sensing

[CEE 411 Remote Sensing: Environmental Applications (also SCAS 461)
Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95

2 lecs, 1 lab.
A survey of how remote sensing is applied in various environmental disciplines. Laboratory emphasis is on using aircraft and satellite imagery for inventorying and monitoring surface features in engineering, planning,
agriculture, and natural resource assessments.]

## CEE 610 Remote Sensing Fundamentals

 (also Agronomy 660)Fall. 3 credits. Prerequisite: permission of instructor.

2 lecs, 1 lab. W. D. Philpot.
An introduction to equipment and methods used in obtaining information about earth resources and the environment from aircraft or satellite. Coverage includes sensors; sensor and ground-data aquisition; data analysis and interpretation; and project design.

## CEE 615 Digital Image Processing

Spring. 3 credits. Prerequisites: facility with algebra and trigonometry (Mathematics 109) and statistics (CEE 304 or Agricultural Economics 310), or permission of instructor.

$$
2 \text { lecs, } 1 \text { lab. W. D. Philpot. }
$$

An introduction to digital image-processing concepts and techniques, with emphasis on remote-sensing applications. Topics include image acquisition, enhancement procedures, spatial and spectral feature extraction, and classification. Assignments will require the use of image-processing software and graphics.
[CEE 616 Digital Image Analyais
Spring. 3 credits. Prerequisites: calculus (Mathematics 192), statistics (CEE 304 or Agricultural Economics 310), and computer programming (FORTRAN or C), or permission of instructor. Not offered 1994-95.

2 lecs, 1 lab. W. D. Philpot.
Pattern recognition, feature extraction, and classification of digital images as used in remote-sensing applications. Both spectral and spatial patterns will be considered. Assignments will require the development of computer programs and will make use of existing image-processing software and graphics.]
CEE 617 Project-Remote Sensing On demand. 1-6 credits.

## Staff.

Students may elect to undertake a project in remote sensing. The work is supervised by a professor in this subject area.

## CEE 618 Special Topics-Remote

 SensingOn demand. 1-6 credits. Staff.
Supervised study in small groups on one or more special topics not covered in the regular courses. Special topics may be of a theoretical or applied nature.

## CEE 619 Seminar in Remote Sensing (also SCAS 662)

Spring. 1 credit. S-U grades only Staff.
Lectures on current developments in assessing earth resources or the environment. Each week a different topic on remote sensing or geographic information systems is presented by specialists from government, industry,

Cornell, or other research or academic institutions.

## CEE 710 Research-Remote Sensing

On demand. $1-6$ credits.
Staff.
For students who want to study one particular area in depth. The work may take the form of laboratory investigation, field study, theoretical analysis, or development of design procedures.

CEE 810 Thesis-Remote Sensing
Fall, spring. 1-12 credits. Students must register for credit with the professor at the start of each term.
A thesis research topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Environmental and Public Systems

See also CEE 120.
CEE 323 Engineering Economics and Management (also ENGRG 323)
Spring; usually offered in summer for Engineering Co-op Program. 3 credits Primarily for juniors and seniors. D. P. Loucks.

For description see Engineering Common Courses.

## CEE 422 The Economics of Infrastructure and a Sustainable Environment

Fall. 4 credits. Prerequisite: Mathematical version of intermediate micro-economics (CEE 321 or ECON 203 or 313).

2 lecs, final exam. R. E. Schuler. Course examines the broad economic, physical, and ecological environments in which products, projects and/or engineered systems are implemented. Market failures that must be corrected to sustain a modern industrial economy are studied, including problems of the environment, public goods, renewable resources, scale economies, urbanization, demographics and economic development. Important planning tools presented include methods for assessing project demand, cost-benefit analysis, choosing the proper discount rate, dealing with uncertainty, financial constraints, and when and how to price. Also discussed are problems of sustainability and global climate change, the allocation of scarce and previously nonmarketed resources, and the planning and management of activities with uncertain environmental consequences.

## [CEE 423 Environmental Quality Systems

 AnalysisSpring. 3 credits. Prerequisites: Math 294 and optimization (CEE 323 or ABEN 475, OR\&IE 320). Intended for undergraduates who have not taken ABEN 320 or ABEN 475. Most lectures concurrent with CEE 623. Not offered 1994-95.

3 lecs. C. A. Shoemaker
Applications of optimization and simulation methods to the development of plans and the design and operation of facilities for managing environmental quality. Algorithms for nonlinear programming, linear programming, and sensitivity analysis. See description of CEE 623 for water quality applications.]

## [CEE 529 Water and Environmental

 Resources Problems and PoliciesFall. 3 credits. Intencled primarily for graduate engineering and non-engineering students but open to qualified upperclass students. Prerequisite: permission of instructor. Not offered 1994-95.

Lec-disc. D. Allee, L. Dworksy
Evaluation, appraisal, and prospects for problems involving water and environmental resources. Organization and public policies in the federal system.]

CEE 620 Water-Resources Systems I Fall. 3 credits. Prerequisite: CEE 323 or equivalent.
D. P. Loucks

Development and application of deterministic and stochastic optimization and simulation models for water-resources planning and management. River-basin modeling, including reservoir design and operation, irrigation planning and operation, hydropower-capacity development, flow augmentation, flood control and protection, and water-quality prediction and control.
CEE 621 Water-Resources Systems II Spring. 3 credits. Prerequisites: CEE 304 and 620 or permission of instructor.
J. R. Stedinger, D. P. Loucks.

Advanced topics in the development and use of optimization and simulation models for water-resources planning. Stochastic
hydrologic modeling and stochastic river-basin and reservoir models. Incorporates material in CEE 622.
CEE 622 Stochastic Mydrologic Modeling On demand. 2-3 credits. Prerequisite: CEE 304 or equivalent.

> J. R. Stedinger.

Develops statistical techniques used to analyze and model stochastic processes. Examination of Box-Jenkins, fractional-Brownian noise, and other single- and multiple-site stream-flow models; review of flood-frequency estimation issues; analysis of simulation output; parameter estimation and Bayesian inference.

## [CEE 623 Environmental Quality Systems Analysis

Spring. 3 credits. Prerequisites: Math 294 and optimization (ABEN 475, CEE 593, OR\&IE $320 / 520$ or permission of instructor). Not offered 1994-95.
C. A. Shoemaker

Applications of optimization, simulation methods, and uncertainty analysis to the design and operation of facilities for managing the quality of surface- and groundwater. Applications include location of wastewater, solid waste, and hazardous-waste facilities, restoration of dissolved oxygen levels in rivers, and reclamation of contaminated aquifers. Optimization applications use linear programming, and integer, dynamic, and nonlinear programming.!

## CEE 628 Environmental and Water

 Resources Systems Analysis SeminarSpring. 1 credit.
J. R. Stedinger

Graduate students and faculty members give informal lectures on various topics related to environmental or water resources systems planning, analysis, and on-going research.

CEE 722 Environmental and Water Resources Systems Analysis

## Research

On demand. Variable credit. Prerequisite: permission of instructor. Preparation must be suitable to the investigation to be undertaken. Staff.
Investigations of particular environmental or water resources systems problems.

## CEE 729 Special Topics in

 Environmental or Water Resources Systoms AnalysisOn demand. Variable credit.
Staff.
Supervised study, by individuals or small groups, of one or more specialized topics not covered in regular courses.

## CEE 820 Thesis-Environmental and Water Resource Systems

Fall, spring. 1-12 credits. Students must register for credit with the professor at the start of each term.
A thesis research topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Fluid Mechanics and Hydrology

CEE 331 Fluid Mechanics
Fall. 4 credits; usually offered in summer for Engineering Co-op Program. Prerequisite: Engr 203 (may be taken concurrently).

3 lecs, 1 rec, evening exams. Staff. Hydrostatics, the basic equations of fluid flow, potential flow and dynamic pressure forces, viscous flow and shear forces, steady pipe flow, turbulence, dimensional analysis, openchannel flow. Elements of design in water supply systems, canals, and other hydraulic schemes.

## CEE 332 Hydraullc Engineering

Spring. 4 credits. Prerequisite: CEE 331
2 lecs, 1 lab, field trip. Staff.
Application of fluid-mechanical principles to problems of engineering practice and design: hydraulic machinery, water-distribution systems, open-channel design, river engineering, groundwater flow, and pollutant dispersal. Lectures supplemented by laboratory work and a design project.

## CEE 431 Geohydrology (also ABEN 471

 and CEOL 445)Fall. 3 credits. Prerequisite: permission of instructor.
W. H. Brutsaert and others.

An intermediate course in aquifer geology, groundwater flow, and related design factors. Includes description and properties of natural aquifers, groundwater hydraulics, soil water, and solute transport

## CEE 432 Hydrology

Spring. 3 credits. Prerequisite: CCE 331. Intended for undergraduates. Lectures concurrent with CEE 632.

3 lecs. W. H. Brutsaert.
Introduction to hydrology as a description of the water cycle and the role of water in the natural environment, and other issues for environmental engineers. See description for CEE 632.

## CEE 433 Pollutant Transport and

 Transformation in the Environment Fall. 3 credits. Prerequisite: CEE 331. Intended for undergraduates. Lectures concurrent with CEE 655.3 lecs. J. J. Bisogni, G. H. Jirka. Introduction to the physical transport and chemical and biochemical transformation processes that govern the fate and distribution of pollutants in the environment. See description for CEE 655.

## CEE 630 Advanced Fluid Mechanics

Fall. 3 credits. Prerequisite: CEE 331
Offered alternate years.
3 lecs. J. A. Liggett.
Introduction to tensor analysis; conservation of mass, momentum, and energy. Rigorous treatment includes study of exact solutions of the Navier-Stokes equations. Asymptotic approximations at low and high Reynolds numbers. Similitude and modeling. Laminar diffusion of momentum, mass, and heat.

## CEE 631 Flow and Contaminant

Transport Modeling in Groundwater Spring. 3 credits. Prerequisites: Mathematics 294 or equivalent, Engr 241 or experience in numerical methods and programming, and elementary fluid mechanics.
J. A. Liggett.

Potential flows and their calculation. Numerical methods include finite difference, finite elements, and boundary elements. Fundamental equations of saturated and unsaturated flow in porous media. Flow in fractured media. Numerical modeling of transport in porous media. Diffusion and advective diffusion in one, two, and three dimensions. Anisotropy. Additional terms for reactive substances. The course will include the use of computer programs.

## CEE 632 Hydrology

Spring. 3 credits. Prerequisite: CEE 331. W. H. Brutsaert.

Physical and statistical prediction methods for design related to hydrologic processes. Hydrometeorology and evaporation. Infiltration and base flow. Surface runoff and channel routing. Linear and nonlinear hydrologic systems. Storage routing and unit hydrograph methods.

## [CEE 633 Flow in Porous Media and

 GroundwaterFall. 3 credits. Prerequisite: CEE 331. Not offered 1994-95.
W. H. Brutsaert.

Fluid mechanics and equations of single-phase and multiphase flow; methods of solution Applications involve aquifer hydraulics, pumping wells; drought flows; infiltration. groundwater recharge; land subsidence; seawater intrusion, miscible displacement; transient seepage in unsaturated materials.]

## CEE 634 Boundary Layer Meteorology

 Fall. 3 credits. Prerequisite: CEE 331 or permission of instructor.3 lecs. W. H. Brutsaert.
Physical processes in the lower atmospheric environment: turbulent transport in the atmospheric boundary layer, surface-air interaction, disturbed boundary layers, radiation. Applications include sensible and latent heat transfer from lakes, plant canopy flow and evapotranspiration, turbulent diffusion from chimneys and cooling towers, and related design issues.

## [CEE 635 Coastal Engineering I

Spring. 3 credits. Prerequisite: CEE 331. Not offered 1994-95.

3 lecs. P. L.-F. Liu.
Linear wave theory, wave generation by wind, analysis of fluid forces on floating and fixed coastal structures and modification of waves
and currents by these structures, coastal processes, and coastal sediment motion.]
[CEE 636 Environmental Fluid Mechanics Spring. 3 credits. Prerequisite: CEE 655 or permission of instructor. Offered alternate years. Not offered 1994-95.
G. H. Jirka.

Mass- and heat-transport processes in the environment and their interaction with pollutant discharges. Mechanics of discretely and continuously stratified fluids, internal waves, density currents, selective withdrawal, and baroclinic motions. Flow stability, mixing, and turbulence. Turbulent diffusion and shear flow dispersion, including effects of buoyancy. Convective instabilities and mixedlayer dynamics. Concentrated sources of momentum and buoyancy: jets and plumes and their behavior in the environment. Applications to mixing processes in rivers, lakes, the ocean, and the atmosphere.]

## CEE 638 Hydraulics Seminar

Spring. 1 credit. Open to undergraduates and graduates and required of graduate students majoring in hydraulics or hydraulic engineering.

## Staff.

Topics of current interest in fluid mechanics, hydraulic engineering, and hydrology.

CEE 639 Special Topics in Hydraulics On demand. Variable credit. Staff.
Special topics in fluid mechanics, hydraulic engineering, or hydrology
[CEE 730 Coastal Engineering II
Spring. 3 credits. Prerequisite: CEE 635. Not offered 1994-95.

3 lecs. P. L.-F. Liu.
Review of linear and nonlinear theories for ocean waves, applicability of different wave theories to engineering problems, waveenergy transmission, tsunamis, behavior of submerged and floating bodies, harbor agitations, ship waves.]

## [CEE 732 Computational Hydraulics

Fall. 3 credits. Prerequisite: elementary fluid mechanics or permission of instructor. Offered alternate years. Not offered 1994-95. J. A. Liggett.

Numerical methods for solving hydraulics and fluid-mechanics problems. Solutions for elliptic, parabolic, and hyperbolic equations. Finite-difference, finite-element, and bound-ary-integral methods.]

## [CEE 734 Experimental Methods in Hydraulics

On demand. 2 credits. Prerequisite: CEE 331. Not offered 1994-95.

## G. H. Jirka.

Methods used in planning and conducting laboratory and field experiments in hydraulics and fluid mechanics. Dynamic similarity, modeling laws, and applications. General operating principles and performance characteristics of measurement instruments. Specific devices for measurement of fluid properties, pressure, and flow. Data acquisition, processing, and signal analysis. Laboratory demonstrations.]
CEE 735 Research in Hydraulics
On demand. Variable credit Staff.
The student may select an area of investigation in fluid mechanics, hydraulic engineering, or hydrology. The work may be either experimental or theoretical in nature. Results
should be submitted to the instructor in charge in the form of a research report

## CEE 830 Thesis-Fluid Mechanics and

 HydrologyFall, spring. 1-12 credits. Students must register for credit with the professor at the start of each term.
A thesis resarch topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Geotechnical Engineering

CEE 341 Introduction to Geotechnical Engineering
Spring. 4 credits.
3 lecs, 1 lab-tutorial. Staff.
Soil as an engineering material. Chemical and physical nature of soil. Engineering properties of soil. Stresses and stress analysis of soil. Basic theory and design for water flow in soil, one-dimensional consolidation of clay and silts, and shear-strength problems. Introduction to slope stability, earth pressure, geosynthetics, and landfill and wastecontainment issues. Introduction to laboratory testing. Synthesis of soil analysis and laboratory-test results for the design of engineering structures.

## CEE 640 Foundation Engineering

Fall. 3 credits. Prerequisite: CEE 341
3 lecs, optional tutorial. Staff.
Soil exploration, sampling, and in-situ testing techniques. Bearing capacity, stress distribution, and settlement. Design of shallow and deep foundations. Compaction and site preparation. Seepage and dewatering of foundation excavations.

## CEE 641 Retaining Structures and

 SlopesSpring. 3 credits. Prerequisite: CEE 341. 3 lecs, optional tutorial. Staff.
Earth pressure theories. Design of rigid, flexible, braced, tied-back, slurry, and reinforced soil structures. Stability of excavation, cut, and natural slopes. Design problems stressing application of course material under field conditions of engineering practice.

## CEE 643 Pavement Engineering (also

 ABEN 692)Spring. 4 credits. Limited to engineering seniors and graduate students. Prerequisite: CEE 341 and 642.

3 lecs, 1 lab. L. H. Irwin.
For description see ABEN 692.
CEE 648 Seminar in Geotechnical Engineering
Fall, spring. 1 credit.

> Staff.

Presentation and discussion of topics in current research and practice in geotechnical engineering.
CEE 649 Special Topics in Geotechnical Engineering
On demand. 1-6 credits. Staff.
Supervised study of special topics not covered in the formal courses.
CEE 740 Engineering Behavior of Soils Spring. 4 credits. Prerequisite: CEE 341. 3 lecs, 1 lab. Staff. Detailed study of the physiochemical nature of soil. Stress states due to geostatic loading and stress-history effects. In-depth evaluation of
stress-strain-strength, compressibility, and hydraulic conductivity of natural soils. Fieldtesting methods for determining properties based on laboratory testing. Laboratory sessions include in-situ field testing, simple index tests, and complete laboratory characterization of important soil properties.
CEE 741 Rock Engineering
Fall. 3 credits. Prerequisite: CEE 341 or permission of instructor. Recommended: introductory geology.

2 lecs, 1 lab. Staff
Geological and engineering classifications of intact rock, discontinuities, and rock masses Laboratory and field evaluation of properties. Stress states and stress analysis. Design of foundations on, and openings in, rock masses. Analysis of the stability of rock slopes.

## CEE 744 Advanced Foundation

 EngineeringSpring. 2 credits. Prerequisite: CEE 640. 2 lecs. Staff.
A continuation of CEE 640, with detailed emphasis on special topics in soil-structure interaction. Typical topics include lateral and pullout loading of deep foundations, pile group behavior, foundations for offshore structures, foundations for special structures.

## CEE 745 Soil Dynamics

Spring. 4 credits. Prerequisite: permission of instructor.

3 lecs, 1 lab. Staff.
Study of soil behavior under dynamic loading conditions. Foundation design for vibratory loadings. Introductory earthquake engineering including field and laboratory techniques for determining dynamic soil properties and liquefaction potential. Design of embankments and retaining structures under dynamic loading conditions. Laboratory experiments and demonstrations using resonant column and a range of cyclic testing equipment.
CEE 746 Embankment Dam Engineering Spring. 2 credits. Prerequisites: CEE 641 and 741 , or permission of instructor.

2 lecs. Staff.
Principles of analysis and design for earth and rockfill dams. Materials, construction methods, internal and external stability, seepage and drainage, performance monitoring, abutment and foundation evaluation. Introduction to tailings dams.
[CEE 747 Case Studies in Ceotechnical Engineering
Spring. 3 credits. Prerequisites: CEE 641 and 741. Not offered 1994-95.

Staff.
Study of case histories in geotechnical engineering. Critical evaluation of successful and unsuccessful projects. Oral presentations and engineering report evaluation of each case]

## [CEE 748 Tunnel Engineering

Spring. 2 credits. Prerequisites: CEE 641 and 741. Not offered 1994-95.

2 lecs. Staff.
Principles of analysis and design for earth and rock tunnels. Materials, construction methods, stability and support systems, deformations, and performance monitoring.]

CEE 749 Research in Geotechnical Engineering
On demand. $1-6$ credits. Staff.
For the student who wants to pursue a particular geotechnical topic in considerable depth

## CEE 840 Thesis-Geotechnical Engineering

Fall, spring. $1-12$ credits. Students must register for credit with the professor at the start of each term.
A thesis research topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Environmental Engineering

CEE 351 Environmental Quality

## Engineering

Spring. 3 credits.
3 lecs. L. W. Lion
Introduction to engineering aspects of environmental quality control. Quality parameters, criteria, and standards for water and wastewater. Emphasis on water-quality control concepts, theory, and methods. Elementary analysis pertaining to the modeling of pollutant reactions in natural systems, and introduction to design of unit processes for water and wastewater treatment.

CEE 352 Water Supply Engineering
Fall. 3 credits. Prerequisite: CEE 351.
3 lecs. R. I. Dick.
Analysis of contemporary threats to human health from water supply systems. Criteria and standards for potable-water quality. Water-quality control theory. Design of water supply facilities.
CEE 651 Microbiology for Environmental Engineering
Fall. 2 credits. Prerequisite: one semester of college chemistry.

2 lecs. J. M. Gossett.
A self-paced autotutorial introduction to fundamental aspects of microbiology, organic chemistry, and biochemistry pertinent to environmental engineering. Course work consists of assigned readings, study questions, and brief exams.

## CEE 653 Water Chemistry for

 Environmental EngineeringFall. 3 credits. Prerequisite: one semester of college chemistry or permission of instructor.

3 lecs, 3 recs. L. W. Lion.
Principles of chemistry applicable to the understanding, design, and control of water and wastewater treatment processes and to reactions in receiving waters. Topics include chemical thermodynamics, reaction kinetics, acid-base equilibria, mineral precipitation/ dissolution, and electrochemistry. The focus of the course is on the mathematical description of chemical reactions relevant to engineered processes and natural systems, and the numerical or graphical solution of these problems.

## CEE 654 Aquatic Chemistry

Spring. 3 credits. Prerequisite: CEE 653 or Chemistry 287-288.

3 lecs. J. J. Bisogni.
Concepts of chemical equilibria applied to natural aquatic systems. Topics include acidbase reactions, buffer systems, mineral precipitation, coordination and redox
reactions, Eh-pH diagrams adsorption phenomena, humic acid chemistry, and chemical-equilibria computational techniques. In-depth coverage of topics covered in CEE 653.

## CEE 655 Pollutant Transport and

 Transformation in the Environment Fall. 3 credits. Prerequisite: CEE 331. J. J. Bisogni, G. H. Jirka.An introduction to the physical transport and chemical and biochemical transformation processes that govern the fate and distribution of pollutants in the environment. Advective and diffusive mass transport, turbulent diffusion and shear-flow dispersion in water or atmosphere, dispersion in groundwater flow, homogeneous and heterogeneous chemical reactions and their effects on transport phenomena, air-water-soil interface transfer processes. Emphasis on physical mechanisms, with some applications to surface water, groundwater, and atmospheric transport and quality models.

## CEE 658 Sludge Treatment, Utilization, and Disposal

Spring. 3 credits. Prerequisite: CEE 352 or permission of instructor.

3 lecs. R. I. Dick.
Analysis of the quantity and quality of residues produced from municipal and industrial water-supply and pollution-control facilities and other residue-producing processes as functions of process design and operational variables. Alternatives for reclaiming or disposing of hazardous and nonhazardous residues with assessment of potential environmental impacts. Fundamental factors influencing performance of treatment processes for removing water from sludges and for altering sludge properties prior to reuse or ultimate disposal. Considerations in selecting and integrating of sludgemanagement processes to approach optimal design.

## CEE 659 Environmental Quality Engineering Seminar

Spring. 1 credit. Prerequisite: enrollment as graduate student in environmental engineering.

## R. I. Dick.

Presentation and discussion of current research and design projects in environmental engineering.

## CEE 750 Research in Environmental

 EngineoringOn demand. 1-6 credits.
Faculty.
For students who want to study a particular area in depth. The work may take the form of laboratory investigation, field study, theoretical analysis, or development of design and analysis procedures.

## CEE 755 Environmental Engineering

 Processes IFall. 3 credits. Prerequisite: Previous or concurrent enrollment in CEE 653 or permission of instructor.

3 lecs. J. M. Gossett.
Theoretical and engineering aspects of chemical and physical phenomena and processes applicable to the removal of impurities from water, wastewater, and industrial wastes and to their transformation in receiving waters. Analysis and design of treatment processes and systems.

## CEE 756 Environmental Engineering

 Processes IISpring. 3 credits. Prerequisites: CEE 651 and 755 , or permission of instructor.

3 lecs. J. M. Gossett.
Theoretical and engineering aspects of biological phenomena and processes applicable to the removal of impurities from water, wastewater, and industrial wastes and to their transformation in receiving waters. Biokinetic analysis and design of biological treatment process.

## CEE 757 Environmental Engineering

 Processes Laboratory IFall. 2 credits. Prerequisite: concurrent enrollment in CEE 653 and CEE 755.

1 lab. J. M. Gossett, L. W. Lion. Laboratory studies of aquatic chemistry and physical/chemical processes of environmental engineering. Topics include gravimetric analyses; acids/bases; alkalinity; gas chromatography; UV-visible and atomic absorption spectrophotometry; adsorption; filtration; ion exchange; gas transfer; sedimentation; characterization of reactor mixing regimes; coagulation.

## CEE 758 Environmental Engineering Processes Laboratory II

Spring. 2 credits. Prerequisite: CEE 651 and concurrent enrollment in CEE 756.

1 lab. J. M. Gossett.
Laboratory studies of microbiological phenomena and environmental engineering processes. Topics include microscopy; biochemical and chemical oxygen demand; biological treatability studies; enumeration of bacteria

## CEE 759 Special Topics in

 Environmental EngineeringOn demand. Variable credit.
Hours to be arranged. Staff. Supervised study in special topics not covered in formal courses.

## CEE 850 Thesic-Einvironmontal Engineering

Fall, spring. 1-12 credits. Students must register for credit with the professor at the start of each term.
A thesis research topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Transportation

## CEE 361 Introduction to Transportation Engineering

Spring; usually offered in summer for
Engineering Co-op Program. 3 credits.
A. H. Meyburg.

Introduction to technological, economic, and social aspects of transportation. Emphasis on design and functioning of transportation systems and their components. Supplydemand interactions; system planning, design, and management; traffic flow and control intersection and network analysis. Institutional and energy issues; environmental impact.

## CEE 362 Mighway Engineering (also ABEN 491)

Fall. 3 credits. Prerequisites: Fluid mechanics (may be taken concurrently) and junior standing in engineering.

2 lecs, 1 lab. L. H. Irwin.
For description, see ABEN 491.

CEE 463 Transportation and Information Technology
Fall. 3 credits. Prerequisite: CEE 361 or permission of the instructor.
L. Nozick.

Focuses on shift from building new infrastructure to improving the utilization of current facilities. Reviews major legislation that solidifies this shift and examines the role of computer and telecommunications technology Technologies to be considered include tags and readers, weigh-in-motion, cellular communication technology, the global positioning system, on-board navigation systems, databases, and distributed databases.

## [CEE 660 Transportation Planning and Pollcy

Fall. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95. A. H. Meyburg.

Public-sector planning and decision making for transportation. Problems of urban transportation and their implications. A systems-analysis approach to formulation of cransportation policy at the local, regional, state, and federal levels. Consideration of urban-transportation planning models.]
CEE 664 Transportation Systems Design Spring. 3 credits. Prerequisite: CEE 361. M. A. Turnquist.

Advanced techniques for physical and operational design of transportation systems, including analytical modeling techniques underlying design criteria. Evaluation of alternative designs. Management and operating policies, including investment strategies. Facility location decisions, networks, and passenger and freight terminals.

## CEE 762 Transportation Research

On demand. Variable credit.
Staff,
In-depth investigation of a particular transportation planning or engineering problem mutually agreed upon between the student and one or more faculty members.

## CEE 764 special Topics in Transportation

On demand. Variable credit. Staff.
Advanced subject matter not covered in depth in other regular courses.

## CEE 860 Thesis-Transportation

 EngineoringFall, spring. 1-12 credits. Students must register for credit with the professor at the start of each term.
A thesis research topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Structural Enginearing

See also CEE 116.

## CEE 371 structural Behavior

Fall; usually offered in summer for Engineering Co-op Program. 4 credits. Prerequisite: Engr 202.

3 lecs, one 2-hour lab, evening exams. G. G. Deierlein.

Fundamental concepts of structural engineering: behavior, analysis, and design. Loads, structural materials, structural form, statically determinate analysis, approximate analysis of indeterminate systems. Use of interactive graphical analysis programs. Fundamentals of
behavior of steel and concrete members. Introduction to limit states design.

## CEE 372 Structural Analysis

Spring. 4 credits. Prerequisite: CEE 371. 3 lecs, one 2-hour lab, evening exams. Staff.
Fundamentals of statically indeterminate structures. Moment-area and virtual-work methods of displacement computation. Matrix flexibility and stiffness methods. Moment distribution analysis. Influence lines.
Computer applications to practical structures. Role and limitations of analysis in design. The art of structural modeling for analysis and design.

## CEE 373 Design of Concrete Structures

Fall. 4 credits. Prerequisites: CEE 372 or permission of instructor.

2 lecs, one 2 -hour sec, design project.
P. Gergely.

Behavior and design of reinforced concrete and prestressed concrete structures. Design project.

## CEE 374 Design of Steel Structures

Spring. 4 credits. Prerequisite: CEE 372 or permission of instructor.

3 lecs, one 2 -hour sec, evening exams, design project. T. Pekōz.
Behavior and design of steel members, connections, and structures. Discussion of structural systems for buildings and bridges.

## CEE 376 Civil Engineering Materials

## Spring. 3 credits.

2 lecs, 1 lab. Staff.
Engineering properties of concrete, steel, wood, masonry, and other structural materials. Design characteristics and significance of test results of materials used in engineering works. Developing QA/QC programs and writing specifications. Extensive laboratory testing and report writing.

## CEE 671 Random Vibration

Fall. 3 credits. Prerequisites: M\&AE 326, CEE 779, and OR\&IE 260; or equivalent and permission of instructor.
M. D. Grigoriu.

Review of random-process theory, simulation, and first-passage time. Linear random vibration: second-moment response descriptors and applications from fatigue; seismic analysis; and response to wind, wave, and other non-Gaussian load processes. Nonlinear random vibration: equivalent linearization, perturbation techniques, FokkerPlanck and Kolmogorov equations, Itō calculus, and applications from chaotic vibration, fatigue, seismic analysis, and parametrically excited systems.

## CEE 672 Fundamentals of Structural Mechanics

## Fall. 3 credits.

M. D. Grigoriu.

Theory of elasticity, energy principles, plate flexure, failure theories for structural design, beams on elastic foundation, finite-difference method, plate theory, energy principles, introduction to finite-element method.
CEE 673 Advanced Structural Analysis Fall. 3 credits. Prerequisites: CEE 372 and computer programming.

Evening exams, programming project.
J. F. Abel.

Matrix analysis of structures, computer programming of displacement (stiffness) method, use of interactive graphical analysis programs, solution methods, errors and
accuracy, special analysis procedures, virtual work in matrix analysis, and introduction to nonlinear analysis and finite-element methods.

## CEE 675 Concrete Materials and

## Construction

Spring. 3 credits. Prerequisite: CEE 376 or equivalent.

2 lecs, 1 lab. K. C. Hover.
Materials science, structural engineering, and construction technology involved in the materials aspects of the use of concrete. Cement chemistry and physics, mix design, admixtures, engineering properties, testing of fresh and hardened concrete, and the effects of construction techniques on material behavior. Lab assignments.

## [CEE 677 Stochastic Mechanics

Spring. 3 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1994-95.
M. D. Grigoriu.

Review of concepts of probability theory, random processes, and random fields.
Analytical and numerical methods for reliability analysis. Methods for solution of random eigenvalue problems, equilibrium of uncertain systems and systems with random imperfections, and propagation problems in stochastic systems. Applications include stochastic finite elements, probabilistic fracture mechanics, and dynamic Daniels systems.]
CEE 680 Structural Engineering Seminar
Fall, spring. 1 credit. Limited to qualified seniors and graduate students.

Staff.
Presentation of topics of current interest in the field of structures.

## CEE 770 Engineering Fracture

 MechanicsFall. 3 credits. Prerequisite: CEE 772 or permission of instructor. Offered alternate years.

2 lecs, 1 lab. A. R. Ingraffea.
Fundamentals of fracture-mechanics theory. Energy and stress-intensity approaches to fracture. Mixed-mode fracture. Fatigue-crack propagation. Finite- and boundary-element methods in fracture mechanics. Introduction to elastic-plastic fracture mechanics. Interactive computer graphics for fracture simulation. Laboratory techniques for fracture-toughness testing of metals, concrete, and rock.

CEE 772 Finite-Element Analysis
Spring. 3 credits. Prerequisites: CEE 672 and 673, or permission of instructor.
J. F. Abel.

Conceptual, theoretical, and practical bases for finite-element analysis in structural mechanics and other disciplines. Development and evaluation of formulations for one-, two-, and three-dimensional elements. Introduction to boundary-element analysis. Interactive computer graphics for finite- and boundaryelement analysis.

## CEE 773 Structural Reliability

Spring. 3 credits. Prerequisite: permission of instructor.
M. D. Grigoriu.

Review of probability theory, practical measures for structural reliability, secondmoment reliability indices, probability models for strength and loads, probability-based design codes, reliability of structural systems, imperfection-sensitive structures, fatigue, stochastic finite-element techniques, elementary concepts of probabilistic fracture mechanics.

## CEE 774 Prestressed Concrete

## Structures

Spring. 3 credits. Prerequisites: CEE 373 and 376 or equivalent. Recommended: CEE 775. 3 lecs. R. N. White.
Behavior, analysis, and design of pretensioned and posttensioned concrete structures.
Flexure, cracking shear, bond, prestress losses, deflection predictions, and anchorage zone deign. load-balancing concepts; partial prestressing. Strength and serviceability of structural elements and systems, including buildings, parking garages, and bridges
CEE 775 Advanced Reinforced Concrete Fall. 3 credits. Prerequisites: CEE 373 and 376 or equivalent.

3 lecs. R. N. White
General flexural analysis, shear and torsion using strut-and-tie models, biaxial bending of columns, slender columns, beam-supported and flat-plate slabs, and strip method for slab design. Deep beams, brackets, and corbels by traditional methods and using strut-and-tie modes. Redistribution effects and ductility demands. Walls; lateral forces on wall systems. Building systems and introduction to bridge systems.

## CEE 776 Advanced Design of Metal

 StructuresFall. 3 credits. Prerequisite: CEE 374 or equivalent.
T. Pekōz.

Preliminary design of structural systems. Design of members and connections. Behavior and computer-aided design of building frames. Design of composite members.

## CEE 777 Advanced Behavior of Metal

 StructuresSpring. 3 credits. Prerequisite: CEE 374 or equivalent.
T. Pekōz.

Analysis of elastic and inelastic stability. Behavior and design of hot-rolled and coldrolled steel and aluminum members, elements, and frames. Critical review of design specifications.

## [CEE 778 Shell Theory and Design

Spring. 2-3 credits. Offered alternate years. Not offered 1994-95.
P. Gergely.

Fundamentals of practical shell theory. Differential geometry of surfaces; membrane and bending theory of shells; analysis and design of cylindrical shells, polygonal domes, and paraboloids.]

CEE 779 Structural Dynamics and Earthquake Engineering
Spring. 3 credits.
P. Gergely.

Modal analysis, numerical methods, and frequency-domain analysis. Introduction to earthquake-resistant design.

## [CEE 780 Advanced Concrete Material Science

Fall. 3 credits. Prerequisites: CEE 376 or equivalent and CEE 675. Not offered 1994-95.

> K. C. Hover.

Advanced study of the chemistry, physics, and microstructure of cement and concrete. Investigation of cement manufacture and chemistry. hydration reactions and effect of admixtures. Study of microstructure with scanning electron microscopy, and porosimetry. Engineering properties and behavior include failure mechanisms and elastic and
viscoelastic behavior. Durability. Student presentations.]
[CEE 782 Advanced Topics in FiniteElement Analysis
Fall. 3 credits. Prerequisite: CEE 772. Offered alternate years. Not offered 1994-95. J. F. Abel, A. R. Ingraffea.

Lectures and colloquia on selected advanced topics and research in progress, including dynamics, nonlinear analysis, shells, fracture mechanics, fluid dynamics, and computer graphics.]

## CEE 783 Civil and Environmental

 Engineering Materials ProjectOn demand. 1-3 credits.
Staff.
Individual projects or reading and study assignments involving engineering materials.

## CEE 785 Research in Structural

 EngineeringOn demand. Variable credit.
Hours to be arranged. Staff.
Pursuit of a branch of structural engineering beyond what is covered in regular courses. Theoretical or experimental investigation of suitable problems.

## CEE 786 Special Topics in Structural Engineering

On demand. Variable credit.
Hours to be arranged. Staff.
Individually supervised study or independent design or research in specialized topics not covered in regular courses.
CEE 880 Thesis-Structural Engineering
Fall, spring. 1-12 credits. Students must register for credit with the professor at the start of each term.
A thesis research topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Engineering Management

## [CEE 590 Engineering Management

 PracticeFall. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95 (see CEE 692).
K. C. Hover.

An introduction to the work and skills of management. Planning, organizing, communicating, controlling, and correcting will be covered in combination of lectures, readings, outside assignments, in-class role-playing exercises, and talks by visiting speakers.]

## CEE 591 Engineering Management

 ProjectFall. 3 credits. Prerequisite: permission of instructor.
K. C. Hover, M. A. Turnquist. An intensive evaluation of the management aspects of a major engineering project or system. Most students will work on a large group project in the area of project management, but students may also work singly or in small groups on an engineering management topic of special interest to them.

## CEE 592 Engineering Management

 ProjectSpring. 3 credits. Prerequisite: permission of instructor.
K. C. Hover, M. A. Turnquist.

A continuation of CEE 591.

## CEE 593 Engineering Management

 Methods I: Data, Information, and ModelingFall. 3 credits. Prerequisites: OR\&IE 320 and OR\&IE 270 or CEE 304 or equivalent. L. Nozick.

Methods for managing data and transforming data into information. Modeling as a means to synthesize information into knowledge that can form the basis for decisions and actions. Application of statistical methods and optimization to managerial problems in project scheduling, quality control, forecasting, and resource allocation.
CEE 594 Engineering Management Methods II: Managing Uncertain Systems
Spring. 3 credits. Prerequisite: CEE 593 or permission of instructor.
L. Nozick.

Modeling and managing systems in which uncertainty is a major determinant of system behavior. Systems which are subject to breakdown, deterioration and queuing. Simulation as a tool for analyzing uncertain systems. Projects and case studies to illustrate application of the methods.

## CEE 595 Construction Planning and Operations

Fall. 3 credits. Prerequisite: permission of instructor.

3 lecs. K. C. Hover.
A course on the fundamentals of construction planning: organization of the worksite, construction planning, scheduling, and cost estimating, bidding, design of falsework and shoring systems, construction loadings, materials handling for construction, optimization of construction processes, applications of computer methods.
CEE 597 Risk Analysis and Management Spring. 3 credits. Prerequisite: CEE 304 or OR\&IE 270 or equivalent.

3 lecs. J. R. Stedinger.
Course develops a working knowledge of risk terminology, analytic tools used to analyze environmental and technological risks, and social and psychological risk issues. Discussions address life risks in the U.S., transportation risks, transportation of hazardous materials, waste incineration and remediation, public health risks such as AIDS, regulatory policy, risk communication, environmental risk issues in the media, and risk management.

## CEE 692 Project Management

Fall. 3 credits. Prerequisite: permission of instructor.
M. A. Turnquist, F. J. Wayne Jr. Methods for managing projects. Planning, scheduling, and controlling projects. Functioning as a project manager in various types of organizations. Forming teams and managing group dynamics. (For 1994-95, this is a substitute for CEE 590.)

## CEE 694 Research in Engineering

 ManagementOn demand. 1-6 credits.
Staff.
The student may select an area of investigation in engineering management. Results should be submitted to the instructor in charge in the form of a research report.

## COMPUTER SCIENCE

The Department of Computer Science is part of both the College of Arts and Sciences and the College of Engineering.

## COM S 099 Fundamental Programming Concepts

Fall. 2 credits. No prerequisites. S-U grades only.

1 lec, 1 lab.
This course is designed for students who intend to take COM S 100 but are not adequately prepared for that course. Students who do not intend to take COM S 100 but want some introduction to computers and programming should take COM S 101 instead. Students cannot receive credit for COM S 101 and COM S 099. Basic programming concepts and problem analysis are studied. The programming language used is Pascal. Students with previous programming experience should not take this course.

## COM S 100 Introduction to Computer Programming

Fall, spring, summer. 4 credits. Students who plan to take COM S 101 and also 100 must take 101 first.

2 lecs, 1 rec (optional), 3 evening exams. An introduction to elementary computer programming concepts. Emphasis is on techniques of problem analysis and the development of algorithms and programs. The subject of the course is programming, not a particular programming language. The principal programming language is Pascal. The course does not presume previous programming experience. Programming assignments are tested and run on interactive, stand-alone microcomputers. During most semesters, two versions of COM S 100 are available as described below.

## COM S 100a Introduction to Computer Programming

Standard version of COM S 100. No collegelevel mathematics is assumed. Register for COM S 100.

## COM 5 100b Introduction to Computer Programming

Prerequisite: MATH 111, 191 or equivalent. Not offered every semester.
Alternative version of COM S 100 , emphasizing examples and applications involving continuous mathematics, including trigonometry and calculus. Register for COM S 100 . COM S 100 b is not always available at all COM S 100 lecture hours.

## COM S 101 The Computer Age (also

 ENGRG 101)Fall, summer. 3 credits. Not offered every year. Credit is granted for both COM S 100 and 101 only if 101 is taken first. An introduction to computer science and programming for students in nontechnical areas. The aims of the course are to acquaint the student with the major ideas in computer science and to develop an appreciation of algorithmic thinking. Topics may include the history of computation; microtechnology; the retrieval and transmission of information; scientific computing; computer graphics, art, and music; robotics, natural-language processing, and machine intelligence Students become acquainted with the concept of an algorithm by writing several programs in Pascal or Scheme and testing them on microcomputers. The amount of programming is about half that taught in COM S 100.

COM S 107 An Introduction to SCHEME
Spring. 1 credit. Prerequisite: Introductory course in PASCAL, or equivalent programming experience.

3 lecs.
An accelerated introduction to SCHEME, a dialect of LISP. Recommended for students who intend to pursue the computer science major. Taught in the first four weeks of the semester.

## COM S 172 An Introduction to Artificial Intelligence (also ENGRI 172)

Spring. 3 credits. Prerequisites: COM S 100 or COM S 101 or equivalent computer experience. Enrollment may be limited. Not offered every year.

3 lecs, 2 evening exams
A hands-on introduction to concepts in artificial intelligence. Topics may include heuristic search, game playing, automated theorem proving, natural-language processing, expert systems, neural networks, and/or machine learning. Students will use workstation environments to gain software laboratory experience. Interested students need not be proficient programmers to take this class.

## COM S 211 Computers and Programming (also ENGRD 211)

Fall, spring, summer. 3 credits. Credit will not be granted for both COM S 211 and 212. Prerequisite: COM S 100 or equivalent programming experience.

2 lecs, 1 rec, 2 evening exams. Intermediate programming in a high-level language and introduction to computer science. Topics include program development, proofs of program correctness, program structure, recursion, abstract data types, object-oriented programming, data structures, and analysis of algorithms. Pascal is the principal programming language.

## COM S 212 Modes of Algorithmic

 Expression (also ENGRD 212) Fall, spring. 4 credits. Credit will not be granted for both COM S 211 and 212. Prerequisite: COM S 100 or equivalent programming experience.2 lecs, 2 recs, 2 evening exams. A challenging introduction to programming languages and computer science that emphasizes alternative modes of algorithmic expression. Topics include recursive and higher-order procedures, performance analysis of algorithms, proofs of program correctness, probabilistic algorithms, symbolic hierarchical data, abstract data types, polymorphic functions, object-oriented programming, infinite data types, simulation, and the interpretation of programs. Programs are written in Scheme, a dialect of LISP.
COM S 212 emphasizes a varied collection of advanced programming concepts and techniques available in a modern functional programming language. In contrast, COM S 211 focuses on perfecting programming skills in a conventional imperative programming language. Corrective transfers between COM S 211 and 212 (in either direction) are encouraged during the first few weeks of instruction

## COM S 214 A Taste of UNIX and C

Fall, spring. 1-2 credits. Prerequisite: COM S 211 or equivalent programming experience S-U grades only.

3 lecs, 3 weeks ( 1 credit), 6 weeks ( 2 credits).

A brief introduction to the UNIX operating system and the $C$ programming language. Recommended for students who intend to pursue the computer science major. Taught in the first four to eight weeks of the semester The 2 -credit version involves an implementa tion project

## COM S 222 Introduction to Scientific Computation (also ENGRD 222)

Spring. 3 credits. Prerequisites: COM S 100 and pre/corequisite of MATH 221 or MATH 293.

2 lecs, 1 rec, 2 evening exams. An introduction to elementary numerical analysis and scientific computation. Topics include interpolation, quadrature, linear and nonlinear equation solving, least-squares fitting, and ordinary differential equations. The Matlab computing environment is used. Vectorization, efficiency, reliability, and stability are stressed. Special lectures on parallel computation and high-performance Fortran.

## COM S 280 Discrete Structures

Fall, spring, 4 credits. Prerequisite: COM S 211 or 212 or permission of instructor.

3 lecs.
Covers mathematical aspects of programming and computing. Topics will be chosen from the following: mathematical induction; logical proof; propositional and predicate calculus; combinatorics and discrete mathematics covering manipulation of sums, recurrence relations, and generating-function techniques; basic number theory; sets, functions, and relations; partially ordered sets; graphs

## COM $\$ 314$ Introduction to Digital

 Systems and Computer Organization Fall, spring, summer. 4 credits. Prerequisite: COM S 211, 212, or equivalent.2 lecs, $1 \mathrm{sec}, 2$ evening exams. Introduction to computer organization. Topics include representation of information, machine-assembly languages, processor organization, interrupts and I/O, memory hierarchies, combinatorial and sequential circuits, data path and control unit design, RTL, and microprogramming.
COM $\mathbf{s} 381$ Introduction to Theory of Computing
Fall. 4 credits. Prerequisite: COM S 280 or permission of instructor. Credit will not be granted for both COM S 381 and COM S 481 Collective transfers between COM S 381 and COM S 481 (in either direction) are encouraged during the first few weeks of instruction. 3 lecs.
An introduction to modern theory of computing: automata theory, formal languages, and effective computability.
COM S 400 The Science of Programming Spring. 4 credits. Prerequisite: COM S 280 or equivalent. Not offered every year. 3 lecs.
The practical development of correct programs based on the conscious application of principles that are derived from a mathematical notion of program correctness. Besides dealing with conventional sequential programs, the course covers implementations of abstract data types and contains an introduction to problems with concurrency. Issues in programming-language design that arise from program correctness are discussed Programs are written but not run on a computer

## ENGINEERING - 1994-1995

COM $\$ 401$ Software Engineering: Technology and Technique
Fall. 4 credits. l'rerequisite: COM S 410 and knowledge of the C programming language. An introduction to the programming languages, tools, and methods used in modern software development. Programming methodologies: modularity, data abstraction, object-oriented programming. Effective use of C++, Programming tools, software libraries, and interface definition languages. General techniques will be complemented with programming experience.
COM S 410 Data Structures
Fall, spring, summer. 4 credits. Prerequisite: COM S 280 or permission of instructor.

2 lecs, 2 evening exams.
Lists, trees, graphs, arrays, and other forms of data structure and their implementation. Relationship between language and data structure, emphasizing abstract data types. Dynamic storage allocation and memory management. Detailed study of searching and sorting methods. Analysis to determine the more efficient algorithm in a given situation

## COM S 411 Programming Languages and

 LogicsFall. 4 credits. Prerequisite: COM S 410 or permission of instructor. Not offered every year.

2 lecs.
The major concepts of programming languages, with emphasis on synthesis and interpretation. Language-based programming methodologies, including object-oriented, functional, and logic programming. Design and criticism of programming languages. Type theory and typed lambda-calculus. Exercises in several unusual programming languages

## COM S 412 Introduction to Compilers

 and TranslatorsSpring. 3 credits. Prerequisites: COM S 314, 381, 410. Corequisite: COM S 413

2 lecs, 1 lab
Overview of the internal structure of modern compilers, with emphasis on implementation techniques. Topics covered include lexical scanning, simple parsing techniques, symboltable manipulation, type-checking routines, code generation, and simple optimizations. The course entails a compiler implementation project.

## COM S 413 Practicum in Compilers and

 TranslatorsSpring. 2 credits. Prerequisites: COM S 314, 381, 410. Corequisite: COM S 412

1 lab.
A compiler implementation project related to COMS 412

## COM S 414 Systems Programming and Operating Systems

Fall. 3 credits. Prerequisite: COM S 314 or permission of instructor.

2 lecs, 2 evening exams.
An introduction to the logical design of systems programs, with emphasis on multiprogrammed operating systems. Topics include process synchronization, deadlock, memory management, input-output methods, information sharing, protection and security, and file systems. The impact of network and distributed computing environments on operating systems is also discussed.

## COM S 415 Practicum in Operating Systems

Fall. 2 credits. Prerequisite: COM S 410 Corequisite: COM S 414.

1 lec.
The practical aspects of operating systems are studied through the design and implementation of an operating system kernel that supports multiprogramming, virtual memory, and various input-output devices. All the programming for the project is in a high-level language

## COM 5417 Computer Graphics and

 Visualization (also ARCH 374)Spring. 3 credits. Prerequisite: COM S 211 or 212.

2 lecs.
An introduction to the principles of interactive computer graphics and scientific visualization.
Topics include two- and three-dimensional graphics algorithms (perspective transformations, hidden-line and hidden-surface algorithms, parametric surfaces), lighting models, image synthesis, and application to scientific data analysis.

## COM 5418 Practicum in Computer

Graphics (also ARCH 375)
Spring. 2 credits. Enrollment limited.
Permission of instructor. Prerequisite: COM S 211 or 212 . Recommended: COM S 314 . Corequisite: COM S 417.

1 lab.
Programming assignments dealing with interactive computer graphics and visualization of scientific data.

## COM 5421 Numerical Analysis

Fall. 4 credits. Prerequisites: Mathematics 294 or equivalent, one additional mathematics course numbered 300 or above, and knowledge of programming.

3 lecs.
Modern algorithms for systems of linear equations, systems of nonlinear equations, numerical optimization, and numerical solution of differential equations. Some discussion of methods suitable for parallel computation.

## COM S 422 Parallel Computing for Scientific Problems

Spring. 4 credits. Enrollment limited.
Permission of instructor. Prerequisites: Math 294, COM S 222 or COM S 421, knowledge of C and FORTRAN.

3 lecs.
Parallel algorithms and programming environments for important scientific problems, such as fluid flow, systems of particles, and large-scale optimization. This course will involve algorithm development on some of the world's fastest computers, including a Connection Machine and a hypercube.

## COM S 432 Introduction to Database

 SystemsSpring. 3 credits. Prerequisites: Either COM S 211 or 212 , and 410 , or permission of instructor. Recommended: COM S 314. Not offered every year.

2 lecs, 1 rec.
Introduction to modem database management systems. Concepts in data modeling and query processing. Storage structures and access methods. Design and analysis of relational databases. Concurrency control Object-oriented databases.

## COM S 433 Practicum in Database Systems

Spring. 2 credits. Corequisite: COM S 432 Not offered every year.

1 lab.
Issues related to the design and implementation of database-management systems will be addressed. Students will implement a simplified relational database system, including a file-access method and queryprocessing algorithms.

## COM \$ 444 Distributed Systems and Algorithms

Fall. 4 credits. Corequisite: COM S 414 or permission of instructor. Not offered every year.
The fundamentals of distributed systems and algorithms. Topics include the problems, methodologies and paradigms necessary for understanding and designing distributed applications, with an emphasis on faulttolerant computing. Theoretical concepts will be complemented with practical examples of their application in current distributed systems

COM S 462 Robotics and Machine Vision Spring. 3 credits. Prerequisite: Permission of instructor, COM S 410, and COM S 381. Corequisite: COM S 463. Not offered every year.

$$
3 \text { lecs. }
$$

Introduction to the science of robotics and machine vision using a combination of programming techniques, applied mathematics, algorithms, and lab experiments. Topics include task-level robot planning and programming, hand-eye systems, feature detection and object recognition, motion planning, shape reconstruction, compliant motion and assembly, model-based planning and recognition, uncertainty and error, active sensing, and manipulation.

## COM $\$ 463$ Robotics and Machine Vision

 LabSpring. 2 credits. Prerequisite: Permission of instructor, COM S 410, and COM S 381. Corequisite: COM S 462. Not offered every year.

$$
1 \text { lab. }
$$

Use physical robots (vision systems, hand-eye systems, and mobile robots) in the Computer Science Robotics and Vision Teaching
Laboratory. Students should be comfortable both with mathematical concepts and programming, know LISP or Scheme, have a mastery of calculus and linear algebra, a strong background in algorithms, and an ability to work independently.

## COM S 472 Foundations of Artificial

 IntelligenceFall. 3 credits. Prerequisites: COM S 107 or COM S 212, COM S 280 and COM S 410. Open to juniors, seniors, and graduate students.

$$
3 \text { lecs. }
$$

A challenging introduction to the major subareas and current research directions in artificial intelligence. Topics include knowledge representation, search, problem solving, natural-language processing, vision, robotics, logic and deduction, planning, and machine learning

## COM S 473 Practicum In Artificial Intelligence

Fall. 2 credits. Prerequisite: COM S 107 or COM S 212, COM S 280 and COM S 410. Corequisite: COM S 472. 1 lab.
Project portion of COM S 472. Topics include Common LISP programming, representation systems, deductive retrieval, databases and frame languages, and truth-maintenancesystem implementations.

## COM S 481 Introduction to Theory of

 ComputingFall. 4 credits. Prerequisite: COM S 280 or permission of instructor. Credit will not be granted for both COM S 381 and COM S 481 Corrective transfers between COM S 481 and COM S 381 (in either direction) are encouraged during the first few weeks of instruction. 3 lecs.
A faster-moving and deeper version of COM S 381

## COM S 482 Introduction to Analysis of Algorithms

Spring. 4 credits. Prerequisites: COM S 410 and either 381 or 481 , or permission of instructor.

3 lecs.
Techniques used in the creation and analysis of algorithms. Combinatorial algorithms, computational complexity, NP-completeness, and intractable problems.

## COM S 486 Applied Logic (also Mathematics 486)

Fall or spring. 4 credits. Prerequisites: Mathematics 222 or 294 , COM S 100 , and some additional course in mathematics or theoretical computer science. Not offered every year.

2 lecs, 1 lab to be arranged.
Propositional and predicate logic, compactness and completeness by tableaux, natural deduction, and resolution. Equational logic. Herbrand Universes and unification. Rewrite rules and equational logic, Knuth-Bendix method and the congruence-closure algorithm and l-calculus reduction strategies. Topics in Prolog, LISP, ML, or Nuprl. Applications to expert systems and program verification.

COM S 490 Independent Reading and Research
Fall, spring. $1-4$ credits.
Independent reading and research for undergraduates.

## COM S 501 Software Engineering: Technology and Technique

Fall. 4 credits. Prerequisite: COM S 410 and knowledge of the $C$ programming language. An introduction to the programming languages, tools, and methods used in modern software development. Programming methodologies: modularity, data abstraction, object-oriented programming. Effective use of C++. Programming tools, software libraries, and interface definition languages. General techniques will be complemented with programming experience.

## COM S511 Modern Programming Languages

Fall. 4 credits. Prerequisites: COM S 410 and a project course or permission of instructor. Not offered every year.

2 lecs.
Current trends in programming languages, with emphasis on programming methodologies supported by languages. Topics will include object-oriented programming,
modularity and data abstraction, functional and declarative programming, concurrency, logic programming, and programming language design. There will be programming exercises in several new languages.

## COM S 514 Practical in Distributed Systems

Fall or spring. 4 credits. Prerequisites: COM S 414 or permission of instructor. Not offered every year.

$$
2 \text { lecs. }
$$

Practical issues in designing and implementing distributed software. Topics include local and wide-area network protocols, replicated data, dynamic reconfiguration, monitoring for and reacting to failures or recoveries, distributed computation, synchronization, and techniques for expressing coarse-grained parallelism at the application level.

## COM S 515 Practicum in Distributed

 SystemsFall or spring. 1-2 credits, Co-requisite: COM S 514.

1 lec.
The practical aspects of distributed systems are studied through the design and implementation of a significant system. Students may work alone or in teams. The project varies from year to year, at the discretion of the instructor.
COM 5516 High-performance Computer Architecture
Spring. 4 credits. Prerequisite: COM S 314 required; COM S 412 or 414 highly recommended.

2 lecs.
Introduces techniques used in high-performance computer architecture. Covers pipelining of instruction execution to superscalar, superpipelined, and speculative architectures; memory system design, including caches, operating system support in the form of naming and protection schemes; introduction to parallel architectures.

## COM S 522 Parallel Computing for Scientific Problems

Spring. 4 credits. Enrollment limited. Permission of instructor. Prerequisites: Math 294, COM S 222 or COM S 421, and knowledge of C and FORTRAN.

3 lecs.
Parallel algorithms and programming environments for important scientific problems, such as fluid flow, systems of particles and large-scale optimizations. This course will involve algorithm development using some of the world's fastest computers, including a Connection machine and a hypercube. This course has the same lectures and exams as COM S 422, but greater project work is required.

## COM 5572 Artificial Intelligence Programming

Fall. 4 credits. Prerequisite: COM S 472 or permission of instructor. Not offered every year.

3 lecs.
Review of Common LISP programming and an overview of AI programming techniques. Discussion focuses on practical issues faced by implementors of large LISP systems. Topics may include discrimination nets, agendas, deductive retrievers, slot and filler databases, backtracking problem solvers, and truth-maintenance systems. Students will be expected to implement several of the systems discussed in class.

## COM S 600 Computer Sclence and Programming

Fall. 1 credit. Prerequisite: graduate standing in computer science or permission of instructor. Not offered every year. 1 lec.
An introduction to practical, modern ideas in programming methodology. Covers style and organization of programs, basic techniques for presenting proofs of correctness of programs, and the use of a "calculus" for the derivation of programs.

## COM $\mathbf{S 6 1 0}$ Multimedia Systems

Fall. 4 credits. Prerequisites: COM S 314 or permission of instructor.

3 lecs.
Hardware and software issues involved in computer manipulation of audio, video, and images. Topics include media capture, representation, compression, editing, processing, storage, and transportation. Special emphasis on the processing of digital video, including algorithms for special effects and automatic extraction of content, and applications of parallel architectures to video processing.

## COM $\mathbf{S} 611$ Advanced Programming Languages

Fall. 4 credits. Prerequisites: COM S 410 and 381 or 481 , or permission of instructor. 3 lecs.
A study of programming paradigms; functional, imperative, and logic programming. The untyped lambda-calculus. The typed lambda-calculus, type systems, polymorphism, type inference. Formal semantics of programming languages. Elements of domain theory and type theory. Models of programming logic.

COM S 612 Compiler Design for High. Performance Architectures
Spring. 4 credits. Prerequisites: COM S 314 and 412 or permission of instructor. 3 lecs.
Compiler design for pipelined and parallel architectures. Program analysis: data and control dependencies, dataflow analysis, efficient solution of dataflow equations, dependence tests, solution of Diophantine equations. Architecture and code generation for instruction-level parallel (ILP) processors: pipelined, VLIW and superscalar architectures, code reorganization and software pipelining. Architecture and code generation for multiprocessors: shared- and distributed-memory architectures, latency tolerance and avoidance, loop transformations to enhance parallelism and locality of reference.

## COM S 613 Concurrent Programming

Spring. 4 credits. Prerequisite: COM S 414 or permission of instructor. Not offered every year.

$$
2 \text { lecs. }
$$

Advanced techniques in, and models of, concurrent systems. Synchronization of concurrent processes; parallel programming languages; deadlock; verification.

## COM S 614 Advanced Systems

Spring. 4 credits. Prerequisite: COM S 414 or permission of instructor.

## 2 lecs.

An advanced course in systems, emphasizing contemporary research in distributed systems. Topics may include communication mechanisms, consistency in distributed systems, fault-tolerance, knowledge and knowledgebased protocols, performance, scheduling,
concurrency control, and authentication and security issues.

## COM S 615 Theory of Concurrent

 SystemsSpring. 4 credits. Prerequisites: COM S 611 or permission of instructor. Not offered every year.

3 lecs.
Modeling, specification, and verification of concurrent systems. Topics in modeling will include interleaving vs. partial-order semantics, and linear time vs. branching time. Among the specification methods discussed are temporal logic, automata, process algebra, and Petri nets. Verification methods include proof calculi, model checking, and refinement mappings. Advanced topics will include open systems and real time

## COM S 617 Frontiers of Parallel

## Computer Systems

Fall. 4 credits. Prerequisites: COM S 314 or 516 required; COM S 411, 412, or 414 3 lecs.
Focus on the architecture, compiler, and operating system aspects required to support features taken for granted in sequential computing, such as portable parallel programs, powerful debuggers, multi-user machine access, virtual memory, and fast I/O.

## COM S 618 Topics in the Theory of Distributed Systems

Fall. 4 credits. Prerequisites: COM S 444 or COM S 614 or permission of instructor. 2 lecs.
This course focuses on research in distributed systems and algorithms. It covers the fundamental problems and presents some of the latest results and open questions in both message-passing and shared-memory systems. Problems will be viewed from a theoretical standpoint with an emphasis on precise specifications, proofs of correctness, upper and lower bounds on various complexity measures and impossibility results.

## COM S 621 Matrix Computations

Fall. 4 credits. Prerequisites: Mathematics 411 and 431 or permission of instructor. 3 lecs.
Stable and efficient algorithms for linear equations, least squares, and eigenvalue problems. Direct and iterative methods are considered. The Matlab system is used extensively

## COM S 622 Numerical Optimization and Nonlinear Algebraic Equations

Spring. 4 credits. Prerequisite: COM S 621. 3 lecs.
Modern algorithms for the numerical solution of multidimensional optimization problems and simultaneous nonlinear algebraic equations. Emphasis is on efficient, stable, and reliable numerical techniques with strong global convergence properties: quasi-Newton methods, modified Newton algorithms, and trust-region procedures. Special topics may include large-scale optimization, quadratic programming, and numerical approximation

## COM $\mathbf{\$} \mathbf{6 2 4}$ Numercial Solution of Differential Equations

Spring. 4 credits. Previous exposure to numerical analysis, mathematical analysis including Fourier methods, and differential equations. Not offered every year. 3 lecs.
Finite difference and spectral methods for the solution of differential equations. A fastmoving course that begins with a three-week
survey of numerical methods for ODEs, then moves on to Fourier analysis and methods for PDEs, especially parabolic and hyperbolic equations. Other topics covered include numerical stability, the treatment of boundary conditions, and multigrid methods. This course combines theory and programming (in Matlab), emphasizing fundamental principles more than applications.

## COM S 635 Automatic Text Processing and Information Retrieval

Spring. 4 credits. Prerequisite: COM S 410 or equivalent or permission of instructor. Letter grade only

2 lecs.
Modern methods for natural language text processing. Topics include text analysis, storage and retrieval, automatic spelling aids, text compression and encryption, language understanding systems, automatic abstracting, and text generation and translation.

## COM \$ 661 Robotics

Fall. 4 credits. Prerequisites: COM S 482 and permission of instructor. Not offered every year.

3 lecs
State-of-the-art in theoretical and experimental robotics, with an emphasis on robot-motion planning. Topics include: Task-level robot planning, collision-free path planning, grasp synthesis, modeling and propagating uncertainty, planning compliant motions for precision assembly, geometrical planning theories, motion planning with dynamics (and dynamic constraints), computational complexity of robot-motion planning, computational theories of friction, impact, and the physics of manipulation, and error detection and recovery in robotics.

## COM 5662 Robotics Laboratory

Fall. 4 credits. Prerequisite: graduate standing or permission of instructor. Not offered every year.

1 lab.
Introduction to the use of equipment and techniques in a modern robotics laboratory. Includes robot programming, force sensing, compliant motion, and mechanical assembly.

## COM S 664 Machine Vision

Spring. 4 credits. Prerequisites: undergradu-ate-level understanding of algorithms and Math 221 or equivalent

$$
2 \text { lecs. }
$$

An introduction to computer vision. The following topics will be covered: edge detection, image segmentation, stereopsis, motion and optical flow, shape reconstruction, shape representations and extracting shapes from images, model-based recognition. Students will be required to implement several of the algorithms covered in the course and evaluate them on both synthetic and real images.

## COM S 671 Introduction to Automated Reasoning

Fall. 4 credits. Prerequisites: COM S 611 and 681 and Mathematics 581. Not offered every year.

3 lecs.
Methods to automate reasoning in mathematics, including decision procedures, theorem provers, and formal proof tactics. Various implemented systems such as Edinburgh LCF, Cornell's Nuprl, and the Boyer and Moore theorem prover may be studied. Special topics may include proofs-as-programs, reflection, control operators to interpret classical logics, and parallel theorem proving.

## COM S 672 Advanced Artificial

 IntelligenceSpring. 4 credits. Prerequisite: COM S 472 or permission of instructor.

2 lecs.
Advanced course in the computational study of intelligent behavior. Covers current issues in the design and implementation of agents that operate in the face of limited computational, perceptual, and effectory resources. How agents choose action (planning) and how they improve action choice using feedback from the world (leaming) are the chief topics. Heuristic search with limited resources, planning in dynamic worlds, representations change, reasoning under uncertainty, active learning, knowledge assimilation, AI applications to engineering problems, and building integrated intelligent agents are covered. Exercises include building a small mobile robot and programming a player for a video game.

## COM $\mathbf{S} \mathbf{6 8 1}$ Analysis of Algorithms

Fall. 4 credits. Prerequisite: COM S 381 or 481, or permission of instructor.

3 lecs.
Methodology for developing efficient algorithms, primarily for graph theoretic problems. Understanding of the inherent complexity of natural problems via polyno-mial-time algorithms, randomized algorithms, NP-completeness, randomized reducibilities. Additional topics such as parallel algorithms and efficient data structures.

## COM S 682 Theory of Computing

Spring. 4 credits. Prerequisite: COM S 381 or 481, or permission of instructor.

## 3 lecs.

Advanced treatment of theory of computation, computational-complexity theory, and other topics in computing theory.

## COM S 683 Parallel Algorithms

Fall. 4 credits. Prerequisite: COM S 681 1 lec.
This course is a general survey of parallel algorithms and architectures, based on Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes, by F . Thomson Leighton. This course is organized according to architectural paradigms and repeats the analysis of various classes of problems for each class of architectures: arrays and trees, meshes of trees, and hypercubes and related networks. The emphasis is practical. Topics include arrays of processors, systolic retiming, packet routing, randomized packet routing, sorting algorithms, computational geometry, graph and matrix algorithms, fast evaluation of straight-line code, FFT, and NC.

## COM 5684 Introduction to Symbolic

 ComputationSpring. 4 credits. Prerequisites: COM S 381 or 481 , or permission of instructor. Not offered every year.

3 lecs.
Introduction to the algorithms used for algebraic problems in symbolic computing and their mathematical and complexity theoretic foundations. Topics include simplication of, and arithmetic operations with, continued fractions, polynomials, rational functions and elements of algebraic extensions, polynomial factorization, and techniques for questions in algebraic geometry. Related topics may also be included.

COM S 685 Computational Geometry Fall. 4 credits. Prerequisite: COM S 681 or permission of instructor.
The study of algorithms for geometric problems. Topics include: convex hulls, arrangements of lines, planes and hyperplanes, intersection problems, triangulations, proximity (Voronoi diagrams and Delaunay triangulations), geometric searching, randomized algorithms, parallel algorithms, and geometric optimization.

## COM S 709 Computer Science Graduate Seminar

Fall, spring. 1 credit. S-U grades only. For staff, visitors, and graduate students interested in computer science.
A weekly meeting for the discussion and study of important topics in the field.

COM 5711 Topics in Programming Languages and Systems
Spring. 4 credits. Prerequisites: COM S 381 or 481 , and 611 , or permission of instructor.
Not offered every year.
2 lecs.
Topics are chosen at instructor's discretion.

## COM $\$ 712$ Topics in Programming

 Languages and SystemsSpring. 4 credits. Prerequisite: COM S 612 or permission of instructor. Not offered every year.

2 lecs.
Topics are chosen at instructor's discretion.

## COM S 713 Seminar in Systems and

 MethodologyFall, spring, 4 credits. Prerequisites: a graduate course employing formal reasoning such as COM S $600,611,613,615,671$, a logic course, or permission of instructor. Not offered every year.
Discussion of contemporary issues in the design and analysis of computing systems. Emphasis on the proper use of rigor, models, and formalism.

## COM $\mathbf{S} 714$ Distributed Computing

Spring. 4 credits. Prerequisites: COM S 414 and an advanced systems course such as COM S $613,614,632$, or 643 , or permission of instructor. Not offered every year.

2 lecs.
Principles of distributed computing and their application to fundamental problems. Considerable time will be devoted to modeling distributed computations, the theory of concurrency control, security and protection, and issues in fault tolerance (including consensus problems). Other topics may be optimal resource placement, cache management, the specification of distributed programs, and randomized protocols.
COM 5715 Seminar in Programming Refinement Logics
Fall, spring. 4 credits. Prerequisite: permission of instructor.
Topics in programming logics, possibly including type theory, constructive logic, decision procedures, heuristic methods, extraction of code from proofs, and the design of proof-development and problem-solving systems.
COM S 717 Topics in Parallel Architectures
Fall. 4 credits. Prerequisite: COM S 612 or permission of instructor. Not offered every year.

2 lecs.

Covers topics in parallel computers. Material includes: architectures of parallel computers, parallelizing compilers, operating systems for parallel computers, and languages (functional and logic-programming languages) designed for parallel computation.

COM $\$ 718$ Topics in Computer Graphics Fall or spring. 4 credits. Prerequisite: COM S 417 or permission of instructor. Not offered every year.

1 lec.
Covers advanced topics in computer graphics and applications of computer graphics to scientific computation.

## COM $\mathbf{S} 719$ Seminar in Programming Languages

Fall, spring. 4 credits. Prerequisite: COM S 611 or permission of instructor. S-U grades only.
COM $\mathbf{5} 721$ Topics in Numerical Analysis Fall. 4 credits. Prerequisite: COM S 621 or 622, or permission of instructor. Not offered every year.

2 lecs.
Topics are chosen at instructor's discretion.
COM $\mathbf{S} 722$ Topics in Numerical Analysis Spring. 4 credits. Prerequisite: COM S 621 or 622 or permission of instructor. Not offered every year.

2 lecs.
Topics are chosen at instructor's discretion.
COM 5729 Seminar in Numerical Analysis/ACRI
Fall, spring. $1-4$ credits (to be arranged).
Prerequisite: permission of instructor. S-U
grades only.
COM S 733 Toplcs in Information Processing
Not offered every year.
2 lecs.
Topics are chosen at instructor's discretion.
COM 5739 Seminar in Text Processing and Information Retrieval
Fall, spring. 4 credits. Prerequisite: COM S 635 or permission of instructor.
S-U grades only.
COM $\mathbf{S} 743$ Topics in Fault-Tolerant Distributed Computing
Prerequisites: COM S 614, 643, or 714 . Not offered every year.

1 lec.
A study of the latest results and an exploration of open questions in the area of fault-tolerant distributed computing. Topics may include failure models, reliable broadcasts, synchronization, knowledge, and network partitioning. This course is particularly suited to students interested in pursuing research in this area.

## COM s 747 Seminar in Program Logic

 and Semantics4 credits. Prerequisite: permission of instructor. S-U grades only. Not offered every year.

## COM S 753 Seminar on Work in Progress in Distributed Systems

Fall, spring. 1 credit. Prerequisite: permission of instructor.
A weekly meeting to discuss research problems of interest to the participants. Topics include theoretical and practical aspects of distributed and fault-tolerant computing systems.

## COM S 754 Seminar in Work-in-Progress Distributed Systems

Fall. 1 credit.
1 sec .
COM $\mathbf{\$ 7 6 1}$ Dynamic Manipulation and Scientific Computation
Spring, 4 credits. Prerequisites: COM S 462 or 661 , a strong background in robotics and algorithms (e.g., COM S 481), and permission of the instructor.

1 lec.
Most work in dynamic manipulation, an important new area in robotics, uses computer-controlled devices, and yet has been non-computational in flavor. This course surveys the field and attempts to apply methods from numerical and symbolic computation to cast the field into a precise framework and place it on a firm algorithmic footing. Required readings include papers by a variety of researchers.
COM S 762 Robot Cafê
Spring. 4 credits. Prerequisite: COM S 661
Not offered every year.
Advanced seminar on varying topics.
COM $\mathbf{S} 763$ Topics in Ceometric Matching
Spring. 4 credits. Prerequisite: COM S 685 1 lec .

## COM S 771 Topics in Artificial

 Intelligence4 credits. Prerequisite: permission of instructor. Not offered every year.

## COM S 772 Seminar in Advanced

 Robotics4 credits. Prerequisite: permission of instructor. Not offered every year.
COM $\mathbf{S 7 3}$ Proseminar in Cognitive Studies I (also Cognitive Studies, Philosophy, Linguistics, and Psychology 773)
Fall. 2 credits.
R 1:25-2:40. Staff (taught jointly by faculty from Comell's Cognitive Studies Program, representing fields of computer science, linguistics, philosophy, and psychology). This is a year-long lecture-and-discussion course that is intended to provide graduate students with an interdisciplinary introduction to the study of knowledge, its presentation, acquisition, and use. Topics may include the psychology of perception and cognition; the philosophy of mind, language, and knowledge; the phonology, syntax, and semantics of natural language; computational approaches to natural language processing, vision, and reasoning; parallel distributed processing; and neuropsychology.
COM 5779 Seminar in Machine Learning Fall, spring. Creclit to be arranged. Prerequisite: permission of instructor. S-U grades only.

## COM S 781 Topics in Analysis of

 Algorithms and Theory of Computing Fall. 4 credits. Prerequisites: COM S 681 and 682 , or permission of instructor. S-U grades only.2 lecs.
Topics are chosen at instructor's discretion.

## COM S 782 Topics in Analysis of

Algorithms and Theory of Computing Spring. 4 credits. Prerequisites: COM S 681 and 682, or permission of instructor. S-U grades only

2 lecs.
Topics are chosen at instructor's discretion.

COM S 784 Seminar in Computational Algebra
Fall, spring.
Informal weekly seminar in which current topics in computational algebra and symbolic mathematics are discussed.

COM S 789 Seminar in Theory of Algorithms and Computing
Fall, spring. 2-4 credits. Prerequisite: permission of instructor. S-U grades only.
COM $\mathbf{\$ 7 9 0}$ Special Investigations in Computer Science
Fall, spring. Prerequisite: permission of a computer science adviser. Letter grade only. Independent research or Master of Engineering project.

## COM S 890 Special Investigations in

 Computer ScienceFall, spring. Prerequisite: permission of a computer science adviser. S-U grades only. Master of Science degree research.
COM $\mathbf{5} 990$ Special Investigations in Computer Science
Fall, spring. Prerequisite: permission of a computer science adviser. S-U grades only. Doctoral research.

## ELECTRICAL ENGINEERING

## Core Courses

ELE E 210 Introduction to Electrical Systems (also ENGRD 210)
Fall, spring. 3 credits. Prerequisites or corequisites: Mathematics 294 and Physics 213.

3 lecs and optional tutorial sections. For description, see Engineering Common Courses.

ELE E 230 Introduction to Digital Systems (also ENGRD 230)
Fall, spring. 4 credits. Prerequisite: COM S 100.

2 lecs, 1 lab.
For description, see Engineering Common Courses.

## ELE E 301 Electrical Signals and

 Systems IFall. 4 credits. Prerequisites: a grade of at least C+ in Engr 210 and C in Mathematics 293 and 294.

3 lecs, 1 rec-computing session.
Continuous- and discrete-time signals and systems; Fourier series and transforms; bilateral Laplace and $z$ transforms; convolution; FFTs and DFTs; applications to modulation, filtering, and sampling.

## ELE E 302 Electrical Signals and

 Systems IISpring. 4 credits. Prerequisite: ELE E 301. 3 lecs, 1 rec.
Linear time-invariant systems as models for electrical networks; network topology; nodal analysis, loop analysis, modified nodal analysis, and state variable analysis; unilateral Laplace transforms for solving vector differential equations; elementary nonlinearities.

## ELE E 303 Electromagnetic Fields and

 WavesFall, summer co-op session. 4 credits. Prerequisites: grades of C or better in Physics 213, 214, and Mathematics 294.

2 lecs, 1 rec.

Electrostatics, magnetostatics, quasistatics; electromagnetic energy and force; Maxwell's equations in integral and differential form; Poynting's theorem; wave equation; plane electromagnetic waves, phase and group velocities, dispersive media; wave reflection and transmission; dielectric and conducting interfaces; guided waves on finite-transmission lines; transient pulse propagation.

## ELE E 304 Electromagnetic Fields and

 ApplicationsSpring. 4 credits. Prerequisite: ELE E 303. 3 lecs, 1 rec.
Theory of electromagnetic fields and waves building on the foundations established in ELE E 303. Recommended for students interested in electrophysics. Review of Maxwell's equations, boundary conditions, vector and scalar potentials, electromagnetic waves and the wave equation. Theory of electromagnetic waves including transmission lines, rectangular and cylindrical waveguides, and dielectric guides. Cavities, radiation from dipoles and linear arrays of dipoles transmitting-receiving relations, radar and scattering cross sections. Depending on time available additional material will be included on wave propagation in anisotropic media such as ferrites and magnetized plasma.

## ELE E 306 Fundamentals of Quantum and Solid-State Electronics

Spring. 4 credits. Prerequisites: Physics 214 and Mathematics 294.

3 lecs, 1 rec-computing session. Introductory quantum mechanics and solidstate physics necessary for understanding lasers and modern solid-state electronic devices. Quantum mechanics is presented in terms of wave functions, operators, and solutions of Schroedinger's equation. Topics include the formalism and methods of quantum mechanics, the hydrogen atom, the structure of simple solids, energy bands, Fermi-Dirac statistics, and the basic physics of semiconductors. Applications studied include a simple metal, thermionic emission, and the p-n junction.

## ELE E 308 Fundamentals of Computer Engineering

Spring. 4 credits. Prerequisite: ELE E 230 and CS 211

3 lecs, 1 rec-computing session. An introduction to theoretical topics basic to computer engineering: discrete mathematics; structured computer organization; data structures and algorithms; and computer arithmetic. Practical applications of these concepts.

## ELE E 310 Introduction to Probability and Random Signals

Spring. 4 credits. Prerequisite: Mathematics 294. This course may be used in place of Engr 260 to help satisfy the enginering distribution requirement. It can then also meet a field requirement if 3 additional credits of technical elective are taken.

3 lecs, 1 rec-computing session. Introduction to the theory of probability as a basis for modeling random phenomena and signals, calculating the response of systems incorporating these models, and making estimates, inferences, and decisions in the presence of chance and uncertainty. Applications of these models will be given in such areas as communications, control, and device modeling. Specific topics include the basic concept of probability and its representations through densities, cumulative distribution
functions, and characteristic functions; conditional probability; independence; scalar and vector random variables and nonlinear transformations of data; expectation, conditional expectation, moments, correlation; laws of large numbers and central limit theorem; linear least mean square estimation; Bayes and Neyman-Pearson decision making.

## ELE E 315 Electrical Laboratory I

Fall. 5 credits. Prerequisite: a grade of at least C+ in Engr 210. Satisfies college technical writing requirement.

2 lecs, 2 labs.
Basic electrical and electronic instrumentation. Measurements and design involving circuits with both active and passive elements; characterization of semiconductor devices. Introduction of the personal computer as a laboratory aid. Technical report writing.

## Computer Engineering

ELE E 230 Introduction to Digital Systems (also ENGRD 230)
Fall, spring. 4 credits.
For description, see Engineering Common Courses

## ELE E 423 Computer Methods for Circuit Simulation

Fall. 4 credits. Prerequisite: ELE E 302.
Satisfies undergraduate computer-applications requirement.

3 lecs, open lab.
Numerical techniques presented in the context of circuit simulation. Solution of linear and nonlinear algebraic equations; integration; solution of ordinary differentia! equations; altemative forms of circuit-equation formulation. Starting from a program to simulate simple, linear passive, steady-state circuits, the instructor will add, and the students improve on, procedures that will finally result in a nonlinear transient integrated-circuit simulator that involves most of the techniques discussed in class.

## ELE E 445 Computer Networks and

 TelecommunicationsFall. 3 credits. Prerequisites: ELE E 308 (or COM S 314) and a course in probability. 3 lecs.
Design, analysis, and implementation of local area networks, wide area networks, and telecommunications systems; circuit switching, packet switching; broad band switching; protocols; asynchronous transfer mode systems.

## ELE E 475 Computer Structures

Fall. 4 credits. Prerequisite: ELE E 308 (or COM S 280 and 314).

3 lecs, 1 lab.
Methods of designing digital computers and the hardware-software interface to the systems they function with. Topics will include types of control sequencers, memory and I/O organization and interfacing, interrupt hardware design, floating-point hardware and basic architectural alternatives. Laboratory groups will design and build a small digital computer. User-programmable logic devices will be employed for circuit implementation.

## ELE E 476 Digital Systems Design Using Microcontrollers

Spring. 4 credits. Prerequisite: ELE E 308 or COM S 314 (ELE E 475 strongly recommended).

3 lecs, 1 lab.
Design of real-time digital systems using microprocessor-based embedded controllers.

Students working in pairs will design, debug, and construct several small systems that illustrate and employ the techniques of digital system design acquired in previous courses. The content focuses on the laboratory work, the lectures being used primarily for the introduction of examples, description of specific modules to be designed, and instruction in the hardware and high-level design tools to be employed. The laboratory environment is that of ELE E 475 enhanced with the addition of an integrated single-board computer based on the 80 C 196 KB microcontroller chip. Programming is in assembly language and (optionally) C.

## ELE E 524 Differential Equation

 Numerical Methods for the Electrical EngineerSpring. 4 credits. Prerequisites: ELE E 301 and ELE E 303. ELE E 423 is helpful. A working knowledge of a scientific programming language is required. Open to both undergraduates and graduates. Satisfies undergraduate computer applications requirement

3 lecs, open lab.
Numerical methods for ordinary and partial differential equations are presented using examples from different areas of electrical engineering. Examples include semiconduc-tor-device simulation, plasma simulation, propagation of solitons in optical fibers, and the modeling of electrostatic fields in micromechanical devices. Numerical methods include particle-in-cell simulation techniques; spectral methods; elementary parabolic, elliptic, and hyperbolic methods; and the boundary-element method. The fundamental notions of accuracy and error, consistency, stability, and convergence are discussed.

## ELE E 539 VLSI Digital System Design

Fall and spring. 7 credits (if taken both semesters). Prerequisite: ELE E 475 or consent of instructor.

Fall: 3 lecs, 1 lab, 1 rec; spring: 1 lec, 1 lab.
Custom VLSI design as seen by a system designer. Emphasis on structured design methodologies for VLSI systems. Topics include MOS transistors, design rules for MOS integrated circuits, implementation of common digital components, clocking disciplines for VLSI, tools for computer-aided design, system design for performance, and novel architectures for VLSI systems. A chip design project and design report are required for fall semester. CAD tools are used extensively Chips are tested for functionality and performance, and the design report is revised in the spring semester. The course may be taken without the design project in the fall for 3 credits.

## ELE E 541 Advanced Computer

 ArchitecturesFall. 3 credits. Prerequisite: ELE E 308 (or COMS 280 and 314).
Design and evaluation of processor architectures are examined in the light of actual implementations. Topics include parallel and pipelined architectures, interleaved memories, cache and virtual memories, I/0 processors, vector and array processors, protection mechanisms, and RISC architectures.

## ELE E 542 Parallel Processing

Spring. 3 credits. Prerequisite: ELE E 541 3 lecs.
Parallel computer systems that are designed to provide a high computation rate for large
specific problems are studied. Topics include computer architecture, interconnection networks, performance characterization, basic algorithms, and parallel programming techniques. Recent multicomputers and massively parallel processors are also discussed.

## 〔ELE E 547 Computer Vision

Fall. 4 credits. Prerequisites: ELE E 308 (or COM S 280 and 314) or consent of instructor. Not offered 1994-95.

3 lecs.
Computer acquisition and analysis of image data with emphasis on techniques for robot vision. Computer vision is the construction of explicit meaningful descriptions of physical objects from images. This course will concentrate on descriptions of objects at three levels of abstraction: segmented images (images organized into subimages that are likely to correspond to interesting objects), geometric structures (quantitative models of image and world structures), and relational structures (complex symbolic descriptions of images and world structures). The programming of several computer-vision algorithms will be required.]

## ELE E 563 Communication Networks

Fall. 4 credits.
For description, see Communication and Information Systems.

## Circuits, Systems, and Signal Processing

## ELE E 210 Introduction to Electrical

 Systems (also ENGRD 210)Fall, spring. 3 credits.
For description, see Engineering Common Courses.

## ELE E 301 Electrical Signals and Systems I

Fall. 4 credits
For description, see Core Courses.
ELE E 302 Electrical Signals and Systems II
Spring. 4 credits.
For description, see Core Courses.
[ELE E 318 Electric and Electromechanical Circuits and Systems
Spring. 3 credits. Prerequisite: ELE E 315 Not offered 1994-95.

Integrated lecs and lab
Concepts and methods for design, construction, testing, and analysis of a variety of electronic circuits and for modeling and analysis of electromechanical devices such as speakers, solenoids, and a variety of motors.]

## ELE E 320 The Audio Engineering Laboratory: An Introduction To

 Audio Signal ProcessingSpring. 3 credits. Prerequisites: ELE E 301 and ELE E 315 .
Hands-on laboratory experience in applying signals and systems concepts. Students are paired into teams; each team designs, constructs, and tests simple analog and digital audio circuits and programs. The course builds intuition in signal processing, valuable not only for audio, but also for general communication and control systems. In addition, students develop critical technical writing and presentation skills.

ELE E 423 Computer Methods for Circuit Simulation
Fall. 4 credits.
For description see Computer Engineering.

## ELE E 425 Digital Signal Processing

Fall. 4 credits. Prerequisite: ELE E 301. 3 lecs, 1 lab.
Fundamentals of signal analysis, review of Fourier, Laplace, and Z transforms. Sampling theory. Multirate signal processing. Discrete Fourier transform properties and computation (FFT). Digital filter design; the approximation problem for FIR and IIR filters, the realization problem-finite word-length limitations and filter structures.

## ELE E 426 Applications of Signal Processing

Spring. 3 or 4 credits. Prerequisite: ELE E 425.
$1 \mathrm{lec}, 2$ labs.
Applications of signal processing, including signal analysis, filtering, and signal synthesis The course is laboratory oriented and emphasizes individual student projects Design is done with signal-processing hardware and by computer simulation. Topics include filter design (principally digital filtering) and spectral analysis as well as speech coding, speech processing, digital recording, adaptive noise cancellation, and digital signal synthesis.

## ELE E 521 Theory of Linear Systems

 Fall. 4 credits. Prerequisite: ELE E 302 or permission of instructor. Recommended: a good background in linear algebra and linear differential equations3 lecs.
State-space and multi-input-multi-output linear systems in discrete and continuous time. The state transition matrix, the matrix exponential, and the Cayley-Hamilton theorem. Controllability, observability, stability, realization theory. At the level of Linear Systems, by T. Kailath.

## ELE E 522 Nonlinear Systems: Analysis, Stability, Control, and Applications

Spring. 4 credits. Prerequisites: ELE E 521 or a solid background in linear algebra and real analysis strongly recommended but not required.
A fairly rigorous introduction to nonlinear systems, including nonlinear differential equations, flows, phase-plane analysis, fundamentals of Lyapunov theory, LaSalle's Theorem, regions of attraction, slowly varying systems, advanced stability theory, Lyapunov redesign, applied nonlinear control, describing functions, averaging and singular perturbations; bifurcation analysis and control and application to physical systems.

## ELE E 525 Adaptive Filtering in

 Communication SystemsFall. 3 credits. Prerequisites: ELE E 425 or 472 , or 521 , or permission of instructor. Fundamentals of an adaptive filter theory intended for communication systems applications. Three traditional problems are used to motivate adaptive FIR and IIR filter design and to raise open issues of current interest: (1) channel equalization for intersymbol interference removal from distorted digital sources, (2) echo cancellation in 4 wire telephony loops, and (3) speechband signal-source compression via differential pulse code modulation.

ELE E 526 Advanced Signal Processing
Spring. 4 credits. Prerequisites: ELE E 425 and ELE E 521.

3 lecs, 1 lab.
Sampling and signal reconstruction. Approximation theory. Linear inversion theory.
Exponential signal modeling. Spectral
estimation. Wavelets.

## ELE E 679 Advanced Topics in Systems and Control

1-3 credits.
For description see Power and Control Systems.

## Communication and Information Systems

ELE E 310 Probability and Random Signals Spring. 4 credits.
For description see Core Courses.

## ELE E 411 Random Signals in Communications and Signal Processing

Fall. 3 credits. Prerequisite: ELE E 302 and 310 or equivalent.

3 lecs.
Introduction to models for random signals in discrete and continuous time; Markov chains, Poisson process, queuing processes, widesense stationary processes and power spectral densities, Gaussian random process, including the narrowband case. Electrical engineering phenomena described by such models (e.g., communications channel noise, queues that form in multiple-access telecommunications systems). Response of linear and nonlinear systems to random signals. Elements of estimation and inference as they arise in communications and digital signal processing systems (e.g., problems of extraction of signals from noise via Wiener filtering, power spectral density estimation).

## ELE E 445 Computer Networks and

 Telecommunications I
## Fall. 3 credits.

For description see Computer Engineering.

## ELE E 468 Communications Systems I

 Spring. 4 credits. Prerequisite: ELE E 301 or 521 , and 411 or equivalent.Analog signal representation and filtering using Fourier and Hilbert transform techniques. Varieties of amplitude modulation (AM, DSBSC, SSB, VSB, QAM), phase modulation, and phase locked loops. Frequency modulation. Demodulation of AM and FM in the presence of noise; sampling theorems and aliasing. Pulse amplitude modulation. Quantization for $\mathrm{A} / \mathrm{D}$ conversion. Pulse code modulation. Elements of optimal signal parameter estimation. Application to commercial broadcasting and data transmission.

## ELE E 561 Error-Control Codes

Fall. 3 credits. Prerequisite: ELE E 301 or ELE E 521 or equivalent. A strong familiarity with linear algebra is assumed.

3 lecs.
An introduction to the theory of algebraic error-control codes. Topics include: Hamming codes, group codes, the standard array, minimum-distance decoding, cyclic codes, and the dual of a linear block code. Methods of shortening and combining codes. Hamming and Singleton bounds for error-correcting codes. Algebra: groups, rings, and fields with special emphasis on Galois or finite field theory. The construction and decoding of Bose-(Ray) Chaudhuri-Hocquenghem (BCH)
and Reed-Solomon (RS) codes. Twodimensional cyclic codes and cascaded ReedSolomon codes. Computer methods for the study of the structure and algorithms for errorcontrol are used.

## ELE E 562 Fundamental Information Theory

Fall. 3 credits. Prerequisite: ELE E 310 or equivalent.

3 lecs.
Fundamental results of information theory with application to storage, compression, and transmission of data. Entropy and other information measures. Block and variablelength codes. Channel capacity and ratedistortion functions. Coding theorems and converses for classical and multiterminal configurations. Gaussian sources and channels.
ELE E 563 Communication Networks
Spring. 4 credits. Prerequisite: ELE E 310 or permission of instructor.

3 lecs.
Classical line-switched communication networks: point-process models for offered traffic; blocking and queuing analyses. Stability, throughput, and delay of distributed algorithms for packet-switched transmission of data over local-area and wide-area nets (LANS and WANS): TDMA, FDMA, ALOHA, slotted ALOHA, Ethernet, reservation, tree, and interval-searched contention resolution protocols. Flow control and capacity assignment algorithms for wideband, robust networks. Adaptive routing and ATM networks.

## ELE E 564 Decision Making and Estimation

Fall. 4 credits. Prerequisite: Coregistration in ELE E 411.
An introduction to those methods of making rational decisions and inferences and of forming estimates that are central to problems of communications, detection, pattern recognition, and statistical signal processing. Topics include Bayes, minimax, and NeymanPearson decision theories; Bayes and maximum likelihood point estimation; CramerRao bound, efficient, and consistent estimation; spectral estimation; and robust models for signal extraction.

## ELE E 567 Communication Systems II

 Spring. 4 credits. Prerequisites: ELE E 411, 468.Fundamental topics in modern digital communication. Analytical and computational tools required to understand modern data conversion, transmission, and storage systems. Possible topics include: PCM, DPCM, PAM, PSK, FSK, matched filtering, equalization, line codes, trellis codes, Viterbi decoding, applications to audio, video, and magnetic recording. Vector quantization and universal data compression including LZ, LZW, and arithmetic coding, applied to files, speech, images, and video.

## ELE E 577 Artificial Neural Networks

Fall. 3 credits. Prerequisites: ELE E 310; ELE E 411 recommended.
Artificial neural networks are brainlike in being formed out of many highly interconnected nonlinear memoryless elements. Probability theory will provide the primary analytical approach to design and analysis of neural networks. The course will cover capabilities of feed-forward nets (multilayer perceptrons) that can serve as pattern classifiers, decision-making devices, and
controllers, as well as aspects of recurrent/ feedback/Hopfield nets that can serve as associative memories and combinatorial optimizers. At the level of the current literature.

## [ELE E 664 Foundations of Inference and Decision Making

Spring. 3 credits. Prerequisite: a course in probability and some statistics, or permission of instructor. Not offered 1994-95.

3 lecs.
An examination of methods for characterizing uncertainty and chance phenomena and for transforming information into decisions and optimal systems. Discussion of the foundations of inference includes topics drawn from comparative probability, interval-valued probability, quantitative probability, relative frequency interpretations, computational complexity, randomness, classical probability and invariance, induction, and subjective probability.]

## ELE E 668-669 Random Processes in Electrical Systems

668 , fall; 669 , spring. 3 credits each term. Advanced topics in the general area of randomness and uncertainty and their relevance to the analysis and design of electrical systems.

## Power and Control Systems

## ELE E 318 Electric and

 Electromechanical Circuits and SystemsSpring. 3 credits.
For description see Circuits, Systems, and Signal Processing.

ELE E 451-452 Computer-Aided Analysis of Electric Power Systems I and II
451, fall; 452, spring. 4 credits each term. Prerequisite: ELE E 302.

3 lec-recs, 1 lab-computing session. Representation of 3-phase power systems, modeling of synchronous machines; transmission lines; transformers; loads, introduction to sparce matrix techniques, power-flow analysis, economic dispatch, optimal power flow, symmetrical components, fault studies, powersystem protection, power-system stability, online power-flow analysis, voltage-control systems, and power-control systems.

## ELE E 471 Feedback Control Systems

Fall. 4 credits. Prerequisite: ELE E 302 or M\&AE 326, or permission of instructor.

$$
3 \text { lecs, open lab. }
$$

Analysis techniques, performance specifications, and analog-feedback-compensation methods for single-input, single-output, linear, time-invariant systems. Laplace transforms and transfer functions are the major mathematical tools. Design techniques include PID, root-locus, frequency response, and algebraic pole placement. Computer-aided design laboratory examines modeling and control of a computer-simulated dynamic process.

## ELE E 472 Digital Control Systems

Spring. 4 credits. Prerequisite: ELE E 471 or permission of instructor.

3 lecs, open lab.
Analysis and design of feedback control systems using digital devices to implement compensation. Z-transforms and linear algebra are the major mathematical tools. Topics include: state realizations, digitizations of analog systems, least-squares system identification, state feedback control,
observers, combined observer-controller, and algebraic-control design. Assignments will consist of reports on computer-aided controller design and digitally simulated evaluation.

## [ELE E 555 Advanced Power Systems

 Analysis and Control IFall. 3 credits. Prerequisites: ELE E 302 and concurrent registration in 451, or permission of instructor. Not offered 1994-95. Advanced static analysis of power systems. State estimation in power systems. Bad-data detection and identification. Static equivalent circuits of external power systems. Static contingency analysis and selection. Steadystate security assessment. Static bifurcation and voltage stability. Theoretical analysis of load flow equations.]

## ELE E 556 Advanced Power Systems Analysis and Control II

Spring. 3 credits. Prerequisite: ELE E 555 or permission of instructor. Not offered 1994-95 Analysis of power-system components including rotating machines, excitation systems, automatic voltage regulation, boilerturbine control, and speed regulation Automatic Generation Control. Numerical simulations of mid-term and long-term powersystem dynamics. Direct methods for powersystem stability analysis. Dynamic equivalent circuits of external power systems. Dynamic contingency analysis and selection. Dynamic Security Assessment.]

## ELE E 564 Decision Making and

 EstimationFall. 4 credits
For description see Communication and Information Systems.

## [ELE E 573 Optimal Control and

 Estimation for Continuous SystemsFall. 4 credits. Prerequisite: ELE E 521 or permission of instructor. Not offered 1994-95. 3 lecs.
Control system design through parameter optimization, with and without constraints. The minimum principle; linear regulations, minimum-time and minimal-fuel problems. Computational techniques; properties of Lyapunov and Riccati equations.]

## ELE E 574 Estimation and Control in

 Discrete Linear SystemsSpring. 4 credits. Prerequisites: ELE E 521 and 411 , or permission of instructor. 3 lecs.
Optimal control, filtering, and prediction for discrete-time linear systems. Approximation on discrete point sets. The principle of optimality. Kalman filtering. Stochastic optimal control.

## ELE E 664 Foundations of Inference and Decision Making

Spring. 3 credits.
For description see Communication and Information Systems.

ELE E 679 Advanced Topics in Systems and Control
$1-3$ credits. Prerequisite: permission of instructor. Not offered every year. Topics include robotics, nonlinear feedback system stability, multivariable control, and qualitative theory on nonlinear systems.

## Solid-State Electronics

ELE E 306 Fundamentals of Quantum and Solid-State Electronics
Spring. 4 credits.
For description, see Required Courses.
ELE E 412 Applied Solid-State Physics Spring. 4 credits. Prerequisite: ELE E 306. ELE E 407 recommended.

3 lecs, 1 rec.
Review of basic solid-state concepts (lattice, primitive cell, reciprocal lattice, Brillouin zone). Lattice vibrations. The diatomic chain. Polarity of waves. Binding of crystals. Thermal properties of insulators and metals Effective mass tensor. Magnetic flux quantization and the Fermi surface in metals. Plasmons, polaritons, and polarons. Chargecarrier scattering. Optical properties. Kramers-Kronig relations. Elements of superconductivity. Dia- and ferroelectric materials. Dia-, para-, ferro-, and antiferromagnetism.

ELE E 433 Microwave Integrated Circuits Fall. 4 credits; may be taken for 3 credits without laboratory. Prerequisites: ELE E 303 and ELE E 306.

3 lecs, 1 lab.
An introduction to the design and testing of high-speed circuits (frequencies above 1 GHz ). Topics include: computer-aided design, automated microwave measurement techniques, optoelectronic applications, and GaAs monolithic microwave integrated circuits. Six two-week labs cover the basics of designing, fabricating, and testing microwave integrated circuits.

## ELE E 453 Integrated Circuit Design

Fall. 4 credits. Prerequisites: ELE E 301 and ELE E 315 or equivalent. ELE E 457 recommended.

3 lecs, 1 lab.
Introduction to analysis and design of digital and analog MOS and bipolar integrated circuits (IC). Device models. Computer-aided design (layout, design rules, floor planning). Common building blocks for digital and analog applications (inverters, switches, single-stage units, sources, sinks, differential pairs, active loads). Steady-state and transient analysis, frequency response and noise. Overview of common IC designs (microprocessors, memories, amplifiers).

## ELE E 457 Silicon Semiconductor

 ElectronicsFall. 4 credits with lab. Prerequisites: ELE E 315 and ELE E 306 or equivalent.

3 lecs, 1 lab.
Fundamental electronic properties of semiconductors. Energy-band diagrams, carrier transport and recombination, pn junctions, metal-semiconductor Schottky contacts, ohmic contacts, and metal-oxidesemiconductor (MOS) structures. Operation of bipolar junction transistors (BJTs) and field effect-transistors (FETs). Six two-week labs covering electrical measurements of semiconductor materials and devices.

## ELE E 524 Differential Equation

 Numerical Methods for the Electrical EngineerSpring, 4 credits.
For description, see Computer Engineering.

## ELE E 533 Semiconductor Lasers

Spring. 3 credits. Prerequisites: ELE E 430, ELE E 457, or permission of instructor. May not be offered 1994-95.

3 lecs.
Study of principles and characteristics of semiconductor lasers. Topics cover laser dynamics, noise, quantum confined structures, single-frequency lasers, traveling-wave lasers, surface-emitting lasers, reliability, and emerging research subjects. A term project and paper will be required.

## ELE E 535 Semiconductor Physics

Fall. 4 credits. Prerequisites: ELE E 457, 458, and 407 , or permission of instructor.

3 lecs.
Fundamental semiconductor physics of charge carrier transport and optical characteristics of materials and structures useful in electronic and photonic devices. Crystal structure, energy band structures, carrier effective mass, phonons, statistics, classical low-field transport, including temperature effects, highfield and ballistic charge carrier transport, electron scattering by phonons in bulk and quantum well structures, optical absorption, reflection, optical emissions, deep levels as charge carrier traps, surface and interface effects. Examples of related phenomenon in electronic and photonic devices. On the level of Compound Semiconductor Device Pbysics by S. Tiwari.

## ELE E 536 VLSI Technology

Spring. 4 credits. 3 credits without laboratory with permission of instructor. Prerequisite: ELE E 457 or ELE E 453 or ELE E 539, or permission of instructor. May not be offered 1994-95.

2 lecs, 1 lab.
Processing technology for very large scale integrated circuits for CMOS, BiCMOS, ECL, and related applications. Lithography, oxidation, diffusion, ion implantation, film deposition, wet and dry etching, multilevel metal interconnect, process integration, manufacturing yield, and integrated circuit reliability. Hands-on laboratory includes full MOS device and circuit fabrication process in a clean room; process simulation on CAD tools; and process, device, and circuit characterization

## ELE E 537 Computer System Packaging

 Fall. 4 credits. 3 credits without project with permission of instructor. Prerequisites: ELE E 230 and ELE E 453 or ELE E 457 or ELE E 539; or permission of instructor2 lecs, 1 project
Integration of electronic systems from integrated circuits, to VLSI chips, modules, boards, and full electronic systems including handheld, notebook, desktop, workstation, mainframe, and supercomputer size classes. Packaging architectures, high-speed electrical and optical signal distribution, power distribution, and power and thermal management, functional architecture, manufacturing, measurement and simulation methods, and fundamental limits. Computer simulations and designs on workstations using SPICE3e and AUDiT4.4 CAD tools.

ELE E 539 Custom VLSI Design as Seen by a System Designer
Fall and spring. 6 credits.
For description, see previous listing under Electrical Engineering: Computer Engineering.

ELE E 554 Advanced VLSI Circuit Design Spring. 4 credits. Prerequisite: ELE E 453 or equivalent.

3 lecs, 1 lab.
Integration of building blocks on chip. Overview of recent innovations in VLSI circuits.

Feedback circuits. Operational amplifiers. Switched-capacitor circuits. Digital-to-analog and analog-to-digital converters. Dynamic and static memories. Programmable logic and gate arrays. Systems on chips (microprocessors, wafer-scale integration).

## ELE E 558 Compound Semiconductor Electronics

Spring. 4 credits with lab. Prerequisites: ELE E 457 or equivalent.

3 lecs, 1 lab.
Electronic properties of advanced semiconductor structures using compound semiconductor materials and heterojunctions. Fundamentals of carrier transport and scattering. Properties of direct bandgap semiconductors and quanlum wells. Advanced semicunductur devices including metal-semiconductor transistors (FETs), modulation-doped FETs, and heterojunction bipolar transistors (HBTs). High-frequency operation of compound semiconductor devices. Six two-week labs, which include low-temperature carrier transport, optical absorption and emission, and electrical characterization of compound semiconductor devices.

## ELE E 633 Radiation Effects in

 Microelectronics (also NS\&E 621)Fall. 3 credits. Prerequisites: permission of instructor. A seminar intended for seniors and graduate students in engineering or applied physics.

Two 1-1/2 hour lecs. S. C. McGuire. An introduction to the physical processes that underlie the malfunction of microelectronic circuitry resulting from exposure to ionizing radiation. Basic device-failure mechanisms, including total-dose effects, single-event upsets, and latchup, as well as the roles that circuit testing and modeling methods play in improving circuit design. Impact of surface radiation typical of low-energy electron and photon sources on device fabrication. Reference materials from the current literature.

## ELEE 636 Advanced Solid-State Devices

 Spring. 4 credits. Prerequisites: ELE E 535 or ELE E 457 and ELE E 407 or equivalent. May not be offered academic year 1994-95.2 lecs or seminar sessions, 1 project. Review of quantum foundations of carriers in semiconductors. Detailed discussion of nonequilibrium transport of carriers in semiconductors including carrier dynamics, scattering, relaxation, recombination, hot carrier effects, high field effects, and quantum mechanical tunneling. Exploration of semi-classical drift-and-diffusion, hydrodynamics, and Monte Carlo-based device simulation. Project requires independent simulation study of state-of-the-art semiconductor device.

## Quantum and Opto-Electronics

ELE E 306 Fundamentals of Quantum and Solid-State Electronics
Spring. 4 credits.
For description, see Core Courses.
ELE E 407 Quantum Mechanics and Applications
Fall. 4 credits. Prerequisite: ELE E 306 or equivalent.

3 lecs, 1 rec.
Review of basic quantum mechanical concepts. Harmonic oscillator. Annihilation and creation operators. Application of the WKB approximation to bound states and transmission coefficients. Angular momentum. Raising and lowering operators. Addition of
angular momentum. Radial equation. Effective potential. Hydrogen atom. Selection rules. Spin states. LS coupling. Pauli principle. Hybridization. Helium atom. Perturbation theory. Atom-radiation interaction. Golden rule. Sum rule. Thomas-Fermi atom. LCAO. Bound and anti-bound states. The quantum well. Density of states in the three dimensions. Degeneracy of Landau levels.
ELE E 430 Lasers and Optical Electronics
Fall. 3 credits. Prerequisite: ELE E 306 or equivalent.

3 lecs, 1 rec-lab. An introduction to the operation of stimulatedemission devices such as lasers and devices based on linear and nonlinear optics. Material covered includes diffraction-limited optics, propagation of Gaussian laser beams, optical resonators, interaction of radiation with matter, physics of laser operation, laser design. Applications of coherent radiation to nonlinear optics, communication, and research will be discussed as time permits.

## ELE E 524 Differential Equation Numerical Methods for the Electrical Engineer

Spring. 4 credits.
For description, see Computer Engineering.
ELE E 530 Fiber and Integrated Optics Spring. 4 credits with lab. Prerequisite: ELE E 303 or equivalent. 1-credit lab optional.

3 lecs, 1 lab.
Physical principles of optical waveguides, optical sources and detectors, noise, modulators, and sensing. Wave equation solutions to the mode structure in waveguides, mode coupling, dispersion and bandwidth limitations, optical sources based on semiconductors, detectors and noise, modulation techniques, nonlinear effects in optical waveguides, and optical sensors. Laboratory includes demonstrations of optical coupling and waveguide characterization.

ELE E 531 Quantum Electronics I
Fall. 4 credits. Prerequisites: ELE E 306 and 407, or Physics 443.

3 lecs, 1 computing session. A detailed treatment of the physical principles underlying lasers, related fields, and applications. Topics include the interaction of radiation and matter, including emission, absorption, scattering, and basic spectroscopic properties of key laser media; theory of the laser, including methods of achieving population inversions, dispersive effects, and laser oscillation spectrum.

## ELE E 532 Quantum Electronics II

 Spring. 4 credits. Prereq̧uisite: ELE E 531 or permission of instructor.3 lecs, 1 lec-computing session. A continuation of ELE E 531. Topics include density matrix; nonlinear optical processes; properties of nonlinear optical materials; optical parametric oscillators; spontaneous and stimulated Raman and Brillouin processes; theory of coherence; pico- and femto-second optics; ultrafast processes in semiconductors and molecules; optical properties of semicon-ductor-doped glasses, quantum-well structures, and superlattices.
ELE E 535 Semiconductor Physics
Fall. 4 credits.
For description see Solid-State Electronics.

## Plasmas and Large-Scale Fluids

ELE E 484 Introduction to Controlled Fusion: Principles and Technology (also M\&AE 559 and NS\&E 484)
Spring. 3 credits. Prerequisites: ELE E 301 and 303 , or permission of instructor. Intended for seniors and graduate students.

3 lecs.
For description, see NS\&E 484.

## ELE E 486 Space Science and

 EngineeringSpring. 3 credits. Prerequisites: ELE E 301 and ELE E 303 or equivalent.
A survey of subjects relevant to spacecraft design. Astrodynamics and orbital maneuvers. Rigid-body dynamics and control. Communications. Black-body radiation and temperature control. Geospace environment. Remote sensing using electromagnetic techniques. Applications of these topics will be discussed where appropriate. At the level of Design of Geosyncbronous Spacecraft, by Agrawal.

## ELE E 487 Introduction to Antennas and

 RadarFall. 3 credits. Prerequisites: ELE E 304 (or at least a B in 303).
For description, see Fields, Waves, and Antennas.

ELE E 524 Differential Equation Numerical Methods for the Electrical Engineer
Spring. 4 credits.
For description, see Computer Engineering.
ELE E 580 Applied Electrodynamics
3 credits ( 4 credits with project). Prerequisite: ELE E 581 or ELE E 583 or permission of instructor.
Contemporary electrodynamics with emphasis placed on applications. Theory, design, and use of high-power microwave devices, such as gyrotons, CARMs, free-electron lasers, and traveling-wave tubes. Electromagnetic waveguide and cavity modes, charged-particle orbit theory, particle dynamics in electromagnetic fields, field transforms, electron beam generation, equilibria, waves on beams, lowand high-power microwave devices and their applications. Project based on the numerical simulation of microwave devices.

## ELE E 581 Introduction to Plasma Physics

Fall. 4 credits. Prerequisites: ELE E 303 and ELE E 304 or equivalent. First-year graduatelevel course; open to exceptional seniors with permission of instructor.

3 lecs.
Plasma state; motion of charged particles in fields; drift-orbit theory; coulomb scattering, collisions; ambipolar diffusion; elementary transport theory; two-fluid and hydromagnetic equations; plasma oscillations and waves, CMA diagram; hydromagnetic stability; elementary applications to space physics and controlled fusion.

ELE E 582 Advanced Plasma Physics (also A8EP 607)
Spring. 4 credits. Prerequisites: ELE E 581 and A\&EP 606.

3 lecs.
Boltzmann and Vlasov Equations; dielectric tensor; waves in hot-magnetized plasma; Landau and cyclotron damping; microinstabilities; drift waves, low-frequency stability; test particles, Cerenkov emission; fluctuations; collisional effects; applications.

## ELE E 583 Electrodynamics

Fall. 4 credits
For description, see Fields, Waves, and Antennas.

## [ELE E 585 Atmospheric and Ionospheric Physics (also Astronomy 575)

Fall. 3 credits. Not offered 1994-95. Energy-balance and thermal structure of neutral atmospheres. Elements of circulation theory. Waves and instabilities. Coupling of lower atmospheres to upper atmospheres. Observations of the terrestrial atmosphere and of the other planets. Physical processes in the earth's ionosphere and magnetosphere Production, loss, and transport of charged particles. Electric fields. Coupling of neutralatmosphere dynamics with electric fields and charged-particle transport. Diagnostic techniques, including radar and in situ observations. The equatorial electrojet. Observations of ionospheres on the other planets.]

## [ELE E 586 Solar Terrestrial Physics (also Astronomy 576)

Spring. 3 credits. Not offered 1994-95. High-latiude ionosphere; electric fields in the polar cap and auroral zone; particle precipitation and the aurora; magnetic and ionospheric storms; plasma instabilities in the ionosphere and magnetosphere; structure and physical processes in the sun, solar corona, and solar wind; interactions between the solar wind and the earth's magnetosphere; trapping, acceleration, and drift of energetic particles in the magnetosphere.]

## [ELE E 588 Advanced Electromagnetic Wave Propagation and Scattering

Spring. 3 credits. Prerequisites: ELE E 487 and 581 , or permission of instructor. Not offered 1994-95

3 lecs.
For description, see Fields, Waves, and Antennas.]

## ELE E 682 Nonlinear Phenomena in Plasma Physics <br> Fall. 3 credits. Prerequisite: ELE E 582.

 Nonlinear models and behavior of plasmas. Solitons and nonlinear wave equations resonant mode-mode coupling, ponderomotive effects and parametric processes, development of simplified plasma dynamical models.
## [ELE E 685 Solar Plasma Physics

Fall. 3 credits. Offered upon demand. Not offered 1994-95
This course will be coordinated with the two courses on upper atmospheric physics, ELE E 585 and 586, to provide an integrated view of solar-terrestrial physics for the graduate student intending a research career in space plasma physics. A thorough understanding of electromagnetic theory and some knowledge of fluid mechanics and plasma physics at the level of ELE E 581 and 582 are assumed.]

Fields, Waves, and Antennas
ELE E 303-304 Electromagnetic Fields and Waves
303, fall; 304 , spring. 4 credits each semester. For description, see Core Courses.

ELE E 433 Microwave Integrated Circults
Fall. 4 credits; may be taken for 3 credits without laboratory. Prerequisites: ELE E 303 and ELE E 306
For description, see Solid-State Electronics.

ELE E 487 Introduction to Antennas and Radar
Fall. 3 credits. Prerequisites: ELE E 301 and ELE E 304 (or a grade of B or better in ELE E 303).

Fundamentals of antenna theory, including gain and effective area, near and far fields, phased arrays, aperture antennas and aperture synthesis. Fundamentals of radar, including detection, tracking, Doppler shifts, sampling, range and frequency aliasing. Pulse compression principles and the ambiguity function; synthetic aperture radars and remote sensing from aircraft and satellites; over-the-horizon (OTH) radars and ionospheric propagation effects; radar astronomy techniques, including range-Doppler mapping of planets and the problem of overspread targets.

## ELE E 534 Microwave Semiconductor Devices

Spring. 4 credits. Prerequisites: ELE E 433 and 457.

3 lecs, 1 lab. For description, see SolidState Electronics

## ELE E 583 Electrodynamics

Fall. 4 credits. Prerequisite: ELE E 301 and ELE E 304 or equivalent.

3 lecs.
Maxwell's equations, electromagnetic potentials, integral representations of the electromagnetic field, Green's functions. Special theory of relativity, Lienard-Wiechert potentials, radiation from accelerated charges, Cerenkov radiation. Electrodynamics of dispersive dielectric and magnetic media. At the level of Classical Electrodynamics, by Jackson.

## ELE E 584 Microwave Theory

Spring. 4 credits. Prerequisites: ELE E 301 and 304 or equivalent.

3 lecs, 1 rec.
Theory of passive microwave devices. Modal analysis of inhomogeneous waveguides and cavities. Waveguide excitation, perturbation theory. Nonreciprocal waveguide devices. Scattering matrix analysis of multiport junctions, resonant cavities, directional couplers, circulators. Periodic waveguides, coupled-mode theory.

## [ELE E 588 Advanced Electromagnetic

 Wave Propagation and Scattering Spring. 3 credits. Prerequisite: ELE E 487 and 581 or permission of instructor. Offered alternate years. Not offered 1994-95.3 lecs.
WK band and full-wave solutions of the wave equations, interactions between particles and waves, scattering of radio waves from random fluctuations in refractive index, scatter propagation, incoherent scatter from the ionosphere and its use as a diagnostic tool, scattering from unstable plasma waves, pulse compression and other radar probing techniques.]

## General

ELE E 250 Technology in Western Society (also ENGRG 250)
Fall. 3 credits. Approved for humanities distribution.
For description, see Engineering Common Courses.

ELE E 292 The Electrical and Electronic Revolutions (also ENGRG 292)
Spring. 3 credits. Approved for humanities distribution.
For description, see Engineering Common Courses.

ELE E 360 Ethical Issues in Engineering Spring. 3 credits. A social science elective for engineering students. Open to juniors and seniors.

3 lecs.
For description, see Engineering Common Courses

ELE E 480 Thermal, Fluid, and Statiatical Physics for Engineers
Spring. 3 credits. Prerequisite: Physics 214. May not be offered 1994-95.
Extensive review of thermodynamic principles. Elementary theory of transport coefficients. Elements of fluid dynamics. Shock waves. Central-limit theorem. Random walk. Electrical noise. Fluctuation-dissipation theorem. Quantum and classical statistics Black-body radiation. Thermal properties of solids. Kramers-Kronig relation. Elementary descriptions of the p-n junction. Shockley equation, superfluidity, superconductivity, and the laser.

## ELE E 491-492 Electrical Engineering

 Project491, fall; 492, spring. 1-8 credits Individual study, analysis, and, usually, experimental tests in connection with a special engineering problem chosen by the student after consultation with the faculty member directing the project. An engineering report on the project is required

## ELE E 495-496 Special Topics In Electrical Engineering

1-4 credits.
Seminar, reading course, or other special arrangement agreed on by the students and faculty members concerned.

## ELE E 515-516 Applied Signal

 Processing Systems Design515, fall; 516, spring. Variable credits. Project-level design of systems in the area of signal processing and general instrumentation, including digital signal processing hardware, audio, speech, and analog interfacing. Students pursue individual projects and coordinate ideas and resources with other students with related interest.

## ELE E 517-518 Large-scale, System-

 Design Concepts: A Practical Electric Vehicle Motor Controller517, fall; 518, spring. Variable credits (3-8 per year). Prerequisites: ELE E 471, 472, 476, or 457.

1 lab, 1 rec, 1 group meeting.
Design of a microcontroller-based vectorcontrol system for a 3 -phase induction motor. Emphasis is placed upon the coordinated design of a suitable power electronics switching network, a suitable feedback system with torque control, and a microprocessor arrangement capable of performing the coordinate rotations and implementing the overall feedback algorithm.

## ELE E 591-599 Graduate Topics in

 Electrical Engineering$1-4$ credits.
Seminar, reading course, or other special arrangement agreed on by the students and faculty members concerned.

## ELE E 691-692 Electrical Engineering

 Colloquium691, fall; 692, spring. 1 credit each term. For students enrolled in the graduate Field of Electrical Engineering.
Lectures by staff, graduate students, and visiting authorities. A weekly meeting for the presentation and discussion of important current topics in the field. Report required.

## ELE E 693-694 Master of Engineering Design

693, fall; 694, spring. 1-10 credits. For students enrolled in the M.Eng.(Electrical) degree program. Uses real engineering situations to present fundamentals of engineering design. Each professor is assigned a section number. To register, see roster for appropriate numbers.
ELE E 695-699 Graduate Topics in Electrical Engineering
$1-6$ credits.
Seminar, reading course, or other special arrangement agreed on by the students and faculty members concerned.

ELE E 791-792 Thesis Research
791 , fall; 792 , spring. $1-15$ credits. For students enrolled in the master's or doctoral program.

## GEOLOGICAL SCIENCES

## Freshman and Sophomore Courses

GEOL 101 Introductory Geological Sciences
Fall, spring, or summer. 3 credits.
2 lecs, 1 lab, field trips, evening exams
Fall and spring, R. W. Allmendinger. Observation and understanding the earth, including oceans, continents, coasts, rivers, valleys, and glaciated regions; earthquakes, volcanoes, and mountains; theories of plate tectonics; the origin, discovery, and the development of mineral and water resources. Use of topographic and geologic maps, recognition of minerals and rocks, and field trips to Cascadilla Gorge, Fall Creek, and Enfield Glen.

## GEOL 102 Evolution of the Earth and Life (also Bio S 170)

Spring. 3 credits. GEOL 101 recommended.
2 lecs, 1 lab, field trips, weekly quizzes, no midterm. J. L. Cisne.
Earth systems and their evolution. Earth history's astronomical context. Plate tectonics, continental drifts, and their implications for climate and life. Coevolution of life and the atmosphere. Precedents for ongoing global change. Dinosaurs, mass extinctions, and human ancestry. Laboratories on reconstructing geological history and mapping ancient geography. Fossil collecting on field trips.
GEOL 103 Introductory Geology in the Field
Fall. 3 credits. Limited to 35 students. 1 lec, 1 field trip or lab, 1 rec.
A. L. Bloom.

Subject matter of GEOL 101, taught as much as possible by field trips on campus and in the vicinity, on foot and by bus. Weekly field trips until November introduce most of the major topics of the course, supplemented by lectures, recitations, and labs later in the term.

GEOL 104 The Sea: An Introduction to Oceanography (also Bio S 154)

## Spring. 3 credits

2 lecs, 1 lab. A. L. Bloom, C. Greene. A survey of the physics, chemistry, geology, and biology of the oceans for both science and non-science majors. Topics include: seafloor spreading and plate tectonics, marine sedimentation, chemistry of seawater, ocean currents and circulation, the oceans and climate, ocean ecology, coastal processes, marine pollution and waste disposal, and marine resources.

## QEOL 105 Writing on Rocks (Freshman

 Seminar)Fall. 3 credits.
J. Chiment

See Freshman Seminar Handbook for description.

## GEOL 108 Frontiers of Gealogy

Spring. 1 credit. May be taken concurrently with or after GEOL 101, 102, 103, 104, 111, 201, 202, or 206.

1 lec. J. L. Cisne and staff. Intended for students who are curious about what lies beyond the introductory courses, what geologists actually do, what the big questions are in current research, and what a geology career might hold in store. A different Comell researcher lectures each week on topics geared to the spring introductory geology courses.

## GEOL 109 Dinosaurs

Fall. 1 credit.
1 lec. J. L. Cisne.
An entry-level survey course for those who are interested in dinosaurs and may lack a science background. Lectures examine the fossil evidence and illustrate how various geological and biological disciplines contribute to understanding dinosaurs and their world.

## [GEOL 111 To Know the Earth

Fall. 3 credits. Not offered 1994-95
2 lecs, 1 lab, and field trips. J. M. Bird Acquaints the non-scientists with the earth Geology as an intellectual challenge, a provider of resources, an environment, a danger, a base for culture, and a science among sciences. Landscapes, mountains, earthquakes, volcanoes, oceans, gold, petroleum, and icecaps. Record of the past, context of the present, forecast for the future.]
GEOL 122 Earthquake! (also ENGRI 122) Fall. 3 credits.

2 lecs, 1 lab. L. D. Brown.
The science of natural hazards and strategic resources is explored in a series of geophysical exercises involving: Earthquakes-an obscure scientist predicts a major earthquake for Los Angeles. Join a disaster task force as it attempts to evaluate the prediction and its social consequences. Oil-participate in a simulated cruise to probe with sound waves for oil deep beneath the Gulf of Mexico. Water-a toxic spill occurs near a housing complex in Ithaca, NY. Use seismic instruments to map the shallow subsurface and identify potential routes of contamination.
GEOL 201 Introduction to the Physics and Chemistry of the Earth (also ENGRD 201)
Spring. 3 credits. Prerequisites: Mathematics 191 and Physics 112.

2 lecs; 1 rec, lab, or field trip. L. Cathles For description, see Engineering Common Courses.

GEOL 202 Environmental Geology
Spring. 3 credits.
2 lecs; 1 rec, lab, or field trip. D. E. Karig Geologic processes that affect or are affected by human society, including stream behavior and floods, earthquakes, land stability and mass-wasting, and volcanic hazards. Applications of geology to engineering, natural resources, and land-use planning. Local examples discussed and visited on short field trips. Best taken as an introduction to geology for students with primary interest in other environmental sciences.

## GEOL 204 Hydrology and the

 Environment (also SCAS 371 and ABEN 371)Spring. 3 credits. Prerequisite: 1 course in calculus.

2 lecs., 1 lab. P. C. Baveye,
J.-Y. Parlange, T. S. Steenhuis,
M. F. Walter.

Introduction to hydrology: the hydrologic cycle and the role of water and chemicals in the natural environment. Includes precipitation, infiltration, evapotranspiration, groundwater, surface runoff, river meandering, floods, and droughts. Case studies, short field trips, computer programs, and laboratories foster an understanding of concepts and principles of hydrologic processes.
GEOL 206 Geologic Perspectives on Global Change
Spring. 3 credits. Prerequisites: GEOL 101,
$102,201,202$, or permission of instructor 3 lecs. K. Attoh. Principles that govern the interactions among the principal components of the climate system (atmosphere, oceans, lithosphere, and solar radiation) are used to reconstruct Earth's climates from the geologic record. Continental climate record in rocks. Geological forcing/ responses to climate change.

## CEOL 210 Introduction to Field Methods in Geological Sciences

Fall. 2 credits. Prerequisite: GEOL 101 or permission of instructor. Weekly field sessions. A weekend field trip.
S. Mahlburg Kay.

The methods by which rocks are used as a geological database. Field methods used in the construction of geologic maps and cross sections; systematic description of stratigraphic sections. Field and laboratory sessions on Saturday mornings until Thanksgiving. One additional lecture during most of these weeks. One weekend field trip to eastern New York.

## GEOL 212 Special January Field Trip

Fall. 1 credit. Prerequisites: GEOL 101 or 201 or equivalent, and permission of instructor. Travel and subsistence expenses to be announced.

1 lec, field trip. Staff. A trip of one week to ten days during January intersession in an area of interesting geology in the lower latitudes. Interested students should contact the instructor during the early part of the fall semester.

GEOL 213 Marine and Coastal Geology Summer. 2 credits. Prerequisites: an introductory course in geology or permission of instructor.
A special one-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island near Portsmouth, New Hampshire. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (including tuition, room, board, and ferry transportation) is $\$ 600$.

GEOL 214 Western Adirondack Field Course
Spring, one week at the end of the semester. 1 credit. Prerequisite: GEOL 101 or 102 and 210 or equivalent, or permission of instructor. Students should be prepared for overnight camping and share in the cost of camp meals. Independent project.
W. A. Bassett.

Field mapping methods, mineral and rock identification, examination of Precambrian metamorphic rocks and lower Paleozoic sediments, talc and zinc mines.

## Junior, Senior, and Graduate Courses

Of the following, the core courses GEOL 326, $355,356,375$, and 388 may be taken by B.S. candidates who have successfully completed GEOL 201 or the equivalent and by B.A. candidates who have completed GEOL 101 or the equivalent, or who can demonstrate to the instructor that they have adequate preparation in mathematics, physics, chemistry, biology, or engineering

## OEOL 326 Structural Ceology

Spring. 4 credits. Prerequisite: GEOL 101 or 201, or permission of instructor.

3 lecs, 1 lab, field trips.
R. W. Allmendinger.

Nature and origin of deformed rocks at microscopic to macroscopic scales, with emphasis on structural geometry and kinematics. Topics includes stress, strain, rheology, deformation mechanisms, minor structures, faulting, folding, and structural families.

## GEOL 355 Mineralogy

Fall. 4 credits. Prerequisite: GEOL 101 or 201 and Chem 207 or permission of instructor. 1 lec, 1 lab; assigned problems and readings. S. M. Kay.
Examination of minerals by hand-specimen properties and optical microscopy. Geological setting, classification, crystal structures, phase relations, chemical properties, and physical properties of minerals. X-ray diffraction is introduced. Independent research project.

GEOL 356 Petrology and Geochemistry
Spring. 4 credits. Prerequisite: GEOL 355.
3 lecs, 1 lab, 1 field trip; assigned
problems and readings. R. W. Kay
Principles of phase equilibrium as applied to igneous and metamorphic systems. Description, classification, chemistry, origin, regional distribution, and dating of igneous and metamorphic rocks. Geochemical distribution of trace elements and isotopes in igneous and metamorphic systems. The petrological evolution of the planets.

## GEOL 375 Sedimentology and Stratigraphy

Fall. 4 credits. Recommended: GEOL 102 or 201.

3 lecs, 1 lab, field trips. J. L. Cisne, T. E. Jordan

Formation of sedimentary rocks. Depositional processes and environments. Correlation of strata in relation to time and environment. Petrology of sandstones and limestones. Geological age determination. Reconstruction of paleogeography and interpretation of earth history from stratigraphic evidence. Organization of strata in stratigraphic sequences.
GEOL 388 Geophysics and Geotectonics Spring. 4 credits. Prerequisites: Mathematics 192 and Physics 208, 213, or equivalent.

3 lecs, 1 lab. B. L. Isacks.

Global tectonics and the deep structure of the solid earth as revealed by investigations of earthquakes, earthquake waves, the earth's gravitational and magnetic fields, and heat flow.

## GEOL 410 Field Geology

Summer. 4 credits. Prerequisites: GEOL 210, $214,326,356$, and 375 , or permission of instructor. Four weeks at research sites in the western United States or Canada. Fee, approximately $\$ 1,300$.

Staff.
Field mapping techniques in igneous, metamorphic, and sedimentary rock, using topographic maps and air photos. The structural geology, petrology, geomorphology, and sedimentology of selected areas in the Rocky Mountains will be included. An independent project and report is done during the last week.

## GEOL 411 Global Change Research: Mountains, Climate, and Erosion

 Fall. 3 credits.1 lec, 2 labs. B. L. Isacks.
Undergraduate participation in one of the interdisciplinary research projects of the Earth Observing System (EOS). Choice of topics concerning the interplay of climate, topography, and the environment of the Andes and Himalayan mountains as revealed by satellite images and other computerized data analyzed with modern image processing and Geographic Information Systems (GIS).

## [GEOL 423 Petroleum Geology

Fall. 3 credits. Recommended: GEOL 326. Offered alternate years. Not offered 1994-95.

2 lecs, 1 lab. W. B. Travers.
Introduction to hydrocarbon exploration and development. Exploration techniques, including well logs, fluid pressures, seismicreflection methods, gravity, and magnetic measurements to map subsurface structures and stratigraphy. Petroleum origin and migration. Dispersal systems and depositional patterns of petroleum reservoirs. Economics of exploration, leasing, drilling and production. Estimates of petroleum reserves, including tar sands and oil shales.]
GEOL 425 Precambrian Orogenic Cycles Fall. 3 credits. Prerequisites: GEOL 326, GEOL 356, or permission of instructor.

2 lecs, $1 \mathrm{lab} /$ discussion. K. Attoh. Thermal and kinematic histories of Precambrian orogenic belts. Recent data from metamorphic, structural, and geochronological studies to infer deformation paths in selected orogens, including Dahomeyide and Eburnian orogens of West Africa, and Grenville, Penokean, and Kenoran orogens of the Canadian Shield. Current hypotheses regarding Precambrian orogenic styles and continental crust evolution.

## [GEOL 426 Geologic Evolution of South

 AmericaSpring. 3 credits. Prerequisites: GEOL 326 and GEOL 356, or permission of instructor. Not offered 1994-95.

2 lecs, 1 lab. S. Mahlburg Kay. Regional overview of Paleozoic to recent tectonic and magmatic evolution of South America in the framework of crustal and mantle evolution, with particular emphasis on the evolution of the region of the modern Andean Cordillera.]

GEOL 437 Geophysical Field Methods
Fall. 3 credits. Prerequisites: PHYS 213 and MATH 192 or equivalents, or permission of instructor.

1 lec, 1 lab. L. D. Brown. Introduction to field methods of geophysical exploration, especially as applied to environmental issues, using seismic, gravity, and magnetic techniques. Lectures and laboratory sessions during the semester introduce geophysical principles, data-reduction techniques, interpretation, and environmental applications. Summary report required.

## GEOL 438 Exploration Seismology I: Data Acquisition and Processing

Fall. 3 credits. Prerequisite or corequisite: GEOL 437 or equivalent. Offered alternate years.

3 lecs. L. D. Brown.
Planning seismic reflection and refraction surveys. Array design. Source characteristics and ground coupling. Land and marine operations. 2-D and 3-D surveys. Convolutional seismic model. Applied seismic processing: FK filtering, deconvolution, velocity analysis, stacking, migration, display. True amplitude processing.
[GEOL 439 Exploration Seismology II: Analysis and Interpretation
Spring. 3 credits. Prerequisite: GEOL 437 or equivalent. Offered alternate years. Not offered 1994-95.

3 lecs. L. D. Brown.
Techniques for inferring geologic structure and lithology from multichannel seismic reflection data and crustal refraction data. Migration. Velocity and amplitude interpretation, correlation criteria, resolution wave-form analysis, seismic structure, and stratigraphy. Seismic modeling. 3-D and VSP. Attribute and tau-p analysis.]

## GEOL 441 Geomorphology

Fall. 3 credits. Prerequisite: GEOL 102 or 201, or permission of instructor.

2 lecs, 1 lab. A. L. Bloom.
Systematic analysis of landforms constructed by tectonic and volcanic processes and their subsequent progressive destruction by climate-controlled erosional processes.

## GEOL 442 Glacial and Quaternary

 GeologySpring. 3 credits. Prerequisite: GEOL 441 or permission of instructor.

2 lecs, 1 lab; several field trips.
A. L. Bloom.

Glacial processes and deposits and the chronology of the Quaternary Period.

## GEOL 445 Geohydrology (also ABEN 471

 and C\&EE 431)Fall. 3 credits. Prerequisites: Mathematics 294 and Engr 202.

2 lecs, 1 disc, lecture, or field trip.
W. Brutsaert, L. M. Cathles, J.-Y. Parlange, T. S. Steenhuis.

Intermediate-level study of aquifer geology, groundwater flow, and related design factors. Includes description and properties of natural aquifers, groundwater hydraulics, soil water, and solute transport.
GEOL 452 X-ray Diffraction Techniques Spring. 3 credits. Prerequisites: GEOL 355 or permission of instructor. Offered alternate years.

2 lecs, 1 lab. W. A. Bassett and staff. Automated X-ray diffractometer, DebyeScherrer, real-time Laue, high-temperature diffraction, high-pressure diffraction, and pole-
figure analysis. Applications in materials science and geological sciences. Labs will be held in the new Materials Science X-Ray Facility.
GEOL 453 Advanced Petrology
Fall. 3 credits. Prerequisite: GEOL 356. Offered alternate years

2-1/2 lecs, $1 / 2$ lab. R. W. Kay.
Magmas and metamorphism in the context of plate tectonics. Major and trace element chemistry and phase petrology as monitors of the creation and modification of igneous rocks. Temperature and stress in the crust and mantle and their influence on reaction rates and textures of metamorphic rocks. Application of experimental studies to natural systems.

## [GEOL 454 Advanced Mineralogy

Spring. 3 credits. Prerequisite: GEOL 355 or permission of instructor. Offered alternate years. Not offered 1994-95.

2 lecs, 1 lab. W. A. Bassett. Crystallography and crystal chemistry of minerals and the methods of their study. X-ray diffraction, optical methods, computer simulation of crystal structures. Emphasis on effects of high pressures and temperatures with implications for understanding of Earth's interior.]

## [GEOL 455 Geochemistry

Fall. 4 credits. Prerequisites: Chemistry 207 or equivalent, Mathematics 192. Recommended: GEOL 356. Offered alternate years. Not offered 1994-95.

3 lecs, 1 disc. W. M. White.
The Earth from a chemical perspective. Formation of the elements; cosmorchemistry; chemical evidence regarding the formation of the Earth and Solar System; trace-element geochemistry; isotope geochemistry; geochemical thermodynamics and kinetics; chemical evolution of the crust, mantle, and core; weathering and the chemistry of natural waters; chemistry of the oceans; hydrothermal systems and ore deposition.]

## GEOL 458 Volcanology

Spring. 3 credits. Corequisite: GEOL 356 or equivalent. Offered altemate years.

2 lecs., $1 \mathrm{lab} / \mathrm{rec}$, possible spring-break
field trip to volcanic area such as Hawaii. R. W. Kay.

Causes of volcanism, melting in the Farth and the origin of magmas. Physical volcanology, nature and types of volcanic eruptions and associated deposits, eruption mechanisms. Volcanic plumbing systems, magma chamber processes, evolution of magma. Volcanism and impact phenomena in the Solar System. Volcanic hazard assessment and volcano monitoring. Ore deposits associated with volcanism.

## [GEOL 476 Sedimentary Basins:

Tectonics and Mechanics
Spring. 3 credits. Prerequisite: GEOL 375 or permission of instructor. Offered alternate years. Not offered 1994-95.

3 lecs. T. E. Jordan.
Subsidence of sedimentary basins from the point of view of plate tectonics and geomechanics. Interactions of subsidence, sediment supply, and environmental characteristics in development of stratigraphic sequences. Stratigraphic characteristics of active-margin, passive-margin, and cratonic basins. Geophysical and stratigraphic modeling; sequence stratigraphy. Modern and ancient examples.]

## OEOL 478 Advanced Stratigraphy

Spring. 3 credits. Prerequisite: GEOL 375 or permission of instructor. Offered alternate years.

2 lecs, 1 lab. T. E. Jordan.
Modern improvements on traditional methods of study of ages and of genetic relations among sedimentary rocks, emphasizing 3-D relationships. Techniques and applications of sequence stratigraphy at scales ranging from beds to entire basins. Physical correlation, dating techniques, and time resolution in sedimentary rocks. Physical controls on the stratigraphic record and numerical modeling.

## [CEOL 479 Paleobiology (also Bio Sci 479)

Fall. 3 credits. Prerequisites: Biological Sciences 101-102 and 103-104 or equivalent, and either GEOL 375, Biological Sciences 272 or 274 , Biological Sciences 373 , or permission of instructor. Offered alternate years. Nor offered 1994-95.

3 lecs. J. L. Cisne and staff.
The major groups of organisms and their evolutionary histories. Intended to fill out the biological backgrounds of geology students and the geological backgrounds of biology students concerning the nature and significance of the fossil record.)

## [GEOL 481 Senior Survey of Earth Systems

Fall. 3 credits. Limited to seniors majoring in geological sciences. Not offered 1994-95.

1 lec, 1 disc. J. M. Bird.
Survey course that integrates undergraduate course work, intended to enhance overall understanding of geological sciences. Emphasis on current models of earth's dynamic systems (e.g., global climate change; mantle evolution). Guest lecturers; synthesis and review literature; scientific literature readings; discussions; student presentations.]
GEOL 490 Honors Thesis (B.A. degree candidates)
Fall, spring. 2 credits.
Staff.
Thesis proposal to be discussed with director of undergraduate studies during the junior year. Participation requires acceptance of a thesis proposal by the faculty committee.

## GEOL 491-492 Undergraduate Research

Fall, spring. 1 or 2 credits.
Staff (D. E. Karig and A. L. Bloom,
coordinators).
Introduction to the techniques and philosophy of research in the earth sciences and an opportunity for undergraduates to participate in current staff research projects. Topics chosen in consultation with, and guided by, a staff member. A short written report is required, and outstanding projects are prepared for publication.

## GEOL 500 Design Project in Geohydrology

Fall, spring 3-12 credits. An alternative to an industrial project for M.Eng. students choosing the geohydrology option. May continue over two or more semesters.
L. M. Cathles.

The project may address one of many aspects of groundwater flow and contamination, and must involve a significant geological component and lead to concrete recommendations or conclusions of an engineering nature. Results are presented in GS 501, Geohydrology Design Project Seminar.

## GEOL 501 Geohydrology Design Project

 SeminarFall or spring. 1 credit. Required for the M.Eng. degree, geohydrology option. 1 rec., hours to be arranged. L. M. Cathles. Seminar is normally in the spring and provides a forum for discussion of courses and development of design projects (see GS 500), and an opportunity to present and discuss design projects.

## GEOL 502 Case Histories in

 Oroundwater AnalysisSpring. 4 credits.
L. M. Cathles.

Groundwater flow in a specific area, such as a proposed nuclear-waste disposal site, analyzed in depth. Geological and resource data on the area are presented early in the course. Then the material is analyzed by students working as an engineering analysis team. Each student makes a weekly progress report and writes part of a final report.
Results are presented in a half-day seminar at end of term.

## [GEOL 621 Marine Tectonics

Fall. 3 credits. Prerequisites: GEOL 326 and a course in geophysics. Offered alternate years. Not offered 1994-95.

3 lecs. D. E. Karig.
Study of geophysical and geological characteristics of the earth's crust beneath the oceans. Emphasis on recent geologic data concerning plate margins in the oceans; island-arc systems, spreading systems, and transforms. Techniques for determining instantaneous and finite plate rotations. Lectures and reviews of recent papers. Term project and paper required.]

## [GEOL 622 Advanced Structural

 Geology ISpring. 3 credits. Prerequisites: GEOL 326 and permission of instructor. Offered alternate years. Not offered 1994-95.

2 lecs, 1 lab, possible weekend field trips.
D. E. Karig, R. W. Allmendinger.

Stress-strain theory and application. Advanced techniques of structural analysis. Topics include finite and incremental strain measurement; microstructure, preferred orientation, and TEM analysis; pressure solution and cleavage development; and experimental deformation. Applications to deformation of unconsolidated sediments, brittle and brittle-ductile deformation of supracrustal strata, and ductile deformation of high-grade metamorphic rocks. Kinematic analysis of shear zones and folds in these regimes.]

## [CEOL 624 Advanced Structural

 Geology IISpring. 3 credits. Prerequisites: GEOL 326 and permission of instructor. Offered altemate years. Not offered 1994-95.

2 lecs, 1 lab, spring-recess trip.
R. W. Allmendinger, D. E. Karig. Geometry, kinematics, and mechanics of structural provinces. Concentration on thrust belts, rift provinces, or strike-slip provinces. Techniques of balanced cross sections.]
[GEOL 625 Tectonic Mistory of Western North America from Craton to Terranes
Fall. 2 credits. Open to seniors and graduate students. Offered alternate years. Not offered 1994-95.

Lecture, term paper, quizzes, no final.
W. B. Travers.

Seminar on current research on the sequence, style, and mechanics of deformation, with emphasis on growth of the continent in the western United States and southern Canada.]
[GEOL 628 Geology of Orogenic Belts
Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95.

T R 10:10-12:05. J. M. Bird.
A seminar course in which students study specific geologic topics of an orogenic belt selected for study during the term. The course is intended to complement GEOL 681.]

GEOL 635 Advanced Geophysics I: Fractals and Chaos in Geology and Geophysics
Fall. 3 credits. Prerequisite: GEOL 388 or permission of instructor.

3 lecs. D. L. Turcotte.
Definitions of fractal sets and statistical fractals, scale invariance, self-affine fractals, multifractals, applications to fragmentation, seismicity and tectonics, petroleum distribution and reserves, ore grade and tonnage, drainage networks and landforms, and floods and droughts. Definitions of chaos and selforganized criticality, renormalization groups, diffusion limited aggregation and percolation clusters, wavelet transforms, applications to mantle convection, the earth's dynamo, and distributed seismicity.
GEOL 636 Advanced Geophysics II: Quantitative Geodynamics
Spring. 3 credits. Prerequisite: GEOL 388 or permission of instructor.

3 lecs. D. L. Turcotte.
Stress and strain in the earth, elasticity and flexure, heat transfer, gravity, fluid mechanics, rock rheology, faulting, chemical geodynamics, flow in porous media.
[GEOL 655 Isotope Geochemistry
Fall. 3 credits. Open to undergraduates.
Prerequisite: GEOL 356 or permission of instructor. Offered alternate years. Not offered 1994-95.

3 lecs. W. M. White.
Nucleosynthetic processes and the isotopic abundances of the elements. Geochronology and cosmochronology using radioactive decay schemes, including U-Pb, Rb-Sr, $\mathrm{Sm}-\mathrm{Nd}$, K-Ar, U-series isotopes, and cosmogenic isotopes such as ${ }^{14} \mathrm{C}$ and ${ }^{36} \mathrm{Cl}$. Use of radiogenic and stable isotopes in petrology and their application to study of the evolution of the crust and mantle. Isotopic evidence regarding the formation of the Earth and the Solar System. Stable isotopes and their use in geothermometry, ore petrogenesis, paleontology, and the global climate system.]

## [GEOL 681 Geotectonics

Fall. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95

2 lecs. J. M. Bird
Theories of orogeny; ocean and continent evolution. Kinematics of lithosphere plates Rock-time assemblages of modern oceans and continental margins, and analogs in ancient orogenic belts. Time-space reconstructions of specific regions. Problems of dynamic mechanisms-corollaries and evidence from crustal features.]
CEOL 695 Computer Methods in Geological Sciences
Fall. 3 credits
L. D. Brown, B. L. Isacks

To familiarize students with the growing importance of computers in geological and
geophysical research. Develop, debug, implement, and document a program relevant to current research. Facilities include the department's VAX workstations, MEGASEIS seismic computer, Landmark Interpretation Workstation, IIS image processor, and numerous graphics and I/O peripherals. The Cornell National Supercomputer Facility may also be used.

## GEOL 700-799 Seminars and Special

 WorkFall, spring. 1-3 credits. Prerequisite:
permission of instructor.
Advanced work on original investigations in geological sciences. Topics change from term to term.

GEOL 722 Advanced Topics in Structural Geology
R. W. Allmendinger.

GEOL 725 Rock and Sediment Deformation
D. E. Karig
[GEOL 731 Plate Tectonics and Geology Not offered 1994-95. J. M. Bird.]

## [GEOL 733 Fractal Chaos

Not offered 1994-95. D. L. Turcotte.]

GEOL 741 Advanced Geomorphology Topics
A. L. Bloom.

GEOL 751 Petrology and Geochemistry S. Mahlburg Kay.

GEOL 753 Advanced Topics in Mineral Physics W. A. Bassett.
[GEOL 755 Advanced Topics in Petrology and Tectonics
Not offered 1994-95.
J. M. Bird, W. A. Bassett.]

GEOL 757 Current Research in Petrology R. W. Kay, S. Mahlburg Kay.
[GEOL 762 Advanced Topics in Petroleum Exploration
Not offered 1994-95. W. B. Travers.]

GEOL 771 Advanced Topics in Sedimentology and Stratigraphy T. E. Jordan.

GEOL 773 Paleobiology J. L. Gisne.

GEOL 780 Seismic Record Reading M. Barazangi.

GEOL 781 Geophysics, Exploration Seismology L. D. Brown.

GEOL 783 Advanced Topics in Geophysics B. L. Isacks.

GEOL 789 Seismic-reflection Profiling L. D. Brown.

GEOL 793 Andes-Himalaya Seminar R. W. Allmendinger, A. L. Bloom, B. L. Isacks, T. E. Jordan, S. Mahlburg Kay
[GEOL 796 Geochemistry of the Solid Earth
Fall. Not offered 1994-95. W. M. White.]

GEOL 797 Fluid-Rock Interactions L. M. Cathles.

GEOL 799 Contemporary Issues in Groundwater Hydrology
Spring
L. M. Cathles.

## MATERIALS SCIENCE AND ENGINEERING

## Undergraduate Courses

MS\&E 111 Elements of Materials Science and Engineering (also ENGRI 111)
Fall. 3 credits. 3 lecs.
Explores the relationship between atomic structure and macroscopic properties of such diverse materials as metals, ceramics, polymers, and semiconductors. Hands-on project involves dissecting and analyzing various consumer products like a disposable camera, portable cassette player, or CD player. Emphasis is placed on materials identification and their selection to perform an engineering function.
MS\&E 118 Design Integration: A Portable CD Player (also ENGRI 118)
Spring. 3 credits.
3 lecs. M. Thompson
For description, see Engineering Common Courses.

## MSeE 261 Introduction to Mechanical

 Properties of Materials (also ENGRD 261)Fall, spring. 3 credits. Prerequisite:
coregistration in Physics 213 or electricity and magnetism in high school physics.

2 lecs, 1 rec or lab.
For description, see Engineering Common Courses.

MS\&E 262 Introduction to Electrical Properties of Materials (also ENGRD 262)

Spring. 3 credits. Prerequisite: co-registration in Physics 213 or electricity and magnetism in high school physics.

2 lecs, 1 rec or lab.
For description, see Engineering Common Courses.
MS\&E 285 Art, Archaeology, and Analysis (also ENGRI 185 and NS\&E 285))

Spring. 3 credits.
3 lecs.
For description, see Engineering Common Courses.
MS\&E 331/531 Structure of Materials
Fall. 4 credits.
3 lecs, 1 lab
Crystal structures and crystal defects,
stereographic projection methods. Techniques for materials analysis: X-ray and electron diffraction, optical and electron microscopy. Design of experimental systems for the structural characterization of materials

MS\&E 332/532 Electrical and Magnetic Properties of Materials
Spring. 3 credits. Prerequisite: MS\&E 331 or permission of instructor.

3 lecs.
Introduction to electronic band structure of crystals. Electrical and magnetic properties of
metals and semiconductors as affected by microstructure. Design of semiconductor properties by doping. Carrier drift, diffusion, and recombination. Properties of heterojunctions in semiconductor devices. Principles and design of ferromagnetic materials for transformers, permanent magnets, and magnetic memory devices. Fundamentals of superconducting materials for high-field magnets and Josephson junctions. Introduction to dielectic and optical properties.

## MS\&E 333 Research Involvement I

Fall. 3 credits. Prerequisite: approval of course coordinator
Supervised independent research project in association with faculty member and faculty research group of the department. Students design experiments, set up the necessary equipment, and evaluate the results. Creativity and synthesis are emphasized.

## MS\&E 334 Research Involvement II

 Spring. 3 credits. Prerequisite: approval of department.May be a continuation of MS\&E 333 or a oneterm affiliation with a research group.

## MS8 E 335/535 Thermodynamics of Condensed Systems <br> Fall. 4 credits. Prerequisite: Math 293 and 294.

3 lecs
The three laws of thermodynamics are introduced as a basis for understanding phase equilibria, heterogeneous reactions, solutions, electrochemical processes, surfaces, and defects. Statistical mechanics is introduced and applied to the calculation of entropy and specific heat of ideal gases and solids. Onethird of the course involves examples of design and control of processes.

## MSaE 336/536 Kinetics, Diffusion, and

 Phase TransformationsSpring. 3 credits. Prerequisite: MS\&E 335 or permission of instructor.

3 lecs.
Introduction of absolute rate theory, atomic motion, and diffusion. Applications and design involving nucleation and growth of new phases in vapors, liquids, and solids; solidification, crystal growth, oxidation and corrosion, radiation damage, recrystallization, gas-metal reactions, and thermomechanical processing to produce desired microstructures and properties. One-third of the course involves examples of design and control of processes

## MSAE 345 Materials and Manufacturing

 Processes (also M\&AE 312)Spring. 3 credits. Prerequisite: T\&AM 202 or permission of instructor

2 lecs, 1 lab.
For description see M\&AE 312.

## MS\&E 414/514 Chemical Processing of Ceramics

Spring. 3 credits. No prerequisites. Design and characterization of materials at the molecular level. Synthesis, drying, and sintering of ceramics, glasses, and composites. Sol-gel, hydrothermal, chemical-vapor deposition, and pyrolysis techniques. Surface chemistry of oxides. Analytical techniques include chromatography, mass spectrometry, infrared, uv-visible and nuclear-magnetic resonance spectroscopy. Design, synthesis, and chemical properties of inorganic/ organometallic precursors. Ceramic thin films, fibers whiskers, and membranes.

## MS\&E 435 Senior Thesis I \& II

 435 , fall and spring. 2 -semester course 8 credits.Staff.
Open to advanced undergraduates in lieu of the senior materials laboratory. Proposals for thesis topics should be approved by the supervising faculty member prior to beginning the senior year. Approved thesis topics will normally involve original experimental research in direct collaboration with an ongoing research program. Periodic oral and written presentations and a final written thesis are required.

## MS\&E 441/541 Microprocessing of

 Materials
## Fall. 3 credits.

3 lecs, occasional lab
Materials and processing steps involved in the production of integrated circuits and other micro-devices. Science, engineering, and design of processes to produce a specific device, such as a DRAM or CMOS inverter (not detailed electrical-circuit analysis of these devices or system design). Emphasis is on silicon, with extensions to gallium arsenide All fabrication steps are considered, from single crystal growth and wafer production, to characterization, testing and yield calculations. Major topics are thermal oxidation of silicon, chemical vapor deposition of thin films, diffusion, ion implantation, resists and the principles of lithography using UV, electrons and X-rays, and wet/dry etching

## MS\&E 442/542 Macroprocessing (also MeAE 512)

Spring. 3 credits.
3 lecs.
Deformation processing of materials, including superplastic forming, sheet-metal forming massive forming, and powder processing. Time, temperature, and strain-rate effects in warm-forming and hot-forming. Characterization of powder-compaction mechanisms and their use in process design. Forming-limit diagrams. Development of microstructurebased criteria for fracture in large deformations. Optimization and design of forming processes. Development of constitutive equations for superplastic flow. Design of a superplastic forming process starting from basic mechanisms. The course includes a comprehensive experimental project in which the constitutive equations for superplastic flow are measured and computer-aided techniques are used to design a superplastic forming process. The forming experiment is carried out, and the results are compared with the predictions from the numerical analysis.

## MS\&E 443-444 Senior Materials

 Laboratory443 , fall; 444 , spring. 3 credits Practical laboratory experience covering the analysis and characterization of materials and processing. Emphasis on design of experiments for evaluation of materials' properties and performance as related to processing history and microstructure. Projects available in areas such as plasticity, mechanical and chemical processing, phase transformations, electrical properties, and electron microscopy

## MS\&E 445 Mechanical Properties of

 MaterialsFall. 3 credits. Prerequisites: MS\&E 331 and 336 , or permission of instructor. 3 lecs.
Stress, strain, and the basics of concepts in deformation and fracture for metals, polymers,
and ceramics. Analysis of important mechanical properties such as plastic flow, creep, fatigue, fracture toughness, and rupture. Application of these principles to the design of improved materials and engineering structures.

## MS8E 447 Materials Design Concepts

 I 8I, fall; II, spring. 4 credits
Defines design in the field of materials science using Dieter's Engineering Design, Ashby's Materials Selection in Engineering Design, and other sources. Innovation, patent searching, and ASTMS standards. Speakers from industry and other institutions lecture on case studies of design problems. Students give short oral and written presentations. Proposal for design-study project in the fall semester Completion of extensive design-study project in the spring semester. Study includes prior art literature, materials selection, and some modeling, as well as discussion of broader economic, regulatory, environmental, and liability concerns that may arise.
[MS\&E 449 Introduction to Ceramics Fall. 3 credits. Prerequisite: MS\&E 331 or permission of instructor. Not offered 1994-95 3 lecs.
Ceramic processes and products, crystal structures, structure of glasses, point defects (point-defect chemistry and relation to nonstoichiometry), line defects, grain boundaries, diffusion in ionic materials (emphasis on the relationships between diffusion and point-defect structure), phase diagrams, phase transformations, kinetics of solid-state reactions (reactions with and between solids: heterogeneous reactions, reactions between different solids, point-defect relaxation, internal reactions), grain growth and sintering. Physico-chemical aspects are emphasized.]

## [MS\&E 450 Physical Metallurgy

Spring. 3 credits. Not offered 1994-95 The service and design requirements of engineering alloys and their testing and characterization. The properties of important alloy systems. The selection and design of alloys for various engineering requirements, such as ASME design codes.)

MS\&E 452 Properties of Solid Polymers Spring. 3 credits. Prerequisite: Engr 261 or permission of instructor.

3 lecs.
Synthetic and natural polymers for engineering applications. Production and characterization of long-chain molecules. Gelation and networks, rubber elasticity, elastomers and thermosetting resins. Amorphous and crystalline thermoplastics and their structure. Time- and temperature-dependent elastic properties of polymers. Molecular-weight measurement. Design of high-impact-strength polymers.

## [MS\&E 454 Processing of Olass, Ceramic, and Glass-Ceramic Materials

Spring. 3 credits. Offered alternate years. Not offered 1994-95.
Conventional and unconventional techniques for processing glass, glass-ceramic, and ceramic materials. Case studies illustrate the design, engineering, and scientific aspects of such processes. Vapor processes for highpurity optical fibers, hot-processing of ceramic turbine blades, photosensitive materials, and powder processing and sintering of ceramics
will be discussed. This course is team taught with scientists from the research and development laboratory of Corning Glass Works.]

MS\&E 455 Analysis of Manufacturing Processes (also M\&AE 512)
Spring. 3 credits. Prerequisite: M\&AE 312. 3 recs.
For description, see M\&AE 512.

## MS\&E 459 Physics of Modern Materials

 AnalysisSpring. 3 credits
The interaction of ions, electrons, and photons with solids, and the characteristics of the emergent radiation in relation to the structure and composition of materials. Aspects of atomic physics that are relevant to understanding techniques of modern materials analysis. Principles of analysis techniques such as Auger electron spectroscopy, ion scattering, and secondary ion-mass spectroscopy. Design of experiments for near-surface analysis.

## MS\&E 463 Principles of Electronic

 PackagingSpring. 3 credits.
Design, materials, and manufacturing needs for packaging technology, from chip to board Principles involved in key areas of materials science, and other engineering disciplines. Packaging materials to be discussed include metals, ceramics, and polymers.

## Graduate-Level Professional Courses

MsaE 510 Optical Methods and Materials
Spring. 3 credits.
Principles of geometric and Gaussian optics, instrumentation required for optical experiments, and methods in optical spectroscopy. Fundamental aspects of the interaction between optical waves and crystalline solids Materials aspects of optical devices such as optical films and coatings, light-modulation devices, displays, lasers and detectors, optical waveguides, electro-optic devices, optical recording, and applications of high-intensity light beams.

MS8E 516 Thin-Film Materials Science Fall. 3 credits.
This course is a fundamental approach to thinfilm science that will cover deposition of films, growth of epitaxial layers, formation of multilayered structures such as superlattices and quantum wells, and interdiffusion and reaction in thin films. The course will begin with the structure and thermodynamics of surfaces and ultrathin films. The conditions for epitaxial growth, such as used in semiconductor heterostructures, will be contrasted with those for amorphous or polycrystalline films. The role of thermal processing for reactive thin films involving the formation of surface oxides, metallic silicides, and aluminides will be presented

## MSaE 518 Introduction to Electron Microscopy

Fall. 3 credits. Prerequisite: MS\&E 331 or permission of instructor

3 lecs.
Basic optics and operation of scanning and transmission electron microscopes. Image formation, modes of contrast, and resolution in SEM and TEM. Electron diffraction. Images of perfect crystal and defects in two-beam diffraction contrast. Analytical microscopy; comparison of EDS, WDS, and EELS.

Overview of specimen preparation and in-situ microscopy.

MS\&E 520 Practical Electron Microscopy
Fall. 3 credits. Corequisite: MS\&E 518-520. Limited to 12 students. A fee will be charged for instrument usage.

Lab.
Students will be instructed in the proper use of a scanning and a transmission electron microscope. All stages from initial alignment of the instrument to presentation of the results will be covered. Three or four projects will be completed, including obtaining atomic lattice fringe images and X-ray microanalysis
MS\&E 553-554 Special Project
553, fall; 554 , spring. 6 credits each term. Research on a specific problem in the materials area.

## Graduate Core Courses

MS\&E 601 Thermodynamics of Materials Fall. 3 credits. Prerequisite: previous course in thermodynamics at level of MS\&E 335. Basic statistical thermodynamics. Partition function and thermodynamic state functions. Distributions. Laws of thermodynamics. Freeenergy functions and conditions of equilibrium. Chemical reactions. Statistics of electrons in crystals. Heat capacity. Heterogeneous systems and phase transitions. Lattice models of 1-, 2-, 3-dimensional interacting systems. Statistical thermodynamics of alloys. Free-energy and phase diagrams. Order-disorder phenomena. Point defects in crystals. Statistical thermodynamics of interfaces.

## MS\&E 602 Elasticity, Plastic Flow, and Fractures

Fall. 3 credits.
Micromechanical modeling of mechanical behavior. A materials-science approach to modeling combines concepts from continuum mechanics, thermodynamics, kinetics and atomic structure. Topics include: elastic properties of crystals, deformation mechanisms from ambient temperature to very high temperatures over a wide range of strain rates, fracture in brittle materials, fracture in ductile materials, fracture at elevated temperatures, crack tip phenomena, and composite materials

## MS\&E 603 Analytical Techniques for

 Materials ScienceSpring. 4 credits.
Survey of atomic and structural analysis techniques as applied to surface and bulk materials. Physical processes involved in the interaction of ions, electrons, and photons with solids; characteristics of the emergent radiation in relation to the structure and composition. Techniques covered include Auger electron spectroscopy, ion scattering, nuclear activation, secondary ion mass spectroscopy, UV and X-ray photoelectron spectroscopies, X-ray diffraction and related techniques, etc. Selection and design of experiments for near-surface analysis.

## MS\&E 604 Diffusion and Phase Transformation: Kinetics in Condensed Matter

Spring. 3 credits.
Phenomenology and microscopic aspects of diffusion in fluids, both simple and polymeric, and in solids, metallic and ionic. Phase stability and transformation; nucleation and growth, spinodal decomposition and
displacive transformations. Phase coarsening processes, recrystallization and grain growth. Diffusion-controlled growth, interfacial reactions, moving-boundary problems. Grainboundary migration controlled kinetics. At the level of Diffusion in the Condensed State, by Kirkaldy and Young

## MS\&E 605 Structure and Chemistry of Condensed Matter <br> Spring. 3 credits.

This course focuses on the link between the local chemistry of the elements comprising a solid, the structure of the solid, and the bonding in the solid. Elementary aspects of group theory and representation theory; introductory quantum mechanics including Schrödinger equation for approaches to bonding in extended systems; hydrogen atom and diatomic molecules; band structures and densities of states of simple crystals. Crystal structures. Structure of and bonding in surfaces, amorphous materials, glasses, liquids, interfaces as well as case studies.

Related Course In Another Department
Introductory Solid-State Physics (Physics 454)

## Further Graduate Courses

MS\&E 610 Principles of Diffraction (also A\&EP 711)
Spring. 4 credits. Offered alternate years. For description, see A\&EP 711.
MS\&E 611 Modern Polymer Physics Spring. 3 credits. Prerequisites: MS\&E 452, ChemE 711, or equivalent. Offered alternate years. Not offered 1995-96
Modern engineering plastics and polymeric matrices for fiber-reinforced composite materials often demand more detailed knowledge of polymer structure and properties in the melt or solid state than is afforded by beginning courses that emphasize polymer solutions. This course is a fundamental approach to the structure and physical properties of polymers, copolymers, and polymer mixtures, including thermodynamics, phase equilibria, diffusion, kinetics of phase separation, surfaces, and interfaces. At the level of Scaling Concepts in Polymer Physics by de Gennes.

## MS\&E 612 Solid-State Reactions

Fall. 3 credits. Offered in spring alternate years after 1994-95 to begin Spring 1996. Point defects (thermal disorder, component activity-dependent disorder, influence of dopants, different kinds of associates, Coulomb interaction between point defects), dislocations, grain boundaries transport in solids (definition and different types of diffusion coefficients, reference frames, mechanisms of electrical conduction, elementary diffusion mechanisms, atomic theory of transport, correlation effects, phenomenological theory of transport including some aspects of thermodynamics of irreversible processes, Fick's laws), pointdefect relaxation (migration controlled, phase-boundary-reaction controlled), interdiffusion, solid-state reactions involving compound formation (oxidation of metals, reactions between solids), demixing of materials in potential gradients, selected solid-state processes (internal reactions, solid-state galvanic cells, etc.).

## MseE 614 Advanced Transmission Electron Microscopy

Fall, spring. 3 credits. Prerequisite: MS\&E 518 or permission of instructor. Offered on demand.
Kinematic and dynamic diffraction, dispersion surfaces, and Bloch waves. Anomalous absorption, Kikuchi band theory, and energyselected images. Contrast-transfer-function theory of phase contrast. Lattice imaging and image modeling. Calculation of multibeam defect images in theory and practice. Weakbeam images. Image processing. Highresolution SEM and STEM images. Convergent beam techniques. Plus selected current topics.

## MS\&E 615 Advanced Mechanical

 PropertiosFall or spring. 3 credits. Offered on demand. Advanced experimental and theoretical aspects of the deformation and failure of structural materials. Although the emphasis is on metals and alloys, attention is also given to glasses, ceramics, semiconductors, and polymeric materials. Topics include theory and practice of mechanical testing, deforma tion behavior of polycrystal, single-crystal metals and covalently bonded semiconductors, phenomenological theories of deformation, the mechanical equation of states for metals, application to the thermal fatigue problem, micromechanical theories of plastic flow in metals, creep in metals, and the timedependent deformation of polymers, relationship of microstructure to mechanical properties of metals and polymers, ductile fracture of metals, brittle fracture of metals and ceramics.

## MS\&E 616 Electronic and Magnetic Materials

Fall or spring. 3 credits. Offered on demand. Electronic transport properties of metals and semiconductors. Semiconductor devices. Optical and dielectric properties of insulators and semiconductors. Laser materials. Structural aspects of superconducting materials, ferromagnetism, and magnetic materials. Magnetic memory devices. At the level of Physics of Semiconductor Devices, by Sze; Ferromagnetism, by Bozworth; and current review articles.

MS8E 617 Solid State Electrochemistry Spring. Alternating years. (Begins in 1994-95; alternates with MS\&E 612.) 3 credits. Prerequisite: MS\&E 612 or permission of instructor.
Disorder in solids; thermodynamic quantities or quasi-free electrons and electron defects in semiconductors; mobility, diffusion and partial conductivity of ions and electrons; solid ionic conductors, solid electrolytes and solid solution electrodes; galvanic cells with solid electrolytes for thermodynamic investigations; technical applications of solid electrolytes. At the level of Electrochemistry of Solids by H. Rickert.

MS\&E 618 Laser Processing of Materlals Fall or spring. 3 credits. Offered on demand. Use of high-intensity lasers in the processing of materials to achieve unique microstructures and metastable phases. Topics: fundamentals of the interaction of E\&M fields with metals, semiconductors and ceramics, transfer of energy between electronic and phonon systems, kinetics of rapid solidification, metastable phase transformations, microstructure of rapidly solidified materials, and current industrial applications.

MS\&E 524/624 Synthesis of Polymeric Materials
Spring. Alternating years. 3 credits. Prerequisite: MS\&E 452 or permission of instructor. Preparation of synthetic polymers by step- and chain-growth polymerization: condensation; free radical, anionic, and cationic mechanisms; ring opening and coordination routes. Statistical and kinetic aspects of homopolymer and copolymer formation. Stereochemistry of polymers and spectroscopic methods for polymer analysis. Molecular aspects of polymer design for properties such as conductivity, elasticity, thermal stability, and engineering properties. Topics will also include liquid crystalline polymers, polymers for photoresists, and electronic packaging. At the level of Principles of Polymerization, by Odian.

## Specialty Courses

## MseE 707 Solar Energy Materials

3 credits. Offered on demand (fall or spring). 3 lecs.
Photovoltaic energy conversion: (1) theory (on the level of Hovel); (2) the role of crystal defects and grain boundaries on the conversion efficiency, and schemes to passivate these defects; (3) current investigations in the DOE program to produce large quantities of solar-grade semiconducting Si; (4) theory and materials for amorphous silicon solar cells.

## MS8E 716 Transition Metal Oxides (also Chem 716)

Fall. 3 credits. Offered on demand.
For description see Chem 716.

## MS8E 779 Special Studies in Materials Sciences

Fall, spring. Variable credit. Offered on demand.
Supervised studies of special topics in materials science.

## MSeE 798 Materials Science and Engineering Colloquium

Fall, spring. 1 credit each term. Credit limited to graduate students.
Lectures by visiting scientists, Cornell staff members, and graduate students on subjects of interest in materials sciences, especially in connection with new research.

## Ms\&E 799 Materials Science Research

 SeminarsFall, spring. 2 credits each term. For graduate students involved in research projects. Short presentations on research in progress by students and staff.

## MS\&E 800/801 Research in Materials

 Science800, fall; 801, spring. Credit to be arranged. Independent research in materials science under the guidance of a member of the staff.

## MECHANICAL AND AEROSPACE ENGINEERING

## General and Required Courses

M\&AE 101 Naval Ship Systems (also Naval Science 102)
Spring. 3 credits. Limited to freshmen and sophomores.
An introduction to primary ship systems and their interrelation. Basic principles of ship construction. Stability, propulsion, control,
internal communications, and other marine systems.

## M\&AE 102 Drawing and Engineering Design (also ENGRG 102)

Fall, spring. 1 credit. Half-term course offered twice each semester. Enrollment limited to thirty students each half term. Recommended for students without previous mechanical drawing experience. S-U grades optional.

2 lecs, 1 lab.
For description, see Engineering Common Courses.

## MeAE 117 Introduction to Mechanical Engineering (also ENGRI 117) <br> Fall. 3 credits.

2 lecs, 1 lab.
For description, see Engineering Common Courses.
M\&AE 212 Mechanical Properties and Processing of Engineering Materials Spring. 4 credits. Prerequisite: ENGRD 202

3 lecs, 1 lab; evening exams and prelims
may be given. N. Zabaras, M. Miller.
Introduction to the broad range of mechanical behavior of materials and their processing. The mechanical properties of metals, ceramics, and composite materials are covered together with their microstructural features and processing. Ideal work methods are introduced for the analysis of bulk deformation processes. Heat treatment of metals and alloys, phase diagrams, casting and quenching processes.

## M\&AE 221 Thermodynamics (also ENGRD 221]

Fall, spring, may be offered summer. 3 credits. Prerequisites: Mathematics 192 and Physics 112
For description, see Engineering Common Courses

## M\&AE 225 Mechanical Design and

 SynthesisSpring. 3 credits. Prerequisite: ENGRD 202. 3 lecs, 1 lab. Lab fee $\$ 50$.
A hands-on laboratory, the use of machine tools, mechanical dissection, and a number of design projects provide direct experience of creative design synthesis.

MeaE 323 Introductory Fluid Mechanics Fall; usually offered in Engineering Cooperative Program. 4 credits. Prerequisites: Engr 202 and 203 and coregistration in 221, or permission of instructor.

4 lecs, evening prelims. Z. Warhaft. Statics, kinematics, potential flow, dynamics, momentum, and energy relations. Thermodynamics of compressible flow; dimensional analysis; real fluid phenomena, laminar and turbulent motion, boundary layer; lift and drag; supersonic flow and shock waves.

## M\&AE 324 Heat Transfer

Spring; may be offered in Engineering
Cooperative Program. 3 credits. Prerequisite: M\&AE 323 or permission of instructor.

3 lecs, evening prelims, evening problem sessions. K. E. Torrance. Conduction of heat in steady and unsteady situations. Surfaces with fins and systems with heat sources. Forced and natural convection of heat arising from flow around bodies and through ducts. Heat exchangers. Emission and absorption of radiation; radiative transfer between surfaces. Introduction to boiling and phase change.

## MeAE 325 Mechanical Design and

 AnalysisFall; usually offered in Engineering Cooperative Program. 4 credits. Prerequisites: Engr 202 and 203.

3 lecs, 1 lab. Evening prelims may be given. D. L. Bartel.
Application of the principles of mechanics and materials to problems of analysis and design of mechanical components and systems.

M\&AE 326 System Dynamics
Spring; may be offered in Engineering Cooperative Program. 4 credits. Prerequisite: Mathematics 294, Engr 203. Junior standing required.

3 lecs, 1 lab, evening prelims. Dynamic behavior of mechanical systems: modeling, analysis techniques, and applications; vibrations of single- and multi-degree-of-freedom systems; feedback control systems, stability analysis. Computer simulation and experimental studies of vibration and control systems.

## MAAE 427 Fluids/Heat Transfer Laboratory

Fall. 3 credits. Prerequisites: M\&AE 323, 324. Fulfills the writing requirement.

1 lec, 1 lab. E. Fisher, C. H. K. Williamson. Laboratory exercises in methods, techniques, and instrumentation used in fluid mechanics and heat transfer. Measurements of temperature, heat transfer, viscosity, drag, fluid-flow rate, effects of turbulence, air foil stall, twophase flows and engine performance. Biweekly written assignments.

## M\&AE 428 Engineering Design

Fall. 2 credits. Prerequisite: completion of six semesters in mechanical engineering or equivalent.

2 lecs.
A comprehensive look at principles of design with a focus on case studies. Examples taken from fluid, thermal, and energy areas, as well as mechanical systems and the manufacturing area of mechanical engineering. Special emphasis on the design sources of engineering failures in products, machines, and mechanical systems, as well as how design should relate to a successful manufactured product.

## Mechanical Systems, Design, Materials Processing, and Precision Engineering

M\&AE 386 Automotive Engineering
Spring. 3 credits. Prerequisite; M\&AE 325 or permission of instructor.

3 lecs. J. Lumley.
Selected topics in the analysis and design of vehicle components and vehicle systems Emphasis on automobiles, trucks, and related vehicles. Power plant, drive line, brakes, aerodynamics, suspension, and structure. Other types of vehicles may be considered

## M\&AE 389 Computer-Aided Design

Fall. 3 credits. Limited to juniors and seniors Prerequisite: A course in programming. May be taken either before or in conjunction with a numerical-methods course. Fulfills
computer applications requirement.
D. L. Taylor.

A first course in CAD, introducing the use of software and computer methods in mechanical engineering. Topics include simulation, optimization, solution of field equations (finite elements, finite differences), least-square function approximation, geometry (space
curves, splines, patches), computer graphics, and data visualization

## M\&AE 412 Metal Forming, Machining and Solidification Processes

Fall. 4 credits. Prerequisite: M\&AE 212 or M\&AE 261.
P. Dawson

Analysis and design of extrusion, drawing, forging and rolling processes using slab analysis techniques. Sheet forming and anisotropy. Machining processes. The mechanics of chip formation. Cutting forces and stresses, shear angle theories, velocity diagrams, heat generation and optimum selection of cutting process parameters. Basic solidification processes. Solution of heat conduction/solute diffusion driven solidification problems for metals and alloys.

## M\&AE 414 Introduction to Precision

 EngineeringSpring. 3 credits or 4 with laboratory. Prerequisites: ENGRG 102 and M\&AE 212, or 412, or permission of instructor.

3 lecs, 1 lab (optional). H. B. Voelcker. Variability in mechanical products arises primarily from the processes used to make and assemble parts; it must be accommodated in design and controlled in manufacturing. This course addresses form variability through studies of ideal-form modeling, form tolerancing, form measurement, and manufacturing process modeling (sources of form error). Central principles, practices, and limitations are summarized.
[M\&AE 417 Introduction to Robotics Spring. 3 credits. Enrollment limited. Not offered 1994-95.
Coordinate transformations for manipulator kinematics. Newton-Euler and Lagrangian developments of manipulator dynamics. Robot control schemes. Trajectory generation Motion planning. Robot programming.]

## [M\&AE 425 Design: Beyond the

 ImaginaryFall. 4 credits. Prerequisite: M\&AE 325 or permission of instructor. Lab fee $\$ 50$. Fulfills senior design requirement. Not offered 1994 95.

Serves as a mechanical engineering field elective. Requires a comprehensive technical report on the design project and fulfills the field design requirement. Students will form teams to design, analyze, and create a prototype of a new mechanism. The experience of creative synthesis is of primary importance; analytic skills will play a critical role in both concept evaluation and final design specification. This course aims to develop an appreciation for the balanced interplay between the synthetic analytic, and "just build it and see" processes. Student teams will present their work and analysis of techniques of special relevance to their design; e.g., dynamic simulation and kinematic analysis of CAD packags. Eclectic design topics include human-powered vehicles, robot submarines, technology appropriate for non-industrialized nations and projects for local industry.]

## M\&AE 461 Engineering for Entrepreneurs

 Fall. 3 creditsR. Warkentin.

Intent is to provide students with the tools and skills necessary to identify, evaluate, and undertake new business ventures. A major course project will be the development of a business plan for an innovative new venture
and will require the detailing of manufacturing, support, and information systems as well as staffing and cost data. Intended for juniors and seniors in the College of Engineering, this course is open to all undergraduates.

M\&AE 464 Design for Manufacture
Spring. 3 credits. Prerequisites: M\&AE 212 and 428 and senior standing. Enrollment limited. Fulfills field design requirement.
R. Warkentin.

Principles and methodologies for conceptual design; elimination procedures for selecting design alternatives; emphasis on design for manufacturability, quality, and cost considerations; team design projects from concept, analysis, and computer-aided drafting to manufacturing methods

M\&AE 465 Biomechanical SystemsAnalysis and Design
Spring. 3 credits. Prerequisites: Engr 202 and 203.

2 lecs, 1 lab. D. L. Bartel.
Selected topics trom the study of the human body as a mechanical system. Emphasis on the modeling, analysis, and design of biomechanical systems frequently encountered in orthopaedic engineering and rehabilitation engineering.

## M\&AE 469 Stress Analysis for

 Mechanical and Aerospace DesignFall. 3 credits. Prerequisite: T\&AM 202 and M\&AE 325 or permission of instructor.
J. F. Booker.

Study of advanced topics in the analysis of stress and deformation of elastic bodies, with applications to the analysis and design of mechanical and aerospace systems and components. Review of fundamentals and application to classical problems. Introduction to modern computational methods (e.g., finite element) for analysis of stress and deformation.

## MeAE 478 Feedback Control Systems

 (also ELE E 471)Fall. 4 credits. Prerequisite: ELE E 302, M\&AE 326, or permission of instructor.

3 lecs. Open computer lab.
Analysis techniques, performance specifications, and analog-feedback-compensation methods for single-input, single-output, linear, time-invariant systems. Laplace transforms and transfer functions are the major mathematical tools. Design techniques include root locus, frequency response, and algebraic pole placement. Feedback architectures include PID, PDF, and lead/lag compensation. Applications include robotics, aerospace vehicles, and industrial processes. Computeraided design laboratory examines modeling and control of a computer-simulated dynamic system.

## M\&AE 486 Automotive Engineering

 DesignSpring. 4 credits. Prerequisite: M\&AE 428 and senior standing. Fulfills field design
requirement.
J. Lumley.

For description, see M\&AE 386

## M\&AE 489 Computer-Aided Design

 ProjectFall. 4 credits. Limited to seniors in mechanical engineering. Fulfills both field design and computer applications requirements.
D. L. Taylor.

Requires extensive project in addition to course assignments. For description, see M\&AE 389

## M\&AE 511 Survey of Manufacturing

 ProcessesSpring; may be offered in summer program. 3 credits. Prerequisites: graduate standing or permission of instructor. Not for M\&AE majors.

2 lecs, 1 lab; evening exams and prelims may be given. R. Warkentin. Yield criteria and plastic flow. Manufacturing processes for engineering materials, including metals, polymers, ceramics and composites. Casting, forming, material removal and joining processes. Intended for non-mechanical engineers.

## M\&AE 555 Introduction to Composite Materials (also T\&AM 555) <br> For course description, see T\&AM 555.

M\&AE 570 Intermediate Dynamics (also T\&AM 570)
Prerequisites: graduate standing or permission of instructor.
For course description, see T\&AM 570.

## M\&AE 577 Mechanical Vibrations (also

 T\&AM 574)Fall or spring. 3 credits. Prerequisites: graduate standing, permission of instructor, and M\&AE 326 or equivalent; open to qualified undergraduates. May be offered 1994-95.

2 lecs, 1 lab (occasional). W. H. Sachse. Vibration phenomena in single- and multiple-degree-of-freedom linear and nonlinear systems, with emphasis on engineering problems involving analysis and design.

## [M\&AE 578 Feedback Control Systems Design and Implementation

Spring. 3 credits. Prerequisite: M\&AE 478 or ELE E 471, graduate standing, or permission of instructor. Fulfills the computer application requirement. Not offered 1994-95.

1 lec, 2 labs. M. L. Psiaki.
Further development of the theory, design, and implementation of feedback control systems with particular emphasis on applications, modeling and system identification, and hardware implementation. Digital control is introduced. Labs include real-time micropro-cessor-based control of a D.C.-motor positioning system, a two-link robot arm, and a two-tank level-control system.]

## [M\&AE 590 Mechanical Engineering

## Design

Spring. 4 credits. Lab fee $\$ 25$. Prerequisites: graduate standing or permission of instructor. Intended for students in M.Eng.(Mechanical) program. Fulfills M.Eng. (M.E.) design requirement. Not offered 1994-95.l

## M\&AE 612 Materials Processing: Theory

 and ApplicationsFall. 4 credits. Prerequisite: graduate standing, or permission of instructor.
M. Miller.

Basic principles governing the inelastic behavior of solids. Slab-analysis models and bound theorems for problems of forging, extrusion, and rolling. Analysis of sheet-metal forming including limit diagrams and springback. Defect initiation during forming processes. Basic solidification processes. Morphological instability of a solid/liquid interface, solidification microstructures, solute redistribution, microsegregation and macrosegregation. Thermomechanical defects in casting processes. Rapid solidification microstructures. Behavior and forming of metal alloys in the semisolid state.

M\&AE 613 Computational Methods in Materials Processing
Spring. 4 credits. Prerequisite: M\&AE 612 or permission of instructor.
P. Dawson.

Thermodynamic framework for inelastic constitutive models, temperature and rate dependence, phenomenology of plastic deformation. The finite-element method for rigid plastic flow analysis of extrusion, drawing, forging, rolling and plate bending. Integration of viscoplastic models, geometry updating, boundary conditions, friction at tool/workpiece interface, modeling of incompressibility, iterative process, and applications to process design. Comparison of the flow formulation with an elasto-plastic analysis. Analysis of hot forming processes. Procedures for heat-transfer analysis. Preform design. Modeling of plastic anisotropy with applications to sheet forming. Modeling of heat flow and deformation on casting processes.

## M\&AE 614 Precision Engineering

Fall. 4 credits. Prerequisite: graduate standing or permission of instructor.

3 lecs, 1 lab (optional). H. B. Voelcker, This is a graduate version of M\&AE 414. The themes are ideal-form modeling, form tolerancing, form measurement, and manufacturing process modeling (sources of form error). Relevant theory is developed, current practices are summarized, and current research issues are examined. Research in the area is expanding rapidly, because formvariation control is a central tool in continuous quality improvement.
M\&AE 625 Product Development
Fall or spring. 4 credits. Prerequisite: graduate standing.

> S. Kannapan.

Covers a wide range of methods and techniques used in the product development process. Cognitive methods of design, team organization, conceptual design, parametric design, concurrent engineering, quality function deployment, and Taguchi method.

## M\&AE 655 Advanced Composite

 Materials and Structures (also T\&AM 655)For course description, see T\&AM 655.

## [M\&AE 665 Advanced Topics in Orthopaedic Biomechanics

 On demand. 4 credits. Prerequisites: graduate standing, prior or concurrent registration in advanced courses in strength of materials or elasticity, and intermediate dynamics. Not offered 1994-95.Advanced treatment of topics in the biomechanics of the musculoskeletal system. Force analysis of the musculoskeletal system under static and dynamic conditions, compact and trabecular bone as structural materials, structural analysis of bone-implant systems, remodeling of bone.]

## MeAE 670 Finite Element Analysis for

 Mechanical and Aerospace Design Spring. 4 credits. Prerequisite: graduate standing, or permission of instructor.J. F. Booker.

Introduction to the finite-element method for static and dynamic analysis of mechanical and aerospace structures (and related nonstructural applications such as heat conduction). Primary emphasis on underlying mechanics and numerical methods. Secondary consideration of inherent capabilities and limitations of
large-scale, general-purpose structural mechanics programs. Introduction to computational aspects through development of small, special-purpose programs and application of available general-purpose programs. Term project.

## [M\&AE 678 Optimal Control and

 EstimationFall, on demand. 3 credits. Prerequisite: M\&AE 478, ELE E 471, graduate standing, or permission of instructor; programming ability in FORTRAN, Pascal, or C. Corequisite: ELE E 521. Not offered 1994-95 Develops the theory of the design of modern multi-input-multi-output feedback control systems using optimal control techniques. Topics covered include trajectory optimization and the minimum principle, bang-bang optimal control solutions, Kalman filtering, LQR/LQE compensator design, suboptimal control and estimation, and applications to regulator and tracking problems. Both linear and nonlinear systems, and continuous-time and discrete-time control, and considered.]
M\&AE 679 Modeling and Simulation of Dynamic Systems
Spring. 4 credits. Prerequisite: graduate standing or permission of instructor. Practice tools with selected applications from diverse fields. Representation of continuous dynamic systems by state-variable models. Simulation by numerical integration using procedural languages (such as FORTRAN and Pascal) and digital simulation packages (such as CSMP and STELLA). Special topics in linear and nonlinear dynamics. Term project.
[M\&AE 682 Hydrodynamic Lubrication: Fluid-Film Bearings
On demand. 4 credits. Prerequisite: graduate standing or permission of instructor. Not offered 1994-95.
J. F. Booker.

Theory of hydrodynamic lubrication and its application to the analysis and design of fluidfilm bearings and other devices. General topics include viscous flow in thin films, selfacting and externally pressurized bearings with liquid and gas lubricant films, bearingsystem dynamics, and computational methods. Selected special topics such as elastohydrodynamic lubrication and artificial joints. Term project.]

## [M\&AE 685 Optimum Design of Mechanical Systems

On demand. 4 credits. Prerequisite: graduate standing or permission of instructor. Not offered 1994-95.
The formulation of design problems frequently encountered in mechanical systems as optimization problems. Theory and application of methods of mathematical programming for the solution of optimum design problems.]

## M\&AE 715 Finite-Deformation Plasticity

 and Rheology and Their Applications in Materials ProcessingFall. 4 credits. Prerequisites: advanced graduate students, Introduction to Continuum Mechanics and Plasticity.

## N. Zabaras.

Hyperelasticity and hypoelasticity. Phenomenology of rate-dependent plastic deformation. Kinematic framework for inelastic constitutive modeling. Lagrangian and Eulerian FEM formulations for large deformation elastoviscoplastic problems.
Viscoplasticity coupled with damage. Slip systems and lattice rotation. Texture develop-
ment and strain hardening in rate-dependent polycrystals. Modeling of the evolution of deformation-induced crystallographic texture in forming processes. Rheological models for polymers.

## Energy, Fluids, and Aerospace Engineering

M\&AE 305 Introduction to Aeronautics
Fall. 3 credits. Limited to upperclass engineers; others with permission of instructor.

## I. Boyd.

Introduction to the concept of aircraft design. Principles of incompressible and compressible aerodynamics, boundary layers, and wing theory. Description and performance of propeller-driven and jet propulsion engines Design studies focus on transonic passenger airplanes and small supersonic jets.

M\&AE 423 Intermediate Fluid Dynamics Spring. 3 credits. Prerequisite: M\&AE 323. 3 lecs.
This course builds on the foundation of M\&AE 323. Emphasis will be both on the calculation of real flows (both engineering and environmental) and fundamental principles. Topics covered will include some exact solutions to the Navier-Stokes equations, boundary layers, wakes and jets, separation, convection, stratified and rotating flows, fluid instabilities, turbulence and chaos.

## [M\&AE 436 Turbomachinery and

 ApplicationsSpring. 3 credits. Prerequisite; M\&AE 323 or 324 or permission of instructor. Not offered 1994-95.
Aerothermodynamic design of turbomachines in general, energy transfer between fluid and rotor in specific types, axial and radial devices, compressible flow. Three-dimensional effects, surging.]

## [M\&AE 439 Acoustics and Noise

Fall. 3 credits. Prerequisites: some knowledge of fluid mechanics or permission of instructor. Not offered 1994-95

3 lecs.
Sound propagation, transmission, and absorption. Sound radiation by surfaces and flow. Room acoustics and noise-control techniques. Hearing, music, noise, and noise control.]

## [M\&AE 441 Advanced Thermodynamics with Energy Applications

Spring. 3 credits. Prerequisites: M\&AE 221 and 323 , or permission of instructor. Not offered 1994-95.
Brief review of classical thermodynamics. Applications to power cycles and refrigeration cycles of particular interest to energy systems. Other topics include the thermodynamic properties of pure systems, phase and chemical equilibria. Brief introduction to statistical thermodynamics.]

MeAE 449 Combustion Engines
Spring, 3 credits. Prerequisites: Engr 221 and M\&AE 323.
E. Fisher.

Introduction to combustion engines, with emphasis on the application of thermodynamic and fluid-dynamic principles affecting their performance. Air-standard analyses, chemical equilibrium, ideal-cycle analyses, deviations from ideal processes, combustion knock. Formation and control of undesirable exhaust emissions.
[MAAE 454 Solar Engineering Design Spring. 3 credits. Prerequisites: M\&AE 428 or senior standing in M\&AE. Fulfills field design requirement. Enrollment limited to 30 students. Not offered 1994-95.
A broad coverage of solar-energy utilization by humankind. Fundamentals of solar radiation. Direct radiation as a source of heat and work. Indirect radiation utilization or natural collection; water power, wind power, and biomass. The production of liquid and gaseous fuels. Solar architecture and environmental control by both active and passive means. Each student will execute a design project in solar engineering. Course grade will be based on design project; presentation of a design proposal, an oral presentation on the progress of the project, and submission of a final design report.]

## [M\&AE 456 Power Systems

Fall. 3 credits. Corequisites: M\&AE 428 and senior standing. Fulfills field design requirement. Not offered 1994-95
A broad survey of methods of large-scale power generation, emphasizing energy sources, thermodynamic cycle considerations, and component description. Power-industry, economic, and environmental factors, trends, and projections.]

## M\&AE 459 Introduction to Controlled

 Fusion: Principles and Technology (also ELE E 484 and NS\&E 484)Spring. 3 credits. Prerequisites: PHYS 112
213 , and 214 , or equivalent background in electricity and magnetism and mechanics with permission of instructor. Intended for senior and graduate students.

3 lecs.
This course is intended to give engineering and physical science students an introduction to the physical basis and technological requirements for generating useful power by nuclear fusion. For complete description see NS\&E 484.

## [M\&AE 506 Aerospace Propulsion

 SystemsSpring. 3 credits. Prerequisite: M\&AE 323 or permission of instructor. Offered alternate years. Not offered 1994-95.

3 lecs. P. C. T. deBoer.
Application of thermodynamic and fluidmechanic principles to the design and performance of aerospace systems. Jet propulsion principles, including rockets. Pollution characteristics. Future possibilities for improved performance.]

M\&AE 507 Dynamics of Flight Vehicles Spring. 3 credits. Prerequisites: M\&AE 405 and Engr 203, or permission of instructor. Offered alternate years. Introduction to stability and control of atmospheric-flight vehicles. Review of aerodynamic forces and methods for analysis of linear systems. Static stability and control. Small disturbance equations of unsteady motion. Dynamic stability of longitudinal and lateral-directional motions; transient control response. At the level of Dynamics of Flight: Stability and Control, by Etkin.
[M\&AE 524 Thermal Management of Electronic Packages
Spring. 3 credits. Prerequisites: M\&AE 221 and MATH 294 or permission of instructor. Not offered 1994-95.
C. T. Avedisian.

This course presents the basic elements of heat transfer in the context of thermal control of a microelectronic package: conduction, convection, radiation, and boiling. The application is to semiconductor chips, transistors, resistors, and optoelectronic devices. Topics include component reliability and temperature; conduction of heat in steady and unsteady states; multilayered structures; thermal contact resistance; extended surfaces (fins); analyses of forced and natural convection flows over surfaces and within enclosures; functional solutions, Reynolds analogy, and integral analyses; calculation of the heat-transfer coefficient; the basics of radiative transfer; jet impingement cooling; immersion cooling; and compact heat exchangers.]

M\&AE 543 Combustion Processes
Fall. 3 credits. Prerequisite: graduate standing or permission of instructor An introduction to combustion and flame processes, with emphasis on fundamental fluid dynamics, heat and mass transport, and reaction-kinetic processes that govern combustion rates. Thermochemistry, kinetics, vessel explosions, laminar and turbulent premixed and diffusion flames, droplet combustion, and combustion of solids.

## M\&AE 601 Foundations of Fluid

 Dynamics and AerodynamicsFall. 4 credits. Prerequisite: graduate standing or permission of instructor. S. B. Pope.

Foundations of fluid mechanics from an advanced viewpoint. Aspects of kinetic theory as it applies to the formulation of continuum fluid dynamics. Surface phenomena and boundary conditions at interfaces Fundamental kinematic descriptions of fluid flow, tensor analysis, derivation of the NavierStokes equations and energy equation for compressible fluids. Viscous flows, boundary layers, potential flows, vorticity dynamics.

## M\&AE 602 Fluid Dynamics at High

 Reynolds NumbersSpring. 4 credits. Prerequisite: M\&AE 601 3 lecs. S. Leibovich.
Navier-Stokes and Euler equations, integral formulas for fluid forces and moments on immersed bodies in compressible and incompressible viscous flows. Vorticity dynamics in compressible flows, Kelvin's theorem. Fjortoft's theorem, Helmholtz decomposition of vector fields. Singularities vortex filaments, vortex sheets, Biot-Savart relations. Irrotational motion: representations in terms of velocity or vector potentials Topology of flows; general results in potential theory

## M\& AE 608 Physics of Fluids

Fall. 4 credits. Prerequisite: graduate standing or permission of instructor I. Boyd.

Behavior of a gas is considered at the microscopic level. Introduction to kinetic theory: velocity distribution, collisions, Boltzmann equation. Quantum theory: internal structure, rigid rotator, harmonic oscillator, one-electron atom. Statistical mechanics: partition functions, relation to thermodynamics. These ideas are combined through
application to modeling finite rate changes in the vibrational energy and chemical composition of high-temperature air.
[Mat 639 Aerodynamic Noise Theory
Fall, on demand. 4 credits. Prerequisites: Graduate standing and knowledge of fluid mechanics, or permission of instructor. Not offered 1994-95.
Topics in acoustics relevant to transportation noise sources and control. Lighthill and Ffowes Williams formulations for sound generation. Deterministic and broadband sources. Propagation, nonlinear effects, absorption, diffraction, and transmission. Applications to aircraft, automobiles, propellers, fans, jets, etc.]
M\&AE 651 Advanced Heat Transfer
Spring. 4 credits. Prerequisite: graduate standing or permission of instructor. Advanced treatment of conductive and convective heat transfer. Basic equations reasoned in detail. Integral and differential formulations. Exact and approximate solutions. Forced convection. Natural convection. Laminar and turbulent flows. Effects of viscous dissipation and mass transfer.

## [M\&AE 653 Experimental Methods in

 Fluid Mechanics, Heat Transfer, and CombustionSpring. 4 credits. Prerequisite: graduate standing or permission of instructor. Not offered 1994-95.

2 lecs, 1 lab.
Study of experimental techniques for measuring pressure, temperature, velocity, and composition of gases, with emphasis on experimental capabilities and physical principles. Topics include laser velocimetry, hot-wire anemometry, spectroscopy, and laser scattering. This course should appeal to theoreticians who wish to have some knowledge of experimental techniques. In addition, it will be of interest to experimentalists.]

M\&AE 654 Radiation Heat Transfer 2-4 credits. Prerequisite: graduate standing or permission of instructor
K. E. Torrance.

An independent readings course. Coverage of surface- and gas-radiation properties, including reflection, emission, absorption, and scattering. Deductions from the first and
second laws of thermodynamics. The radiative-transfer equation; surface-surface, surface-volume, and volume-volume exchange. Simplifying approximations Modern methods for exchange calculations and transport analysis including integral, computer-graphics-assisted, and Monte Carlo approaches. Assigned readings from Radiative Heat Transfer, by Modest. Discussion sessions. Assigned problems and papers.
[M\&AE 732 Analysis of Turbulent Flows Spring. 4 credits. Prerequisite: M\&AE 601 or permission of instructor. Offered alternate years. Not offered 1994-95.
S. B. Pope.

Study of methods for calculating the properties of turbulent flows. Characteristics of turbulent flows. Direct numerical simulations, large-eddy simulations, and the closure problem. Reynolds-stress equation: effects of dissipation, anisotropy, deformation.
Transported scalars. Probability density functions (pdf's): definitions and properties, transport equations, relationship to second-
order closures, stochastic modeling, Langevin equation, and Monte Carlo solutions. The course emphasizes comparison of theory with experiment.]

## M\&AE 733 Stability of Fluid Flow

Fall, on demand. 4 credits. S-U grades only. Prerequisite: graduate standing or permission of instructor.
S. Leibovich.

Basic stability and bifurcation theory in fluid systems. Thermal, double-diffusive, and related instabilities. Post-bifurcation behavior: the Ginzburg-Landau (Stewartson-Stuart) and Chapman-Proctor-Sivashinsky amplitude equations. Phase dynamics and pattern formation. Stability of periodic motion: Floquet theory. Secondary instabilities; Eckhaus instability, Busse "balloons." Energy stability theory. Effects of symmetry. TaylorCouette instability. "Open" flow systems: inviscid Kelvin-Helmholtz, Rayleigh-Taylor instability, and capillary instability of liquid jets. Stability of parallel shear flows and of concentrated vortex flows. Spatial development of linearly unstable motion: "absolute" and "convective" instability.

## M\&AE 734 Turbulence and Turbulent

 FlowFall. 4 credits. Prerequisite: M\&AE 601, graduate standing, or permission of instructor. J. L. Lumley.

Topics include the dynamics of buoyancy and shear-driven turbulence, boundary-free and bounded shear flows, second-order modeling, the statistical description of turbulence, turbulent transport, and spectral dynamics.
M\&AE 736 Computational Aerodynamics Spring. 4 credits. Prerequisites: graduate standing, an advanced course in continuum mechanics or fluid mechanics, and some FORTRAN programming experience.

3 lecs. D. A. Caughey.
Numerical methods to solve inviscid and high Reynolds-number fluid-dynamics problems, including finite-difference, finite-volume, and surface-singularity methods. Accuracy, convergence, and stability; treatment of boundary conditions and grid generation. Focus on hyperbolic (unsteady flow with shock waves) and mixed hyperbolic-elliptic (steady transonic flow) problems. Assignments require programming digital computer.
M\&AE 737 Computational Fluid Mechanics and Heat Transfer Fall. 4 credits. Prerequisites: graduate standing; an advanced course in continuum mechanics, heat transfer, or fluid mechanics; and some FORTRAN or C programming experience.
K. E. Torrance.

Numerical methods for elliptic and parabolic partial differential equations arising in fluid flow and heat-transfer problems involving convection and diffusion. Finite-difference, finite-volume, and spectral methods. Accuracy, stability, convergence, and conservation. Review of current methods. Emphasis on steady and unsteady incompressible flows. Assigned problems are solved on a digital computer and at the College Workstation Facility.

## Special Offerings

M\&AE 400 Components and Systems: Engineering in a Social Context (also Physics 481 and Science, Technology, and Soclety 400)
Spring. 3 credits. Prerequisites: upperclass standing, two years of college physics. Serves as a technical elective but not as a field elective in mechanical engineering.
Z. Warhaft.

This course addresses, at a technical level, broader questions than are normally posed in the traditional engineering or physics curriculum. Through the study of individual cases such as the Strategic Defense Initiative (SDI), the National Aerospace Plane, and nuclear power and its alternatives, we investigate interactions between the scientific, technical, political, economic, and social forces that are involved in the development of engineering systems.

## M\&AE 490 Special Investigations in Mechanical and Aerospace Engineering

Fall, spring. Credit to be arranged. Limited to undergraduate students. Prerequisite: permission of instructor.
Intended for an individual student or a small group of students who want to pursue a particular analytical or experimental investigation outside of regular courses or for informal instruction supplementing that given in regular courses

## M\&AE 491 Design Projects in Mechanical and Aerospace Engineering

Fall, spring. Credits to be arranged. Prerequisite or corequisite: M\&AE 428. Fulfills field design requirement.
Intended for individual students or small groups of students who want to pursue particular design projects outside of regular courses.

## MRAE 545 Energy Seminar (also NS\&E 545)

Fall and spring. 1 credit each semester Prerequisite: graduate standing or permission of instructor. Master of Engineering (M.Eng.) students in the energy option are expected to take the seminar course both fall and spring for credit.

1 lecture.
Selected topics related to energy resources, their conversion to electricity, process heat, etc., and the environmental consequences of the energy cycle will be discussed by faculty members from several departments in the College of Engineering, units within the university, and invited experts. Examples of topics that will be surveyed in these lectures are energy resources, economics, and politics; coal-based electricity generation; nuclear reactors; solar power; energy conservation by users; synthetic fuels; air-pollution control; nuclear-waste disposal; electric-power transmission system; geothermal power; wind power; and advanced oil recovery.

## M\&AE 592 Seminar and Design Project in Aerospace Engineering

Fall, spring. 2 credits each term. Prerequisite: graduate standing or permission of instructor. Intended for students in M.Eng.(Aerospace) program.
Introduction to topics of current research interest in aerospace engineering by Aerospace faculty and invited speakers. Individual design projects supervised by separate faculty members after introductory sessions.

M\&AE 594 Manufacturing Seminar (also ORRIE 894)
Fall, spring. 1 credit. Prerequisite: graduate standing or permission of instructor. S-U grades optional.

1 sec .
A weekly, practice-oriented seminar with external speakers for Master of Engineering students in several disciplines who are interested in manufacturing. Conducted in cooperation with the School of Operations Research and Industrial Engineering, the Cornell Manufacturing Engineering and Productivity Program (COMEPP), and the Cornell Society of Engineers.

## M\&AE 690 Special Investigations in Mechanical and Aerospace Engineering

Fall, spring. Credit to be arranged. Limited to graduate students.

## M\&AE 695 Special Topics in Mechanical and Aerospace Engineering

Fall, spring. Credit to be arranged. Graduate standing and permission of instructor.
Special lectures by faculty members on topics of current research.

## M\&AE 791 Mechanical and Aerospace Research Conference

Fall, spring. 1 credit each term. S-U grades only. For graduate students involved in research projects.
Presentations on research in progress by faculty and students.

## M\&AE 799 Mechanical and Aerospace

 Engineering CalloquiumFall, spring. 1 credit each term. Credit limited to graduate students. All students and staff invited to attend.
Lectures by visiting scientists and Cornell faculty and staff members on research topics of current interest in mechanical and aerospace science, especially in connection with new research.

## M\&AE 890 Research in Mechanical and Aerospace Engineering

Credit to be arranged. Prerequisite: candidacy for M.S. degree in mechanical or aerospace engineering or approval of director. Independent research in an area of mechanical and aerospace engineering under the guidance of a member of the faculty.

## M\&AE 990 Research in Mechanical and Aerospace Engineering

Credit to be arranged. Prerequisite: candidacy for Ph.D. degree in mechanical or aerospace engineering or approval of director. Independent research in an area of mechanical and aerospace engineering under the guidance of a member of the faculty.

## NUCLEAR SCIENCE AND ENGINEERING

A number of courses in nuclear science and engineering are offered through the School of Applied and Engineering Physics (see A\&EP $609,612,633,634,636,638$, and 651).

## NS\&E 121 Fission, Fusion, and Radiation

 (also ENGRI 121)Spring. 3 credits.
2 lecs, 1 lab demonstration.
This is a course in the Introduction to Engineering series. For description, see Engineering Common Courses.

NS\&E 285 Art, Archaeology, and Analysis (also ENGRG 185 and MS\&E 285)

Spring. 3 credits.
3 lecs. Interdepartmental staff.
An interdepartmental course on how techniques of physical sciences and engineering are being applied to issues in cultural research. For full description, see ENGRG 185.

## NS\&E 303 Introduction to Nuclear Science and Engineering I (also A\&EP 303)

Fall. 3 credits. Prerequisite: Physics 214 or Mathematics 294. This course is designed for juniors or seniors from any engineering field who want to prepare for graduate-level nuclear science and engineering courses at Cornell or elsewhere. It can also serve as a basic course for those who do not intend to continue in the field.

3 lecs. V. O. Kostroun.
Introduction to the fundamentals of nuclear reactors. Topics include an overview of the field of nuclear engineering; nuclear structure, radioactivity, and reactions; interaction of radiation and matter; and neutron moderation, neutron diffusion, the steady-state chain reaction, and reactor kinetics. At the level of Introduction to Nuclear Engineering, by Lamarsh.
NS\&E 484 Introduction to Controlled Fusion: Principles and Technology (also ELE E 484, M\&AE 559, and A\&EP 484)
Spring. 3 credits. Prerequisites: PHYS 112, 213 , and 214 , or equivalent background in electricity and magnetism and mechanics; and permission of instructor. Intended for seniors and graduate students.

3 lecs.
Introduction to the physical principles and various engineering aspects underlying power generation by controlled fusion. Topics include: (i) fuels and conditions required for fusion power, and basic fusion-reactor concepts; (ii) fundamental aspects of plasma physics relevant to the confinement of thermonuclear plasmas, and basic engineering problems for a fusion reactor; and (iii) an engineering analysis of the present engineering design for the large, international, nextstep tokamak experiment, ITER (International Toroidal Experimental Reactor), which is to be a fusion-power test reactor, and/or analysis of inertial confinement fusion-reactor designs. Parts (i) and (ii) will be treated in lectures; part (iii) will include talks by course participants.

## NS\&E 509 Nuclear Physics for Applications

Fall. 3 credits. Prerequisites: sophomore physics and math, or permission of instructor; some upper-division physics is desirable. Primarily for graduate students, especially those with a major or minor in Nuclear Science and Engineering; also open to qualified undergraduates.

3 lecs. D. D. Clark.
A first course in nuclear physics. Systematic presentation of nuclear phenomena and processes that underlie applications ranging from nuclear power (fission and fusion), to nuclear astrophysics, to nuclear analytical methods for research in nonnuclear fields. Radioactivity, nuclear reactions, and interaction of radiation with matter. At the level of Radiocbemistry and Nuclear Methods of Analysis, by Ehmann and Vance or Nuclear and Radiochemistry, by Friedlander, et al.

## NS\&E 545 Energy Seminar (also M\&AE

 545)Fall and spring. 1 credit each semester.
Master of Engineering (M.Eng.) students in the Energy Option are expected to take this seminar both fall and spring for credit. 1 lec .
Energy resources, their conversion to electricity or process heat, and the environmental consequences of the energy cycle will be discussed by faculty members from several departments in the College of Engineering, other units within the university, and invited experts. Examples of topics to be surveyed are energy resources, economics, and politics; coal-based electricity generation; nuclear reactors; solar power; energy conservation by users; synthetic fuels; air-pollution control; nuclear-waste disposal; electric-power transmission systems; geothermal power; wind power; and advanced oil recovery.

## NS\&E 551 Nuclear Methods in Non-

 Nuclear Research FieldsSpring. 3 credits. Prerequisite: Physics 214 or 218 , or permission of instructor; some upper-division physics desirable. Primarily for graduate students in archaeology, geology, chemistry, biology, materials science, and other non-nuclear fields in which nuclear methods are used. Open to qualified undergraduates. A more intensive related course, A\&EP 651, is intended for nuclear specialists.

One 2-hour lec and one 2-1/2-hour lab. D. D. Clark.

Lectures on interaction of radiation with matter, radiation protection, and nuclear instruments and methods including data reduction. About ten experiments are available on radiation detection, attenuation, and measurement; electronic instrumentation, including computerized systems; activation analysis; and emerging applications such as prompt gamma analysis and neutron radiography. The TRIGA reactor is used. Emphasis is on those nuclear methods, particularly instrumental ones using neutrons, that are used in, or are being adapted for, non-nuclear fields, but tracer and other chemical techniques are not included. Students each select seven or eight experiments to meet their interests and needs. At the level of Radiochemistry and Nuclear Methods of Analysis, by Ehmann and Vance or Nuclear and Radiochemistry, by Friendlander, et al.

## NS\&E 590 Independent Study

Fall, spring. $1-4$ credits. Grade option letter or S-U.
Independent study or project under guidance of a faculty member.

## NS\&E 591 Project

Fall, spring. 1-6 credits.
Master of Engineering or other project under guidance of a faculty member.

## NS\&E 621 Radiation Effects in

Microelectronics (also ELE E 637)
Fall. 3 credits. Prerequisite: Permission of instructor. A seminar intended for seniors and graduate students in engineering or applied physics.
$21-1 / 2$ hour lecs. S. C. McGuire. An introduction to the physical processes that underlie the malfunction of microelectronic circuitry resulting from exposure to ionizing radiation. Basic device-failure mechanisms, including total-dose effects, single-event upsets, and latchup, as well as the roles that
circuit testing and modeling methods play in improving circuit design. Impact of surface radiation typical of low-energy electron and photon sources on device fabrication.
Reference materials from the current literature

## NS\&E 637 Advanced Topics In Plasma

 Diagnostic TechniquesFall. 3 credits. Prerequisite: plasma physics at the level of both ELE E 581 and 582 (A\&EP 606 and 607 ) as well as the levels of mathematics and electrodynamics appropriate for those courses.

3 lecs. D. A. Hammer.
Addresses diagnostic methods in depth, emphasizing those that can be and are being used in experiments at Cornell. The complete list of specific topics will be determined by the interests of the participants, but will certainly include laser-based techniques and plasma spectroscopy. (This course does not include a laboratory component. Students interested in laboratory experience should take ELE E 481 instead of or in addition to NS\&E 637.)

## OPERATIONS RESEARCH AND INDUSTRIAL ENGINEERING

OR\&IE 115 Engineering Application of Operations Research (also ENGRI 115)

Fall, spring. 3 credits. Enrollment not open to OR\&E upperclass majors.

2 lecs, 1 lab.
For description see Engineering Common Courses.

## OR\&IE 230 Discrete Mathematics

Spring. 3 credits. Prerequisite: one year of calculus or permission of instructor.

3 lecs.
A broad but thorough introduction to topics of discrete mathematics of use in a variety of fields of science and engineering. Topics include basic combinatorics and counting techniques, recurrence relations and generating functions, introduction to modular arithmetic with application to coding theory and experimental designs, and basic notions of graph theory with applications in optimization such as maximum flow in a network and project planning.
OR\&IE 270 Basic Engineering Probability and Statistics (also ENGRD 270)
Fall, spring, summer. 3 credits. Prerequisite: first-year calculus.

3 lecs. Evening prelims.
For description see Engineering Common Courses.

## OR\&IE 320 Optimization I

Fall. 4 credits. Prerequisite: Mathematics 221 or 294.

3 lecs, 1 rec.
Formulation of linear programming problems and solution by the simplex method. Related topics such as sensitivity analysis, duality, and network programming. Applications include such models as resource allocation and production planning.

## OR\&IE 321 Optimization II

Spring. 4 credits. Prerequisite: OR\&IE 320 or equivalent.

3 lecs, 1 rec.
A variety of optimization methods stressing extensions of linear programming and its applications but also including topics drawn
from integer, dynamic, and nonlinear programming. Formulation and modeling are stressed as well as numerous applications.

## OR\&IE 350 Financial and Managerial

 AccountingFall. 4 credits.
3 lecs, I rec. Evening prelims. Principles of accounting, financial reports, financial-transactions analysis; financialstatement analysis, budgeting, job-order and process-cost systems, standard costing and variance analysis, economic analysis of shortterm decisions.

## OR\&IE 360 Engineering Probability and Statistics II

Fall. 4 credits. Prerequisite: ENGRD 270 or equivalent. Not open to students who have taken OR\&IE 260.

3 lecs, 1 rec.
This second course in probability and statistics provides a rigorous foundation in theory combined with the methods for modeling, analyzing, and controlling randomness in engineering problems. Probabilistic ideas are used to construct models for engineering problems, and statistical methods are used to test and estimate parameters for these models. Specific topics include random variables, probability distributions, density functions, expectation and variance, multidimensional random variables, and important distributions including normal, Poisson, exponential, hypothesis testing, confidence intervals, and point estimation using maximum likelihood and the method of moments.

## OR\&IE 361 Introductory Engineering

 Stochastic Processes ISpring. 4 credits. Prerequisite: OR\&IE 260 or OR\&IE 360 or equivalent.

3 lecs, 1 rec.
Basic concepts and techniques of random processes are used to construct models for a variety of problems of practical interest. Topics include the Poisson process, Markov chains, renewal theory, models for queuing and reliability.

## OR\&IE 410 Industrial Systems Analysis Spring. 4 credits.

3 lecs, 1 computing session.
Design of production facilities, including engineering economy, taxation effects, materials handling, process design, and facility layout. Operations analysis, including process scheduling, process evaluation, procedural analysis, project management, methods analysis and design, work measurement, inventory control, job evaluation, and quality engineering and control.

## OR\&IE 416 Design of Manufacturing Systems

Fall. 4 credits. Senior OR\&F students only.
Others by permission of instructor only.
2 lecs, 1 lab.
Project course in which students, working in teams, design a manufacturing logistics system and conduct capacity, material flow, and cost analysis of their design. Meetings between project teams and faculty advisers are substituted for some lectures. Analytical methods for controlling inventories, planning production, and evaluating system performance will be presented in lectures. Lab fee \$15.
OR\&IE 417 Material Handling Systems
Fall. 4 credits.
2 lecs, 1 rec.

Design of the layout of processes and storage areas and the material-handling system for movement of items. Typical equipment used. Material flow analysis. The functions of identification control, storage, movement, batching, merging, and dispersion.
ORaIE 431 Discrete Models
Spring. 4 credits. Prerequisites: OR\&IE 320 and COM S 211, or permission of instructor.

3 lecs, 1 rec.
Basic concepts of graphs, networks, and discrete optimization. Fundamental models and applications, and algorithmic techniques for their analysis. Specific optimization models studied include flows in networks, the traveling salesman problem, and network design.

## ORRIE 432 Nonlinear Optimization

Fall. 4 credits. Prerequisite: OR\&IE 320. 3 lecs, 1 rec.
Introduction to the practical and theoretical aspects of nonlinear optimization. Attention given to the computational efficiency of algorithms and the application of nonlinear techniques to linear programming; e.g., interior-point methods. Methods of numerical linear algebra introduced as needed.
[OR\&IE 435 Introduction to Game Theory
Fall. 3 credits. Not offered 1994-95. 3 lecs.
A broad survey of the mathematical theory of games, including such topics as two-person matrix and bimatrix games; cooperative and noncooperative n-person games; games in extensive, normal, and characteristic function form. Economic market games. Applications to weighted voting and cost allocation.]

## [OR\&IE 451 Economic Analysis of

 Engineering SystemsSpring. 4 credits. Prerequisites: OR\&IE 320 and OR\&IE 350. Not offered 1994-95.

3 lecs, 1 computing session.
Financial planning, including cash-flow analysis and inventory flow models. Engineering economic analysis, including discounted cash flows and taxation effects. Application of optimization techniques, as in equipment replacement or capacity expansion models. Issues in designing manufacturing systems. Student group project.]

## OR\&IE 475 Regression

Spring. Second half of term. 2 credits. Prerequisite: ENGRD 270.

3 lecs, 1 rec.
Linear models; estimation and testing; confidence sets; diagnostics and residual analysis; variable selection and modeling.

OR\&IE 476 Experimental Design I Spring. First half of term. 2 credits. Prerequisite: ENGRD 270.

3 lecs, 1 rec.
Experimental design to improve industrial products and manufacturing processes. Randomization. Blocking. Fractional factorials. Orthogonal arrays. Nested designs.

## OR\&IE 499 OR\&IE Project

Fall, spring. Credit to be arranged. Prerequisite: permission of instructor.
Project-type work, under faculty supervision, on a real problem existing in some firm or institution, usually a regional organization. Opportunities in the course may be discussed with the associate director.

## OR\&IE 515 Design of Manufacturing

 SystemsFall. 4 credits. Prerequisite: permission of instructor
For description, see OR\&IE 416. Lab fee \$15.
OR\&IE 516 Case Studies
Fall. 1 credit. Limited to M.Eng. students in OR\&IE.

3 rec-labs
Students are presented with unstructured problems that resemble real-world situations. They work in project groups to formulate mathematical models, perform computer analyses of the data and models, and present oral and written reports.

## OR\&IE 520 Operations Research I: Optimization I

Fall. 4 credits. Prerequisite: Mathematics 221 or 294. Intended for graduate students minoring in operations research. The same course as OR\&IE 320, but on the graduate level with additional exposure to extensions of linear programming, such as integer and large-scale programming.

3 lecs, 1 rec
For description, see OR\&IE 320.
OR\&IE 521 Optimization II
Spring. 4 credits. Prerequisite: OR\&IE 320 or 520 or equivalent. Intended for graduate students in other fields. Lectures concurrent with OR\&IE 321.

3 lecs, 1 rec.
A variety of optimization methods stressing extensions of linear programming and its applications but also including topics drawn from integer, dynamic, and nonlinear programming. Formulation and modeling are stressed, as well as numerous applications.

OR\&IE 523 Operations Research II: Introduction to Stochastic Modeling Spring. 4 credits. Prerequisite: OR\&IE 260 or OR\&IE 360. Intended for graduate students in other fields. Lectures concurrent with OR\&IE 361.

3 lecs, 1 rec.
Basic concepts and techniques of random processes are used to construct models for a variety of problems of practical interest.
Topics include the Poisson process, Markov chains, renewal theory, models for queuing and reliability
OR\&IE 525 Production Planning and Scheduling Theory and Practice Spring. 3 credits. Prerequisite: OR\&IE 320. 3 lecs.
Production planning, including MRP, linear programming, and related concepts. Scheduling and sequencing work in manufacturing systems. Job release strategies and control of work in process inventories. Focus on setup time as a determinant of plans and schedules.

## OR\&IE 528-529 Selected Topics in Applied Operations Research

Fall, spring. Credit to be arranged. Prerequisite: permission of instructor.
Current topics dealing with applications of operations research.

## [OR\&IE 551 Economic Analysis of

 Engineering SystemsSpring. 4 credits. Prerequisites; OR\&IE 320 and OR\&IE 350. Not offered 1994-95.

3 lecs, 1 computing session.
Lectures concurrent with OR\&IE 451. For description see OR\&IE 451.]

OR\&IE 560 Engineering Probability and Statistics II
Fall. 4 credits. Prerequisite: ENGRD 270 or equivalent. Lectures concurrent with OR\&IE
360. Intended for M.Eng. students and for M.S./Ph.D. students in other fields.

3 lecs, 1 rec.
For description, see OR\&IE 360.

## [OR\&IE 561 Queuing Theory and Its

 ApplicationsSpring. 3 credits. Prerequisite: OR\&IE 361 or permission of instructor. Not offered 1994-95 3 lecs.
Basic queuing models. Little's Law, PASTA property, Markovian and non-Markovian queues. Optimization of queues. Polling queues: exhaustive and gated service.
Jackson queuing networks. Open networks and closed networks. Product-form queuing networks.]

## OR\&IE 562 Inventory Theory

Spring. 4 credits. Prerequisite: OR\&IE 321, 361 or permission of instructor.

## 2 lecs, 1 rec

Discussion of the nature of inventory systems and their design and control. Periodic and continuous review policies for single-item and single-location problems. Multi-item and multi-echelon extensions. Dynamic and static models are discussed. Distribution problems are analyzed. Applications are stressed.

## OR\&IE 563 Applied Time-Series Analysis

 Spring. 3 credits. Prerequisites: OR\&IE 361 and OR\&IE 270, or permission of instructor. 3 lecs.The first part of this course treats regression methods to model seasonal and non-seasonal data. After that, Box-Jenkins models, which are versatile, widely used, and applicable to nonstationary and seasonal time series, are covered in detail. The various stages of model identification, estimation, diagnostic checking, and forecasting are treated. Analysis of real data is carried out. Assignments require computer work with a timeseries package
[OR\&IE 575 Experimental Design II
Spring. Last half of term. 2 credits. Prerequisite: OR\&IE 476. Not offered 1994-95. 3 lecs, 1 rec
Continuation of OR\&IE 476. Design of industrial experiments. Response surfaces. Robust product designs. Taguchi's methods.]

## OReIE 577 Quality Control

Fall. 3 credits. Prerequisites: ENGRD 270. 3 lecs, 1 rec
Concepts and methods for process and acceptance control. Control charts for variables and attributes. Process capability analysis. Acceptance sampling. Continuous sampling plans. Life tests. Use of experimental design and Taguchi methods for off-line control.

## OR\&IE 580 Design and Analysis of Simulated Systems

Fall. 4 credits. Prerequisites: programming experience and OR\&IE 360 or 370 , or permission of instructor.

3 lecs, 1 rec
Digital computer programs to simulate the operation of complex discrete systems in time. Modeling, program organization, pseudo-random-variable generation, simulation languages, statistical considerations; applications to a variety of problem areas.

## OR\&IE 599 Project

Fall, spring. 5 credits. For M.Eng. students. Identification, analysis, design, and evaluation of feasible solutions to some applied problem in the OR\&IE field. A formal report and oral defense of the approach and solution are required.

## [OR\&IE 625 Scheduling Theory

Spring. 3 credits. Not offered 1994-95 3 lecs.
Scheduling and sequencing problems, including single-machine problems, parallelmachine scheduling, and shop scheduling The emphasis is on the design and analysis of polynomial time optimization and approximation algorithms and on related complexity issues.]

## [OR\&IE 626 Advanced Production and

 Inventory PlanningSpring. 3 credits. Not offered 1994-95. 3 lecs.
Introduction to a variety of production and inventory control planning problems; the development of mathematical models corresponding to these problems; a study of approaches for finding solutions.]

## [OR\&IE 627 Dynamic Programming

Fall. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95.

3 lecs.
Optimization of sequential decision processes Deterministic and stochastic models, infinitehorizon Markov decision models, policy iterations. Contraction mapping methods. Applications drawn from inventory theory, production control.]

OR\&IE 630 Mathematical Programming I
Fall. 4 credits. Prerequisites: advanced calculus and elementary linear algebra.

3 lecs, 1 rec.
A rigorous treatment of the theory and computational techniques of linear programming and its extensions. Formulation, duality theory, simplex, and dual simplex methods. Sensitivity analysis. Network flow problems and algorithms. Theory of polyhedral convex sets, systems of linear equations and inequalities, Farkas' Lemma. Exploiting special structure in the simplex method, computational implementation. Decomposition Principle.

## [ORAIE 631 Mathomatical

 Programming IISpring. 4 credits. Prerequisite: OR\&IE 630. Not offered 1994-95.

3 lecs, 1 rec.
A continuation of OR\&IE 630. Introduction to nonlinear programming, interior-point methods for linear programming, complexity theory, and integer programming. Some discussion of dynamic programming, and elementary polyhedral theory.]
[OR\&IE 632 Nonlinear Programming
Fall. 3 credits. Prerequisite: OR\&IE 630. Not offered 1994-95.

3 lecs.
Necessary and sufficient conditions for unconstrained and constrained optima. Duality theory. Computational methods for unconstrained (e.g., quasi-Newton) problems, linearly constrained (e.g., active set) problems, and nonlinearly constrained (e.g., successive quadratic programming) problems.]

OR\&IE 633 Graph Theory and Network Flows
Fall. 3 credits. Prerequisite: permission of instructor.

3 lecs.
Directed and undirected graphs. Bipartite graphs. Hamilton cycles and Euler tours. Connectedness, matching, and coloring. Flows in capacity-constrained networks. Maximum flow and minimum cost flow problems.

OReIE 634 Combinatorial Optimization
Fall. 3 credits. Prerequisite: permission of instructor.

3 lecs.
Topics in combinatorics, graphs, and networks, including matching, matroids, polyhedral combinatorics, and optimization algorithms.

## [OR\&IE 635 Interior-Point Methods for Mathematical Programming

Spring. 3 credits. Prerequisites: Math 411 and OR\&IE 630, or permission of instructor. Not offered 1994-95.

3 lecs.
Interior-point methods arising from Karmarkar's Algorithm. Application to linear and quadratic programming and the linear complementarity problem. Projective-scaling, affine-scaling, path-following, and potentialreduction methods.]

## OR\&IE 636 Integer Programming

Fall. 3 credits. Prerequisite: OR\&IE 630. 3 lecs.
Discrete optimization. Linear programming in which the variables must assume integral values. Theory, algorithms, and applications. Cutting-plane and enumerative methods, with additional topics drawn from recent research in this area.

## [OR\&IE 639 Polyhedral Convexity

Fall. 3 credits. Prerequisite: basic knowledge of linear algebra. Not offered 1994-95. A comprehensive introduction to the geometry and combinatorics of polyhedral convex sets. Linear inequalities, supporting and separating hyperplanes. Polarity. Convex hulls, facets, and vertices. Face lattices. Convex cones and polytopes. Minkowski sums. Gale transforms. Simplicial and polyhedral subdivision. Applications to linear programming, combinatorial optimization, and computational geometry.]

## OR\&IE 650 Applied Stochastic

## Processes

Fall. 4 credits. Prerequisite: a one-semester calculus-based probability course. 3 lecs, 1 rec.
An introduction to stochastic processes that presents the basic theory together with a variety of applications. Topics include Markov processes, renewal theory, random walks, branching processes, Brownian motion, stationary processes, martingales, and point processes.

## OR\&IE 651 Probability

Spring. 4 credits. Prerequisite: Real analysis at the level of Math 413 and a previous onesemester course in calculus-based probability. 3 lecs, 1 rec.
Sample spaces, events, sigma fields, probability measures, set induction, independence, random variables, expectation, review of important distributions and transformation techniques, convergence concepts, laws of large numbers and asymptotic normality, conditioning.

OR\&IE 662 Advanced Stochastic Processes
Fall. 3 credits. Prerequisite: OR\&IE 651 or equivalent.

3 lecs.
Brownian motion, martingales, Markov processes, and topics selected from: diffusions, stationary processes. point processes, weak convergence for stochastic processes and applications to diffusion approximations, Lévy processes, regenerative phenomena, random walks, and stochastic integrals.

## [OR\&IE 663 Time-Series Analysis

Spring. 3 credits. Prerequisite: OR\&IE 650 or equivalent. Not offered 1994-95. 3 lecs.
Representations of stationary time series. The ARIMA models. Spectral analysis. Long-range dependence. Problems of estimation.
Multivariate time series.]

## [OR\&IE 665 Advanced Gueuing Theory

Spring. 3 credits. Prerequisite: OR\&IE 650 or equivalent. Not offered 1994-95. 3 lecs.
A study of stochastic processes arising in a class of problems including congestion, storage, dams, and insurance. The treatment is self-contained. Transient behavior of the processes is emphasized. Heavy-traffic situations are investigated.]

## OR\&IE 670 Statistical Principles

Fall. 4 credits. Co-requisite: OR\&IE 650 or equivalent.

3 lecs, 1 rec.
Review of distribution theory of special interest in statistics: normal, chi-square, binomial, Poisson, $t$, and $F$; introduction to statistical decision theory; sufficient statistics; theory of minimum variance unbiased point estimation; maximum likelihood and Bayes estimation; basic principles of hypothesis testing, including Neyman-Pearson Lemma and likelihood ratio principle; confidence interval construction; introduction to linear models.

## [OR\&IE 671 Intermediate Applied

 StatisticsSpring. 3 credits. Prerequisite: OR\&IE 670 or equivalent. Not offered 1994-95.

3 lecs.
Statistical inference based on the general linear model; least-squares estimators and their optimality properties; likelihood ratio tests and corresponding confidence regions; simultaneous inference. Applications in regression analysis and ANOVA models. Variance components and mixed models. Use of the computer as a tool for statistics is stressed.]

## [OR\&IE 676 Statistical Analysis of Life

 DataSpring. 3 credits. Prerequisite: OR\&IE 671 or equivalent. Not offered 1994-95.
Analysis of data from reliability, fatigue, and life-testing studies in engineering; biomedical applications. Survival distributions, hazard rate, censoring. Life tables. Estimation and hypothesis testing. Standards. Goodness of fit, hazard plotting. Covariance analysis, accelerated life testing. Multiple decrement models, competing risks. Sample-size determination. Adaptive sampling.]

## OR\&IE 680 Simulation

Spring. 4 credits. Prerequisite: permission of instructor.

3 lecs, 1 rec.

An advanced version of OR\&IE 580, intended for Ph.D.-level students.

## OR\&IE 728-729 Selected Topics in

 Applied Operations Research Fall, spring. Credit to be arranged. Current research topics dealing with applications of operations research.OR\&IE 738-739 Selected Topics in Mathematical Programming Fall, spring. Credit to be arranged. Current research topics in mathematical programming.

## OR\&IE 768-769 Selected Topics in

 Applied ProbabilityFall, spring. Credit to be arranged.
Topics are chosen from current literature and research areas of the staff.

## OR\&IE 778-779 Selected Topics in Applied Statistics

Fall, spring. Credits to be arranged.
Topics chosen from current literature and research of the staff.

## OR\&IE 790 Special Investigations

Fall, spring. Credit to be arranged.
For individuals or small groups. Study of special topics or problems.
OR\&IE 799 Thesis Research
Fall, spring. Credit to be arranged.
For individuals doing thesis research for master's or doctoral degrees.

OR\&IE 891 Operations Research Graduate Colloquium
Fall, spring. 1 credit.
A weekly $1-1 / 2$ hour meeting devoted to presentations by distinguished visitors, by faculty members, and by advanced graduate students on topics of current research in the field of operations research.

## OR\&IE 893-894 Applied OR\&IE

 Colloquium ( 894 also M8AE 594)893, fall; 894, spring. 1 credit each term. A weekly meeting for Master of Engineering students. Discussion of various topics on manufacturing with faculty members and outside speakers.

## THEORETICAL AND APPLIED MECHANICS

## Basics in Engineering Mathematics and Mechanics

T\&AM 123 Sensors and Actuators (also Engr 123)
Fall. 3 credits.
2 lecs, 1 lab.
For description, see Engineering Common Courses.

T\&AM 181 Structures and Machines in Uban Society (also Engr 181)
Fall. 3 credits. R. Lance.

For description, see Engineering Common Courses.

T\&AM 202 Mechanics of Solids (also ENGRD 202)
Fall, spring. 3 credits.
2 lecs, 1 rec, 4 labs each semester, evening exams.
For description, see Engineering Common Courses.

T\&AM 203 Dynamics (also ENGRD 203)
Fall, spring. 3 credits. Prerequisite: T\&AM 202, coregistration in Mathematics 294, or permission of instructor

2 lecs, 1 rec, 4 labs each semester, evening exams.
For description, see Engineering Common Courses

## Engineering Mathematics

T\&AM 191 Calculus for Engineers (also Mathematics 191)
Fall. 4 credits. Limited to 25 students per section. Prerequisite: 3 years of high school mathematics, including trigonometry.

3 lecs, 2 recs, evening exams.
Plane analytic geometry, differential and integral calculus, and applications.

## [T\&AM 192 Calculus for Engineers (also

 Mathematics 192)Fall, spring, or summer. 4 credits. Prerequisite: Mathematics/T\&AM 191. Not offered 1994-95.

3 lecs, 2 recs, evening exams.
Methods of integration, hyperbolic functions, polar coordinates, infinite series, complex numbers, introduction to partial derivatives introduction to surface and volume integrals.]

## T\&AM 293 Engineering Mathematics

 (also MATH 293)Fall, spring. 4 credits. Prerequisite: Mathematics/T\&AM 192 or Mathematics 194.

2 lecs, 1 rec, 4 labs each semester, evening exams.
Partial derivatives and multiple integrals; firstand second-order differential equations with applications in the physical and engineering sciences. Includes microcomputer experiments using computer algebra to solve problems.

## T\&AM 294 Engineering Mathematics

 (also MATH 294)Fall, spring. 4 credits. Prerequisite: Mathematics/T\&AM 293

2 lecs, 1 rec, 4 labs each semester, evening exams.
Vector spaces and linear algebra, matrices, eigenvalue problems, and applications to systems to linear differential equations. Vector calculus. Boundary-value problems and introduction to Fourier series. Includes microcomputer experiments using computer algebra to solve problems.

## T\&AM 310 Advanced Engineering Analysis 1

Fall, spring. 3 credits. Prerequisite: Mathematics 294 or equivalent

2 lecs, 1 rec .
Ordinary differential equations as applied in engineering context. Special functions, initial value, boundary value, and eigenvalue problems in linear partial differential equations; introduction to nonlinear ordinary differential equations. Use of computer algebra to solve problems. In the last part of the course, students choose one of two options: (1) introduction to nonlinear ordinary differential equations and Laplace transform methods; (2) introduction to probability and statistics

## T\&AM 311 Advanced Engineering

Analysis II
Spring. 3 credits. Prerequisite: T\&AM 310 or equivalent.
Functions of several variables, introduction to complex variables, analytic functions,
conformal mapping, method of residues

Application to the solution of Laplace's equation, and transform inversion techniques. Examples drawn from fluid mechanics, heat transfer, electromagnetics, and elasticity.

## T\&AM 610 Methods of Applied

 Mathematics IFall. 3 credits. Intended for beginning graduate students in engineering and science. An intensive course, requiring more time than is normally available to undergraduates (see T\&AM 310-311) but open to exceptional undergraduates with permission of instructor. 3 lecs.
Emphasis is on applications. Linear algebra, calculus of several variables, vector analysis, series, ordinary differential equations, complex variables.

## T\&AM 611 Methods of Applied

Mathematics II
Spring. 3 credits. Prerequisite: T\&AM 610 or equivalent

3 lecs.
Emphasis on applications. Partial differential equations, transform techniques, tensor analysis, calculus of variations.

## [T\&AM 612 Methods of Applied

Mathematics III
Fall. 3 credits. Prerequisite: T\&AM 610 or 611 or equivalent. Offered alternate years. Not offered 1994-95. First of a 6-credit sequence (T\&AM 612 and 613) that develops advanced mathematical techniques for engineers and applied physicists.
Review of complex variable theory, conformal mapping, special functions, integral transform, Wiener-Hopf technique, and singular integral equations. Problems drawn from electromagnetics, elasticity, fluid mechanics, heat transfer and acoustics.]

## [T\&AM 613 Methods of Applied Mathematics IV

Spring. 3 credits. Prerequisite: T\&AM 612 or equivalent. Offered alternate years. No offered 1994-95.
Topics include asymptotic behavior of solutions of linear and nonlinear ODE (e.g., the WKB and multiple-scale methods), asymptotic expansion of integrals (method of steepest descent, stationary phase and Laplace methods). Regular and singular perturbation methods for PDE (e.g., method of composite expansions). Other topics (depending on instructor) may include normal forms, center manifolds, Liapunov-Schmidt reductors, Stokes phenomenon. The course may also include computer algebra (MACSYMA) exercises at the option of the instructor.]

## T\&AM 614 Topics in Applied

Mathematics V
Fall. 3 credits. Prerequisites: T\&AM 610-613 or equivalent. Offered alternate years.
Topics such as nonlinear wave motion, bifurcation theory, or computer algebra will be covered, depending on the instructor and student interest.

## T\&AM 615 Topics in Applied

Mathematics VI
Spring. 3 credits. Prerequisites: T\&AM 610613 or equivalent. Offered alternate years. See T\&AM 613 for description

## Continuum Mechanics

T\&AM 501 Topics in Composites I
Fall. 1 to 3 credits ( 1 credit each topical minicourse)

Analysis of Composite Structures (T. J. Healey)
Linear analysis of thin structural members possessing anisotropic material properties relevant to a composite. Focus on analysis, rather than on modeling or design. Topics include: (1) analysis of rodes, beams, and sandwich beams; (2) analysis of thin, orthotropic plates; and (3) analysis of thin orthotropic cylindrical shells. Grading may be based on homework and a short final examination

## Biological Composites I (J. T. Jenkins)

Overview of the microstructural features and the origin of mechanical properties of bone and soft tissues, such as tendon, ligament, muscle, and skin, and outline of their use as structural components. Survey of design principles for composite materials that mimic those found in biological systems. Final grade determined by the student's in-class presentation on a relevant topic.
Design Principles for Composite Structures (R. H. Lance)

A review of thermo-mechanical behavior of anisotropic, orthotropic, and transversely isotropic materials. Includes development of pertinent equations for laminated materials and sandwich structures. Application is made to the design and analysis of rods, beams, tubs, and plates. Examples drawn from space structures
Mechanical Testing of Composite Constituents (P. Petrina)

Focuses on the theoretical and experimental characterization of strength and life of advanced composite constituents and materials. Reviews test methods, specimen preparation, testing, data reduction, and analysis. Perform laboratory experiments to determine short-term strength distribution of fiber material, and the evaluation of interface and life strength.
Reliability Models for Composites
(S. L. Phoenix)

Surveys statistical models for the strength of fibers, fiber bundles, and composites with emphasis on reliability assessment. Features include the roles of the Weibull distribution, size effects, and the micromechanics of stress transfer around fiber breaks. Time-dependent failure in fatigue is considered as an extension involving matrix creep and interface
debonding. Grades are based on several homework tasks.

T\&AM 502 Topics in Composites II Spring. 1 to 3 credits ( 1 credit each topical minicourse)
Design and Manufacturing of Laminated Composites (P. Petrina)
Students learn to manufacture and to perform analysis and design of laminated composite structures. Practical applications will include manufacturing and analysis of bars, tubes, sandwich beams, and plates. Each student will have a chance to make several types of composite structures and have access to software for the analysis.
Nondestructive Testing of Composites (W. Sachse)

Overview of nondestructive testing techniques that are used to monitor composite materialfabrication procedures to determine the mechanical properties of composite specimens
and to assess the integrity of composite structural components. A survey of current NDT research. Topics include (1) goals and problems of NDT/NDE measurements in composites, (2) survey of NDT rechnologies applicable to measurements in composites, (3) active (UT) and passive (AE) ultrasonic NDT measurements in composite materials, and (4) developments and directions of NDT research applicable to composite materials evaluation. Grade based on laboratory work and a written response to a specific composite NDT problem.

## T\&AM 555 Introduction to Composite

 Materials (also M\& AE 555)Fall. 4 credits.
R. H. Lance

Introduction to composite materials: varieties of reinforcements, matrix materials, and their properties. Mechanics and failure analysis of lamina, laminates, and wound structures Introduction to micromechanics theories of composites, manufacturing methods,
fabrication and assembly techniques,
composite applications, environmental effects.

## [T\&AM 569 Sensors

Fall. 3 credits. Not offered 1994-95.
3 lecs a week, 4 labs a semester.
This course deals with the general properties of sensors and actuators used in measurement and process-control applications involving thermal and mechanical quantities. Considered are sensors and actuators based on a broad range of physical transduction phenomena. Attention is given to the development of sensor models and criteria for evaluating the general performance characteristics of a sensor, including its transduction characteristics and its measurement field. Also studied are algorithms for processing sensor signals to recover the characteristics of the sensor or to remove its effect in a specific measurement application. An integral part of the course is the Sensors Laboratory, which provides students with hands-on opportunities for measuring the characteristics and operational parameters of a broad range of thermo-mechanical sensors.!

## T\&AN 591 Master of Engineering Design Project I

Fall. 3-5 credits.
Staff.
M. Eng. (Mechanics) project related to the mechanics of advanced composites and structures.

## T\&AM 592 Master of Engineering Design Project II

Spring. $5-10$ credits
M. Eng. (Mechanics) project related to the mechanics of advanced composites and structures.

## T\&AM 655 Advanced Composite

Materials and Structures (also M\&AE 655)

Spring. 4 credits.
Advanced mechanics of composite materials Strength theory of continuous- and discontinu-ous-reinforced composites. Micromechanics, interface mechanics, modes of failure, creep rupture. Mechanics of strcutural components. Design and analysis of composite structures: pressure vessels, aerospace structures, thick composites, and plates. Adhesive bonding and mechanical fastening. Dynamic effects and hygrothermal effects

## T\&AM 663 Solid Mechanics I

## Fall. 4 credits.

Rigorous introduction to small-strain solid mechanics with emphasis on linear elasticity; stress, strain, tensors, balance laws, energy principles, general theory of linear elasticity, and solutions of elementary boundary-value problems.

## T\&AM 664 Solid Mechanics II

Spring. 4 credits. Prerequisites: Mathematics 610 and T\&AM 663, or equivalent

3 lecs, 1 lab
Preparation for advanced courses in solid mechanics. Singular solutions in linear elasticity, large deformations, noniinear elasticity, linear visco-elasticity, mechanics of defects (cracks and dislocations), classical plasticity, and constitutive relations.

## [T\&AM 751 Continuum Mechanics and Thermodynamics

Fall. 3 credits. Prerequisites: T\&AM 610 and 611 ; and 663 and 664 or equivalents. Offered alternate years. Not offered 1994-95

3 lecs.
Kinematics, conservation laws, the entropy inequality, constitutive equations, frame indifference, material symmetry. Ratedependent materials and materials with internal variables.]

## T\&AM 752 Nonlinear Elasticity

Fall. 3 credits. Prerequisites: T\&AM 610 and 611 ; and 663 and 664 or equivalents. Offered altemate years.

3 lecs.
Review of kinematics and constitutive theory appropriate for large deformations of nonlinearly elastic bodies. The basic field equations of nonlinear elastostatics and elastodynamics. Exact solutions of special problems. Linearization and stability Nonlinear theories of thin structural members and their relationship to the three-dimensional theory. Introduction to static bifurcation theory with applications to strings, rods, plates, and shells.

## IT\&AM 753 Fracture

Fall. 3 credits. Prerequisites: T\&AM 610 or 611; and 663 and 664 or equivalents. Offered alternate years. Not offered 1994-95.

3 lecs.
Topics will be selected from (1) elastic fracture mechanics: K, small-scale yielding, solutions of elastic crack problems; (2) nonlinear rate-independent, small-deformation fracture mechanics: plastic fracture, J-integral, small-scale yielding; (3) rate-dependent fracture mechanics: dynamic fracture, creep fracture; (4) mechanics of failure in polymers, ceramics, composites, and metals: void growth, load transfer between fibers, crazing.]

## [T\&AM 757 Inelasticity

Spring. 3 credits. Prerequisites: T\&AM 610 and 611; and 663 and 664 or equivalents. Offered alternate years. Not offered 1994-95. 3 lecs.
Inelasticity; plasticity, visco-elasticity, and modern nonlinear theories. Plasticity: general principles, limit analysis, and boundary value problems. Visco-elasticity: general principles and solution of boundary value problems. Modern state variable theories: their relation to classical theories, their phenomenology, and use in solving boundary value problems.]

## T\&AM 759 Computational Methods

Fall. 4 credits. Prerequisites: T\&AM 610 and 611 ; and 663 and 664 or equivalents. Offered alternate years.

3 lecs.
The aim of this course is to survey a wide range of applications of the boundary element method (BEM) and finite element method (FEM) in solid mechanics. The boundary element method will be introduced and then be used in problems in linear elasticity, diffusion, wave propagation, and problems with material and/or geometric nonlinearities. Finite-element applications will emphasize nonlinear problems in solid mechanics

## [T\&AM 768 Elastic Waves

Fall. 3 credits. Prerequisites: T\&AM 610 or 611; and 663 and 574 or equivalents. Offered alternate years. Not offered 1994-95

3 lecs.
An advanced course on dynamic stress analysis and wave propagation in elastic solids. Theory of elastodynamics. Waves in isotropic and anisotropic media. Reflection and refraction. Surface waves and waves in layered media. Transient waves and methods of Lamb-Cagniard-Pakeris. Thick-plate theories. Vibration of spheres. Scattering of waves and dynamic stress concentration.]

## Dynamics and Space Mechanics

T\&AM 570 Intermediate Dynamics (also M\&AE 570)
Fall. 3 credits
2 lecs.
Introduction to analytical mechanics; virtual work, Lagrangian mechanics. Small vibration and stability theory. Newtonian-Eulerian mechanics of rigid bodies.

## T\&AM 574 Vibrations and Waves in

 Elastic Systems (also M\&AE 577) Spring. 4 credits. Prerequisites: T\&AM 570 and 610.$$
3 \text { lecs, } 1 \text { lab. }
$$

Oscillations and one- and two-degree-of freedom vibrating systems. General properties of vibrating systems. Modal analysis.
Vibration of continuous systems. Elementary nonlinear systems and chaos. Characterization of vibrating systems. Measurements and applications. Two vibrations laboratory experiments.

## T\&AM 671 Advanced Dynamics

Spring. 3 credits. Prerequisite: T\&AM 570 or equivalent. Offered alternate years.
Review of Lagrangian mechanics; Hamilton's principle, the principle of least action, and related topics from the calculus of variations Hamilton's canonical equations; approximate methods for two-degrees-of-freedom systems (Lie transforms); canonical transformations and Hamilton-Jacobi theory; KAM theory

## T\&AM672 Celestial Mechanics (also

 Astronomy 579)Spring. 3 credits. Offered alternate years. Two $11 / 4$-hour lecs.
Description of orbits; 2-body, 3-body, and nbody problems; Hill curves, libration points and their stability; capture problems; virial theorem. Osculating elements, perturbation equations; effects of gravitational potentials, atmospheric drag, and solar radiation forces on satellite orbits; secular perturbations, resonances, mechanics of planetary rings

## [T\&AM 673 Mechanics of the Solar

 System (also Astronomy 571) Spring. 3 credits. Prerequisite: an undergraduate course in dynamics. Offered alternate years. Not offered 1994-95.Gravitational potentials, planetary gravity
fields. Free and forced rotations. Chandler wobble, polar wander, damping of nutation. Equilibrium tidal theory, tidal heating. Orbital evolution of natural satellites, resonances, spin-orbit coupling, Cassini states. Long-term variations in planetary orbits. Dust dynamics. Dynamics of ring systems. Physics of interiors, seismic waves, free oscillations. Illustrative examples are drawn from contemporary research.]

## [T\&AM 675 Nonlinear Vibrations

Fall. 3 credits. Prerequisite: T\&AM 574 or equivalent. Offered alternate years. Not offered 1994-95.
Review of linear systems, free and forced vibrations. Nonlinear systems, phase plane methods, method of isoclines. Conservative systems. General autonomous systems, equilibrium and periodic solutions, linearization and Lyapunov stability criteria, PoincaréBendixson theorem. Quantitative analysis of weakly nonlinear systems in free and forced vibrations, perturbation methods, KrylovBogoliubov method. Applications to problems in mechanics.]

## T\&AM 776 Applied Dynamical Systems

 (also Math 617)Fall. 3 credits. Suggested prerequisite: T\&AM 675, Mathematics 517, or equivalent. Offered alternate years.
Review of planar (single-degree-of-freedom) systems. Local and global analysis. Structural stability and bifurcations in planar systems. Center manifolds and normal forms. The averaging theorem and perturbation methods. Melnikov's method. Discrete dynamical systems, maps and difference equations, homoclinic and heteroclinic motions, the Smale Horseshoe and other complex invariant sets. Global bifurcations, strange attractors and chaos in free and forced oscillator equations. Applications to problems in solid and fluid mechanics.

## Special Courses, Projects, and Thesis Research

T\&AM 491-492 Project in Engineering Science
491, fall; 492, spring. $1-4$ credits, as arranged. Projects for undergraduates under the guidance of a faculty member.

## T\&AM 796-800 Topics in Theoretical and

 Applied MechanicsFall, spring. 1-3 credits, as arranged. Special lectures or seminars on subjects of current interest. Topics are announced when the course is offered.

## T\& AM 890 Master's Degree Research in

 Theoretical and Applied Mechanics Fall, spring. 1-15 credits, as arranged. S-U grades optional.Thesis or independent research at the M.S. level on a subject of theoretical and applied mechanics. Research is under the guidance of a faculty member.

## T\&AM 990 Doctoral Research in

 Theoretical and Applied Mechanics Fall, spring. $1-15$ credits, as arranged. S-U grades optional.Thesis or independent research at the Ph.D. level on a subject of theoretical and applied mechanics. Research is under the guidance of a faculty member.

## FACULTY ROSTER

Abel, John F., Ph.D., U. of California at Berkeley. Prof., Civil and Environmental Engineering
Albright, Louis D., Ph.D., Cornell U. Prof., Agricultural and Biological Engineering
Allmendinger, Richard, Ph.D., Stanford U. Assoc. Prof., Geological Sciences
Anantharam, Venkatachalam, Ph.D., U. of California at Berkeley. Assoc. Prof., Electrical Engineering
Aneshansley, Daniel J., Ph.D., Cornell U. Assoc. Prof., Agricultural and Biological Engineering
Anton, A. Brad, Ph.D., California Inst. of Technology. Assoc. Prof., Chemical Engineering
Ast, Dieter G., Ph.D., Cornell U. Prof., Materials Science and Engineering
Attoh, K., Ph.D., Northwestern U., Assoc. Prof., Geological Sciences
Auer, Peter L., Ph.D., California Inst. of Technology. Prof., Mechanical and Aerospace Engineering
Avedisian, C. Thomas, Ph.D., Princeton U Prof., Mechanical and Aerospace Engineering
Ballantyne, Joseph M., Ph.D., Massachusetts Inst. of Technology. Prof., Electrical Engineering
Barazangi, Muawia, Ph.D., Columbia U. Senior Scientist, Geological Sciences
Bartel, Donald L., Ph.D., U. of Iowa. Prof., Mechanical and Aerospace Engineering
Bartsch, James A., Ph.D., Purdue U. Assoc. Prof., Agricultural and Biological Engineering
Bassett, William A., Ph.D., Columbia U. Prof., Geological Sciences
Batterman, Boris W., Ph.D., Massachusetts Inst. of Technology. Pref., Applied and Engineering Physics
Berger, Toby, Ph.D., Harvard U. J. Preston Levis Professor of Engineering, Electrical Engineering
Billera, Louis J., Ph.D., City U. of New York. Prof., Operations Research and Industrial Engineering
Bird, John M., Ph.D., Rensselaer Polytechnic Inst. Prof., Geological Sciences
Birman, Kenneth P., Ph.D., U. of California at Berkeley, Prof., Computer Science
Bisogni, James J., Ph.D., Cornell U. Assoc. Prof., Civil and Environmental Engineering
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Bland, Robert G., Ph.D., Comell U. Prof., Operations Research and Industrial Engineering
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Boyd, Iain, Ph.D., U. of Southampton (England). Asst. Prof., Mechanical and Aerospace Engineering
Brock, Joel D. Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Applied and Engineering Physics
Brown, Geoffrey M., Ph.D., U. of Texas. Assoc. Prof., Electrical Engineering
Brown, Larry D., Ph.D., Cornell U. Prof., Geological Sciences

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Buhrman, Robert A., Ph.D., Johns Hopkins U. Prof., Applied and Engineering Physics
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Capps, Susan G., Ph.D., North Carolina State U. Asst. Prof., Agricultural and Biological Engineering
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Cisne, John L., Ph.D., U. of Chicago. Prof., Geological Sciences
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Clark, David D., Ph.D., U. of California at Berkeley. Prof., Nuclear Science and Engineering
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Compton, Richard C., Ph_D., California Inst. of Technology. Asst. Prof., Electrical Engineering
Constable, Robert L., Ph.D., U. of Wisconsin. Prof., Computer Science
Cooke, J. Robert, Ph.D., North Carolina State U. Prof., Agricultural and Biological Engineering
Cool, Terrill A., Ph.D., California Inst. of Technology. Prof., Applied and Engineering Physics
Craighead, Harold G., Ph.D., Cornell U. Prof., Applied and Engineering Physics, and Electrical Engineering
Datta, Ashim K., Ph.D., U. of Florida. Assoc. Prof., Agricultural and Biological Engineering
Dawson, Paul R., Ph.D., Colorado State U. Prof., Mechanical and Aerospace Engineering
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Ruppert, David, Ph.D., Michigan State U. Prof., Operations Research and Industrial Engineering
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Samorodnitsky, Gennady, D.S., TechnionIsrael Inst. of Technology. Assoc. Prof., Operations Research and Industrial Engineering

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vonEicken, Thorsten, Ph.D., U. of California at Berkeley. Asst. Prof., Computer Science
Walker, Larry P., Ph.D., Michigan State U. Prof., Agricultural and Biological Engineering
Walter, Michael F., Ph.D., U. of Wisconsin. Prof., Agricultural and Biological Engineering
Warhaft, Zellman, Ph.D., U. of London (England). Prof., Mechanical and Aerospace Engineering
Warkentin, Richard, Ph D., Comell U. Asst. Prof., Mechanical and Aerospace Engineering
Webb, Watt W., Sc.D., Massachusetts Inst. of Technology. Prof., Applied and Engineering Physics
Weiss, Lionel I., Ph.D., Columbia U. Prof., Operations Research and Industrial Engineering
White, Richard N., Ph.D., U. of Wisconsin James A. Friend Family Distinguished Professor of Engineering, Civil and Environmental Engineering
White, William M., Ph.D., U. of Rhode Island. Prof., Geological Sciences
Williamson, Charles, Ph.D., Cambridge U. (England). Assoc. Prof., Mechanical and Aerospace Engineering
Wise, Frank W., Ph.D., Cornell U. Asst. Prof., Applied and Engineering Physics
Wolga, George J., Ph D., Massachusetts Inst. of Technology. Prof., Electrical Engineering
Zabaras, Nicholas, Ph.D., Cornell U. Assoc. Prof., Mechnical and Aerospace Engineering
Zabih, Ramin, Ph.D., Stanford U. Asst. Prof., Computer Science
Zehnder, Alan, Ph D., California Inst, of Technology. Assoc. Prof., Theoretical and Applied Mechanics

## Walter Cohen, dean

Christine Ranney, associate dean
Eleanor S. Reynolds, associate dean
Hilary Ford, assistant dean
Graduate study at Cornell is pursued through the Graduate School, which administers the many graduate fields of study, or through the various graduate professional schools and colleges.

## GRADUATE SCHOOL

The graduate program at Cornell permits an unusual degree of accommodation to the needs and interests of the individual student. Degree requirements are kept to a minimum. There are no specific course or credit requirements for the advanced general degrees of Master of Arts, Master of Science, and Doctor of Philosophy, but only such general requirements that best accomplish the aim of graduate study: a period of study in residence, the mastery of one subject, adequate knowledge of allied subjects, oral examinations to establish competency for presentation of a dissertation or thesis, and a satisfactory dissertation or thesis. Certain advanced professional degree programs have specific course or credit requirements that are determined by the faculty of the professional school or college in which the degrees are offered.

A close working relationship between the student and faculty members is essential to the graduate program at Cornell. Under the Special Committee system the student is guided by, and works with, at least two or three faculty members chosen by the student to represent his or her major and minor subjects. The major subject representative is the chair of the Special Committee who usually has the primary responsibility for directing the student's thesis or dissertation research.
Students who want to use the university's facilities for intensive specialized training only and who do not want to become degree candidates may apply for admission as nondegree students.

## REQUIREMENTS FOR ADMISSION

To be admitted to the Graduate School, an applicant should:

1) hold a baccalaureate degree or its equivalent, granted by a faculty or university of recognized standing;
2) have adequate preparation for graduate study in the chosen field of instruction;
3) have fluent command of the English language;
4) present evidence of promise in advanced study and research; and
5) take the Graduate Record Examinations General Test for those fields that require the GREs.
Before admission can be final, all applicants whose native language is not English must provide proof of competency in the English language. Acceptable proof could be
6) a Test of English as a Foreign Language (TOEFL) score of 550 or higher;
7) a degree from a college or university in a country where the native language is English; or
8) two or more years of study in an undergraduate or graduate program in a country where the native language is English.
Information on times and places for the TOEFL examination and Graduate Record Examinations and application forms may be obtained from the Educational Testing Service, Princeton, New Jersey 08541, U.S.A.
Applications for admission to the Graduate School may be submitted at any time during the year. Many fields, however, require that applicants for fall admission submit their completed applications by January 10 .
Applicants who are also applying for Cornell Graduate School fellowship consideration must submit their completed applications and supporting credentials by January 10.
Inquiries regarding admission and fellowships should be addressed to the Graduate School Admissions Office, Comell University, Sage Graduate Center, Ithaca, New York 148536201.

Inquiries regarding facilities for advanced study and research in a given field, special requirements for such study and research, and opportunities for teaching and research assistantships should be addressed to the graduate faculty representative in the particular field.
More detailed information may be obtained from the following publications: the Graduate Scbool Catalog, available from Cornell University Catalogs, 122 Maple Avenue, Ithaca, NY 14850-4902, and the application Graduate Study at Cornell University, available from the Graduate School, Cornell University, Sage Graduate Center, Ithaca, New York 14853-6201.
Note:Programs leading to the degrees of Doctor of Law (J.D.), Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), and Master of Business Administration (M.B.A.) are not administered by the Graduate School. Information on those programs can be obtained from the Law School, the Medical College (New York City), the College of Veterinary Medicine, and the Johnson Graduate School of Management respectively.

Information concerning admission requirements and courses of study for degrees not administered by the Graduate School may be obtained from the several schools and colleges that administer them.

## SCHOOL OF HOTEL ADMINISTRATION

## ADMINISTRATION

## David A. Dittman, dean

Michael H. Redlin, associate dean for academic affairs
David W. Butler, associate dean for executive education

Susanne DeGraba, assistant dean for finance and administration
James E. Hisle, managing director of the Statler Hotel and J. Willard Marriott Executive Education Center

Cheryl S. Farrell, director of student services
Yariela Kerr, director of minority student programs
A. Neal Geller, Richard J, and

Monene P. Bradley director for graduate studies
Sandra K. Boothe, director of the professional master's program
Katherine S. Laurence, director of academic information resources and training
Richard MacDonald, director of information technology
Jim Dunston, director of the Binenkorb Computer Center
Millie Reed, associate director of career services
Harry R. Keller, director of alumni affairs
Glenn Withiam, director of publications
Fred Conner, co-managing editor of the
Cornell Hotel and Restaurant Administration Quarterly
Allison Hart, co-managing editor of the Cornell Hotel and Restaurant Administration Quarterly
Mark Adams, director of communications

## DEGREE PROGRAMS

## Degree

Hotel and Restaurant Administration
B.S.
M.P.S.
M.S.

Ph.D.
the school's academic and executiveeducation programs, providing students with training and work experience in facilities similar to those in which they will work after graduation.

## The School of Hotel Administration

Library has the largest single collection of hospitality-related materials in the United States. The collection contains approximately 25,000 volumes, 1,000 videotapes, numerous ephemera and memorabilia (such as photographs, menus, and rare books), and more than 800 magazine, newsletter, and newspaper subscriptions. Materials on lodging, foodservice, travel and tourism, and general business topics comprise the core of the library's collections. Among the library's special features are numerous computerized information resources, including NEXIS, Dow Jones, ABI/INFORM, and The Hospitality Database, an extensive and unique (one of only four in America) index to hospitality articles. Information resources and services for the hospitality industry are available for a fee through the library's HOSTLINE service. In addition to offering an excellent collection of materials and a dignified and refined study space, the Hotel School library extends quality service to every student. Please visit us and benefit from our collections and services.

## Statler Hotel and J. Willard Marriott

 Executive Education Center. The Statler Hotel comprises 150 guest rooms, an executive-education center, restaurants, a lounge, and the university's faculty and staff club. It demonstrates the very finest in hospitality and hospitality-education practices. The Statler is an independent, self-sustaining teaching hotel that provides quality food, beverage, meeting, and lodging services to the Cornell community and campus visitors, including parents and those who visit Cornell as part of the application process. In addition, the hotel is a practice-management facility for certain classes, internships, and independentstudy projects. It offers part-time jobs to approximately 250 students each semester with preference given to students in the hotel school.
## UNDERGRADUATE CURRICULUM

The School of Hotel Administration offers education in the numerous disciplines required for modern management, including accounting, finance, marketing, operations, communication, properties management, information technology, law, and human resources management. The school's graduates hold executive positions in a variety of industries, but are especially well represented in the management of hospitalityrelated enterprises, including the lodging, food service, and travel industries.
Students are encouraged to pursue a broad range of courses, including those in the humanities, social sciences, and natural sciences, as preparation for assuming positions in the business community.

Included in the basic curriculum are courses in management, human resources, financial management, food and beverage operations, marketing, tourism, properties management, communications, and law
The basic program leading to the undergraduate degree in hotel administration, as set forth below, is enriched by a broad selection of free and distributive elective courses offered by the school and elsewhere in the university. For more complete information about undergraduate program requirements, see the school's student handbook or course supplement (available in room 174 Statler Hall).

## Requirements for Graduation

Regularly enrolled undergraduate students in the School of Hotel Administration are candidates for the degree of Bachelor of Science. The requirements for that degree are:

1) completion of eight terms in residence for those who entered as freshmen; terms of residence for transfer students are determined by the amount of transfer credit awarded;
2) completion, with a minimum cumulative grade-point average of 2.0 (including a grade-point average of 2.0 in a full-time schedule of courses in the final semester), of 120 required and elective credits, as set forth in the table on the following page;
3) qualification in one language other than English. This requirement may be met by any one of the following: 1) three years of high school study of one foreign language; 2) score of 560 on Cornell Placement Test; 3) pass 121 and 122 ( 8 credits) and score 560 on Comell Placement Test; or 4) pass 123.
4) completion of two units of practice credit prior to the last term of residence, as defined on the following page;
5) completion of the university requirement in physical education.
Suggested course programs appear on the following pages. The core courses account for 69 of the 120 credits needed for graduation, the selected concentration accounts for 12 credits, and 18 credits are allotted for distributive electives. The remaining 21 credits may be earned in courses chosen from the offerings of any college of the university, provided that the customary requirements for admission to such courses are met. Note: Students who matriculated before the fall of 1993 should refer to the Hotel School's "course supplement" for graduation requirements.
Students in the School of Hotel Administration who plan to attend summer school at Comell or any other four-year college or university, with the expectation that the credit earned will be counted toward the Cornell degree in hotel administration, must obtain the approval of the school in advance. Without advance approval, such credit may not count toward the degree.

Credit earned in military science, aerospace studies, or naval-science courses may be counted in the 21 -credit group of free electives.

## Transfer Credit Policy

Transfer students are required to complete all degree requirements with at least seventy-five (75) credits at Cornell University, of which a minimum of sixty ( 60 ) must be in courses offered by the Hotel School, and nine (9) must be in distributive electives taken outside the Hotel School. Thus, a maximum of fortyfive (45) hours in transfer credit may be allowed from other accredited colleges or universities, as follows:
Core
Concentration
Distributive Electives
Free Electives

In the core, transfer credit may be allowed against basic courses only (for example, HA 121, HA 136, Economics). Others (including HA 243 and HA 174) generally are waived, and an upper-level course in the area substituted. For instance, if HA 243 were waived, another marketing course would be required in its place. The communication courses (HA 165 and HA 365) are tailored specifically to the School of Hotel Administration, and, thus, communication courses taken elsewhere generally are not accepted against core courses.
Concentration courses may not transfer without the express written consent of the faculty in the area concerned. While such consent is rare, it is not impossible
Distributive electives ensure that Hotel students are exposed to other courses at Cornell, and, thus, only nine (9) credits may transfer. The remaining nine (9) must be taken at Cornell but may be distributed in any combination of humanities, social sciences, or natural sciences provided at least three (3) credits are taken (at Comell or transferred from elsewhere) in each area.
Twenty-one (21) credits in free electives may transfer.

## Concentration

While completing the required courses leading to the bachelor's degree, undergraduates in the school also must select a concentration: 12 elective credits in a major area of the core curriculum or, with the support of a faculty member, in a self-directed course of study.
When students select a field of concentration, they should consult the coordinator of instruction in that area during the sophomore year to plan the sequence of courses that will best fit their program.

## Foreign Languages

Mastery of a foreign language is particularly desirable for students who are planning careers in the hospitality industry and, hence, the second language requirement for graduation. Further information on foreign language courses at Comell, and placement in language courses, may be found in this book in the College of Arts and Sciences program description under the Modern Languages, Literature, and Linguistics section and also under the section Advanced Placement for Freshmen.

## Independent Study

Students may conduct independent study projects in any academic area of the school under the direction of a faculty member. Credit is arranged on an individual basis. To enroll in an independent study project, students must obtain written permission from the school before the add deadline. See H Adm 499 or 699 for more details.

## Practice-Credit Requirement

As part of degree requirements, undergraduates enrolled in the School of Hotel Administration must fulfill the practice-credit requirement and submit verification thereof prior to registering for the last semester. Further details are set forth in the Practice Credit Handbook for Undergraduates in the School of Hotel Administration, available in the school's Career Services Office, room 153 Statler Hall.

## Management-Intern Program

Hotel School juniors and seniors have a unique opportunity to gain invaluable knowledge and experience in the hospitality industry through the management intern program. Students receive 12 academic credits, 1 practice credit, and may petition on an ad-hoc basis to have a portion of the academic credits applied toward their concentration. While on the internship, tuition is reduced and students receive a salary from the sponsoring organization. Positions are available in the U.S. and internationally. Sponsors include hotels, restaurants, casinos, corporate offices, consulting firms, and clubs. Application should be made one semester in advance. Information meetings are held at the beginning of each semester and are open to all students. See H Adm 493 and 494 for more details. More information about the management intern program also is available in the Career Services Office, 153 Statler Hall.

## Study Abroad

Programs providing an opportunity to study in a foreign country and develop an awareness of the international component of the hospitality industry can contribute to each student's total educational experience. Students in recent years have studied in Italy, Spain, France, England, and many other countries. Information on the study-abroad programs operating during the summer and academic year is available at the Cornell Abroad Office (in Uris Hall).
Students should discuss their plans with the school's study-abroad faculty representative and the director of student services so that all petition and credit-evaluation procedures are followed.

## Grading System

Letter grades ranging from $\mathrm{A}+$ to F are given to indicate academic performance in each course. These letter grades are assigned a numerical value for each term average as follows: A is equivalent to $4.0 ; \mathrm{B}$ to $3.0 ; \mathrm{C}$ to $2.0 ; \mathrm{D}$ to $1.0 ; \mathrm{F}$ to 0 . For good standing, the student must maintain a minimum average of 2.0. Of the free-elective courses, a maximum of 4 credits each term may be taken on a "satisfactory-unsatisfactory" (S-U) basis. Students should be aware that a satisfactory grade equals "C-" or above and an unsatisfactory grade equals " $\mathrm{D}+$ " or lower. Courses
taken S-U may be counted only as free electives.
Students whose term averages are at least 3.3 and who took at least 12 credits of letter grades with no unsatisfactory or incomplete grades are honored by being placed on the Dean's List.

## Course Requirements for Graduation

Required courses Credits
Management Operations: Hotel Administration 105, 301 6

Human-Resources Management: Hotel Administration 115, 211 6

Financial Management: Hotel
Administration 121, 221, 222, 321 12
Food and Beverage Management: Hotel Administration 136, 236, 33512
Marketing and Tourism: Hotel Administration 243, elective ..... 6
Properties Management: Hotel Administration 255, 355 ..... 6

Communication: Hotel Administration 165, 365 6
Operations Management and Information Technology: Hotel Administration 174, 175
Law: Hotel Administration 3873
Economics: Micro and Macro 6
Specifically required credits $\quad 69$
Concentration 12
Distributive electives 18
Free electives 21
Total credits required for graduation 120

## Typical Course Sequences

The following arrangements of courses tend to be more fixed in the freshman and sophomore years, with a greater degree of flexibility characterizing the upperclass years.

## Freshman Year

Typically, a freshman schedule will consist of 15 to 16 credits each term, to include the following:
Required courses
Credits
H Adm 105, Rooms Division Management
H Adm 115, Organizational Behavior
$\quad$ and Interpersonal Skills
H Adm 121, Financial Accounting 3
H Adm 136, Food and Beverage Management

H Adm 165, Managerial
Communication I ..... 3

H Adm 174, Microcomputing ..... 3
H Adm 175, Quantitative Methods ..... 3
H Adm 191, Microeconomics for the Service Industries ..... 3
Macroeconomics ..... 3
Distributive or free electives ..... $\frac{3}{31}$

| Sophomore Year |  |
| :---: | :---: |
| Required courses | Credits |
| H Adm 211, Human Resources Management | 3 |
| H Adm 221, Managerial Accounting | 3 |
| H Adm 222, Finance | 3 |
| H Adm 236, Culinary Theory and Practice | ice 4 |
| H Adm 243, Principles of Marketing | 3 |
| H Adm 255, Hotel Development and Planning | 3 |
| Distributive electives | 3-6 |
| Free electives | 3-6 |
|  | 25-31 |
| Junior Year |  |
| Required courses | Credits |
| H Adm 301, Strategic Management | 3 |
| H Adm 321, Hospitality |  |
| H Adm 335, Restaurant Management | 4 |
| H Adm 355, Hospitality Facilities Operations | 3 |
| H Adm 365, Managerial Communication: Principles and Practices | 3 |
| H Adm 387, Business and Hospitality Law | 3 |
| Concentration | 6 |
| Free electives | 3-6 |
|  | 28-31 |
| Senior Year |  |
| Required courses Crader | Credits |
| Marketing Elective | 3 |
| Concentration | 6 |
| Free electives | 15-23 |
|  | 24-32 |

## GRADUATE CURRICULUM

The school's programs for advanced degrees include those of Master of Professional Studies, Master of Science, and Doctor of Philosophy. For further information on graduate programs, consult the school's graduate catalog (available in room 172 Statler Hall); contact Professor A. Neal Geller, the school's graduate faculty representative at 255-7245, Sandra K. Boothe, director of the Master of Professional Studies program at 255-7246, or see the university's Announcement from the Graduate School.

## Required Program for Professional Master's Students

Required courses Credit
H Adm 701, Competitive Strategy for the Hospitality Industry 3
H Adm 702, Human Behavior in Organizations
H Adm 705, Management Strategy for the Hospitality Industry*
H Adm 806, Monograph II ${ }^{\circ}$
H Adm 711, Human Resources Management

H Adm 721, Financial Economics 3
H Adm 722, Hospitality Financial Management
H Adm 731, Food and Beverage
Management
H Adm 732, Restaurant Management*
H Adm 741, Marketing Management
H Adm 751, Properties Development and Planning

3
H Adm 761, Communications Modules 0
H Adm 771, Quantitative Methods
3
H Adm 772, Information Technology for Hospitality Managers

3
H Adm 793, Industry Mentorship 0
H Adm 794, Assessment and Benchmarking Master's Students
Total credits required for first-year professional master's students

0
"required only for professional master's students who matriculated before fall 1994. For details on second-year or other master's students' requirements, see the Graduate Programs catalog available in Room 172, Statler.

## Course Schedule Information

For up-to-date information about course scheduling, and to obtain a course supplement, contact the hotel school student services office in room 178 Statler Hall, telephone 255-3076.

## MANAGEMENT OPERATIONS COURSES

H ADM $\mathbf{1 0 0}$ Principles of Management
Fall. 3 credits. Limited to non-hotel school students. Elective.

T R 10:10-11:25. P. Rainsford.
An introductory survey course in management with general reference toward the hospitality industry. The course is organized around the traditional management functions of planning, organizing, leading, and controlling. A major semester-long project will utilize a computerbased management simulation exercise.

## H ADM 102 Distinguished Management Lectures

Fall. 1 credit. Limited to hotel school students except by written permission. Elective.

## F. 1:25. D. Dittman.

A series of lectures given by non-resident speakers prominent in the hotel and restaurant industries or allied fields. Topics include career ladders, company profiles, and business-policy formulation.

## H ADM 105 Rooms-Division Management

Fall or spring. 3 credits. Limited to hotel school and sponsored internal transfer division students. Required.

T R 11:40-12:55. R. Chase. An introduction to the principles of rooms management beginning with an overview of the hotel industry at large. Focuses on three key stakeholders-guests, managers, and owners. Major issues of designing, marketing, and financing hotels are explored with the Comell Hotel Administration Simulation Exercise. Detailed consideration is given to components of the rooms division: front desk
operations, reservations, housekeeping, and telephone departments. Emphasis is on selling strategies, forecasting, rate efficiency, human resources, and guest relations. Students also will participate in the Statler Hotel's training activities in order to amplify the class materials with first-person and shared experiences.

## H ADM 301 Strategic Management

Fall or spring. 3 credits. Limited to 55 juniors and seniors per lecture. Prerequisites: H Adm 100 or 103 (or 105), 211, 212 (or 115).

T R 11:55-1:10; T R 11:55-1:10; T R
10:10-11:25. T. Cullen, C. Enz.
Focuses on analysis, planning, change, and implementation issues associated with strategic management, emphasizing the value of analyzing environments and formulating strategies linked to environmental conditions, building on organizational strengths, and defending against organizational weaknesses. Emphasis also on handling ambiguous facts and analysis.

## H ADM 303 Club Management

Fall or spring. Fall, second 7 weeks only; spring, first 7 weeks only. 2 credits. Fall, limited to 35 hotel school juniors and seniors; spring, open enrollment. Prerequisite for hotel students: H Adm 103 (or H Adm 105). Elective.

M 1:25-4:25. R. James.
The study of private membership clubs and club administration. The application of current management principles in a not-forprofit environment is discussed and club management is compared to other areas of the hospitality industry. Topical coverage includes: tournament, facility, and recreation management; legal, financial, and legislative issues; human relations and resource consideration; marketing, pricing policies, and quality standards.

H ADM 304 Rooms-Division Management Fall, second 7 weeks only. 2 credits. Open enrollment but Hotel students limited to those who matriculated before fall 1993. Does not substitute for H Adm 105. Elective.

F 1:25-4:25. R. Chase.
An introductory course concentrating on the fundamentals of rooms-division management. Areas of concentration include front-desk operations and the reservations, housekeeping, and telephone departments. Particular emphasis on selling strategies, forecasting, rate efficiencies, labor management, and guest relations.

## H ADM 305 Resort and Condominium Management

Fall. 3 credits. Not open to freshmen. Recommended: H Adm 387. Elective. T R 11:55-1:10. M. Noden. A lecture course in the operation of various types of resort hotels and condominiums. Emphasis is on the promotion of business, the provision of facilities, services, and guest entertainment. Contract and non-contract relationships with the travel industry, terminology, rental-pool agreements, S.E.C. regulations, state statutory requirements, developer-management-owner contracts, and relationships in condominiums are reviewed.
H ADM 306 Franchising in the Hospitality Industry
Spring. 2 credits. Prerequisite: H Adm 121. Elective.

M 1:25-4:25. M. Noden.

Relationships between franchisor and franchisee, advantages and disadvantages of franchising, structure and services offered by franchisors. Case studies of leading lodging and restaurant companies currently offering franchises will be discussed. Guest speakers from the franchising industry

## H ADM 402 Hospitality Management Seminar

Fall. 1 credit. Limited to 30 seniors and graduate students. Students will be expected to register for H Adm 102. Elective

F 2:30. D. Dittman.
A weekly meeting with the H Adm 102 speaker of the week. The subject matter varies from week to week, depending on the speaker's area of expertise. The class is relatively unstructured, and students are expected to participate in discussions
[H ADM 403 International Management
Spring. 3 credits. Limited to seniors and graduate students, juniors with permission of instructor. Prerequisites: H Adm 121, 165 , 301,321 , or graduate student status. Elective. (Formerly H Adm 503.) Not offered 1994-95.

M W 2:30-3:45. Faculty.
A survey of comparative and cross-cultural management, focusing on similarities and differences among business and management systems from different contexts. Students will examine how different management practices and philosophies develop from cultural variables such as attitudes, beliefs, value systems, and behavioral patterns. The course will emphasize Japanese managment systems.]

## H ADM 404 Entrepreneurship and Small Business Management

Fall or spring. 3 credits. Limited to 20 juniors, seniors, and graduate students. Prerequisite:
H Adm 321 or equivalent. Elective
T 2:30-4:25. P. Rainsford.
Focuses on the entrepreneur and the decisions made in planning, financing, developing, and operating a new business venture. Case studies and guest speakers will be used.
There will be one major term project, which will require the application of the course material to a field consulting project that will result in written and oral reports to the owner of the business and the Small Business Administration.

## H ADM 405 Management Planning for the Hospitality Industry

Spring. 3 credits. Limited to 25 students. Prerequisites: all required hotel undergraduate courses at the 100,200 , and 300 levels. Elective.

T R 11:55-1:10. Faculty
Focus is on how to think about quality planning and examines situations from three perspectives: the customer, the employee, and management. Designed to provide students with a systematic approach to identifying, prioritizing, and improving key job functions and work processes. Structured as a seminar, requiring active participation in discussion of readings and case analyses.

## H ADM 406 Integrated Studies in the Hospitality Industry

Spring. 3 credits. Limited to hotel school seniors. Three Tuesday-night meetings in lieu of examinations. Elective.

T R 2:30-3:45. Faculty.
Employs text readings, participation in a simulation of a hotel organization, and guest presentations to explore business missions, objectives, strategies, action plans, and evaluations. As an integrative, summary
course, the areas of review and application will involve hotel and food service, marketing, organization, and finance.

H ADM 407 Seminar in Hotel Operations Spring. 3 credits. Limited to 30 seniors. Estimated cost of field trip, $\$ 200$. Elective.

W 12:20; F 11:15-1:10. J. Clark.
Seminar course applies management theory to actual hotel operations via semester-long interactions and visits with the department heads and general manager of a medium-to-large-size hotel. Field trip includes attendance at executive committee meeting, presentations by various department heads, and half-day "shadow assignments."

## H ADM 408 Casino Management

Fall or spring. Fall, first 7 weeks only; spring, second 7 weeks only. 2 credits. Limited to 45 students. Prerequisite: H Adm 321 (concurrent registration acceptable). Estimated cost of field trip, \$175. Elective.

M 10:10-12:05. J. Lowenhar.
Objectives are to develop an understanding of casino operations within a casino hotel and to develop knowledge of the communication network between the casino and all other deparments of the hotel. A field trip to an Atlantic City casino is required.

## H ADM 409 Airline Management

Spring. 3 credits. Limited to 25 seniors and graduate students, others by permission of instructor. Prerequisites: H Adm 211 and 212 (or H Adm 211 and 115 for those who matriculated fall 1993 or after). Elective.

T 2:30; R 2:30-4:25. M. Noden.
Focuses on domestic and international airline industries and explores both pre- and postregulatory climates. Emphasis is on dynamic organizational change in response to fluctuating economic and legal conditions. Topics include airline organization, comparative corporate strategies, marketing and distribution networks, operations and service management, union relations, finance, government regulation, and air transport. Case studies and guest lecturers will be used. Also, using the computer-driven simulation exercise called AIRLINF, student teams will operate a small regional carrier.

## [H ADM 501 Creative Management for Organizational Change

Spring. 3 credits. Limited to 24 students. Elective. Not offered 1994-95.

W 2:00-4:30. Faculty
Through lectures, exercises, and group problem-solving sessions students will explore the characteristics of creative people, organizations, and processes, and obtain an inventory of their own creative ability, examine blocks to creativity and ways to overcome them, plan tactics for selling ideas, discuss methods for leading creative problemsolving meetings, and analyze strategies for producing organizational change. Organizational leaders will present problems for which students will develop creative solutions.]
H ADM 701 Competitive Strategies for the Hospitality Industry
Fall. 3 credits. Professional master's

## requirement.

T R 8:40-9:55. T. Cullen.
An integration and application of management concepts, theories, and practices to business situations. Students analyze current problems, formulate strategies, and implement policies.

## H ADM 702 Human Behavior In Organizations

Fall. 3 credits. Professional master's requirement.

M W 8:40-9:55. T. Hinkin.
An integration of theory and application, designed to increase interpersonal and managerial effectiveness. Emphasis on personality and perception, decision making, motivation, power, group process, and diversity management.

## H ADM 705 Management Strategy for the Hospitality Industry

Spring. 3 credits. Prerequisites: all required hotel school M.P.S. first-year core courses, or permission of instructor. M.P.S. requirement. T R 8:40-9:55. Includes five evening
sessions during last three weeks.
T. Cullen.

Covers strategic planning and strategy implementation. Planning focuses on defining the organization's philosophy and mission, establishing long- and short-range objectives to achieve the mission, and selecting strategy to be used in achieving objectives. Implementation focuses on developing organizational structure to achieve strategy, ensuring activities are effectively performed, and monitoring effectiveness of the strategy.

H ADM 801 Seminar In Hospitality and Service Inquiry
Fall. 3 credits. Elective. (Formerly H Adm 701)

W 2:30-5:30. C. Lundberg
This seminar introduces academic graduate students to the major alternative ways of conceptualizing and designing research, and acquiring, interpreting, and disseminating data. The implications and consequences of one's choices among the alternative perspectives and approaches will be emphasized.

H ADM 806 Monograph II
Fall. 3 credits. Prerequisite: H Adm 805. M.P.S. requirement.

See the M.P.S. Student Handbook for a full description of the monograph.

## HUMAN RESOURCES MANAGEMENT COURSES

H ADM 115 Organizational Behavior and Interpersonal Skills
Fall or spring. 3 credits. Limited to hotel school students, others by permission of instructor. Required.

M W 8:40-9:55; T R 8:40-9:55; T R
10:10-11:25. T. Simons, faculty.
Objective is to better prepare students for their Hotel School experience and for the workplace. Students will be exposed to theoretical material accompanied by selfassessments, experiential exercises, and group activities designed to enhance their understanding of organizations and improve their interpersonal skills. Begins with a focus on the individual and evolves into an examination of interpersonal interaction and group dynamics.

## H ADM 210 The Management of Muman

 ResourcesFall or spring. 3 credits. Limited to 100 nonhotel school students, no freshmen. Elective.

T R 1:25. Faculty.
Examines the role of human resources
management, starting with an introduction to the personnel function and an analysis of the
social, legal, international, and competitive factors. Examines recruitment, selection, training, motivation, development, compensation, performance appraisal, and labor relations. Class discussion and case analysis are emphasized

## H ADM 211 Human Resources

 ManagementFall or spring. 3 credits. Limited to 40 hotel school students per lecture, no freshmen or graduate students. Prerequisite: H Adm 100 or 103 (H Adm 105 for those matriculating fall 1993 or after). Required

M W 11:15, 12:20, or 1:25. M. Fulford, B. Tracey.

Provides students with an overview of the human resources management (hrm) field and shows them the link between specific hrm activities and substantive issues/situations they will face as future hospitality managers Integrates information and knowledge acquired in previous courses into the field of hrm. Students will understand the relationship between compensation and benefit activities and job design, motivation, and reward structures. Upon completion, students should a) understand the relationship among hrm activities, as well as the relationship between hrm and other functional areas within hospitality organizations; and b) understand how to effectively attract, retain, and motivate hospitality employees.

## [H ADM 313 Training in the Hospitality Industry

Fall. 3 credits. Limited to 24 students. Prerequisite: H Adm 211. Elective. Not offered 1994-95

M W 2:30-3:45. Faculty.
The training function within the hospitality industry will be analyzed, and a training and development model will be presented. Learning theories, task analysis, the writing of objectives, training methods, and program evaluation will be covered at both the conceptual and experiential levels. Students will gain experience designing and implementing a training program for a hospitality organization.]

## H ADM 412 Managing Organizational Change and Productivity

Spring. 3 credits. Prerequisite: H Adm 211 or equivalent. Elective. (Formerly H Adm 512) T R 8:40-9:55. Faculty.
Facilitating and managing change in organizations. Topics include change processes, organizational diagnosis, action planning, and consultancy. Individual and team projects.

## [H ADM 414 Organizational Behavior and

 Small Group ProcessesFall. 3 credits. Limited to 30 hotel school juniors, seniors, and graduate students.
Elective. Not offered 1994-95.
M 7:30- 10 p.m. Faculty
Applications of organizational behavior will be explored through lectures, case studies, and management games and exercises. Students will participate in experientia! labs aimed at enhancing their effectiveness as members or leaders of groups. Topics include leadership, decision making, motivation, power, and organizational change.]

[^1]Students become participant observers in their own lives through studying the field of applied behavioral science. Students will be able to use what they learn about human beings and how they function best in groups and organizations on a day-to-day basis to develop quality relationships between themselves and the people they support and depend upon (boss, staff, internal peers, associates and customers). Because of the popularity of this class, priority will be given in the following order: seniors, juniors, non-employee extramural students, sophomores, freshmen, and Cornell employees. Space permitting, the class may be added up to the first day, but the absolute deadline for dropping the course is 3:00 p.m. on the Monday immediately preceding the class.

## [H ADM 416 Special Studies in the Management of Human Resources: Service Cultures

Spring. 3 credits. Limited to juniors, seniors and graduate students. Prerequisite: H Adm 211 or equivalent. Elective. Not offered 1994-95.

T R 10:10-11:25. Faculty.
Emphasis on diagnosis and design of human resource initiatives to achieve strong service cultures and improve organizational performance. Topics include management of emotions, monitoring and measuring corporate culture, and linkage of human resource practices to service vision, organizational design, and strategic objectives. Students will develop a culture audit in a business. Class discussion, case analysis, and field experience.]

## H ADM 711 Human Resources

Management
Spring. 3 credits. Professional master's requirement.

F 9:05-12:05. Faculty.
A managerial approach to understanding organizational behavior and human resources activities. Exploration of the dilemmas and responsibilities of leadershp in complex situations.

## FINANCIAL MANAGEMENT COURSES

## H ADM 120 Survey of Financial Management

Fall or spring. 2 credits. Limited to non-hotel school students. Elective.

T 2:30-4:25. A. Arbel.
A survey of accounting principles, financial statements, and an introduction to financial analysis. Designed for the student who desires a basic general knowledge of the language of business and finance

## H ADM 121 Financial Accounting

 Spring. 3 credits. Limited to hotel school students. Required.T R 2:30-4:25. D. Ferguson. The basic principles of accounting, involving transaction analysis, flow of accounting data to the financial statements, and careful consideration of accounting for revenues, expenses, assets, liabilities, and owner's equity.

## H ADM 123 Financial Accounting

 PrinciplesFall or spring. 3 credits. Limited to non-hotel school students. Elective.

Fall, T R 11:15-1:20; spring, T R 2:30-4:25. G. Potter.

An in-depth introduction to the principles of financial accounting, involving transaction analysis, flow of accounting data to the financial statements, and careful consideration of accounting for revenues, expenses, assets, liabilities, and owner's equity.

## HADM 125 Finance

Fall or spring. 3 credits. Limited to non-hotel school students. Elective.

Fall, M W 2:30-3:45; spring, T R
11:50-12:15. S. Carvell.
Corporate finance topics include time value of money, financial markets, interest rates, financial statement analysis and planning, working capital policy and management, risk and return, risk management, security valuation models, cost of capital, capital budgeting, capital structure, dividend policy, and creative finance.

## H ADM 221 Managerial Accounting

Fall. 3 credits. Prerequisites: H Adm 121 and 175. Required. (Formerly H Adm 227)

T R 2:30-3:20. N. Geller, G. Potter. Focuses on the managerial use of financial accounting information, including the analysis of business operations to gain a perspective on how outsiders evaluate management's performance. Also extracts, develops, and analyzes data to support managerial decision making.

## H ADM 222 Finance

Spring. 4 credits. Prerequisite: H Adm 121 or equivalent. Required. (Formerly H Adm 226)

T R 2:30-4:25. A. Arbel.
Provides students with a broad understanding of managerial finance. Develops skills in using accounting cash flow information for financial planning, capital structure decisions, capital budgeting evaluation, and short-term and long-term financial decision making Topics include current asset management, short-term financing, capital budgeting, long term financing, cost of capital, and problems in international finance

## H ADM 321 Hospitality Financial

 ManagementFall. 3 credits. Prerequisites: H Adm 121, 221 and 222, or permission of instructor. Required. (Formerly H Adm 325)

T R 8:40-9:55. J. Eyster.
Integrates the areas of financial accounting, managerial accounting, and finance and applies the interpretive and analytical skills of each to hospitality-industry situations. Topics include uniform system of accounts, revenue and expense tracking and internal control, accounting systems, ratio and comparative analysis, cost-volume-profit analysis, pricing, operational budgeting, project capital budgeting, decision-making, equity and debt financing structures, and operating agreement forms. Students analyze hospitality operations and projects and present their findings in management report form.

## H ADM 322 Investment Management

Fall or spring. 3 credits. Limited to juniors, seniors, and graduate students. Elective.

M W 2:30-3:45. A. Arbel
Covers institutional and analytical aspects of security analysis and investment management: securities markets, sources of investment information, risk-return analysis, bond and
stock valuation, behavior of security prices, portfolio analysis, asset allocation, and portfolio management. Covers the capital asset pricing model, generic stock investment strategy, and the screen-to-profile approach and their practical implications for security analysis and investment management. Computer-assisted analysis in which students participate in an investment game. No previous knowledge of computers is required.

## H ADM 323 Hospitality Real-Estate Finance

Spring. 3 credits. Limited to juniors and seniors, no graduate students. Prerequisite: H Adm 321, or equivalent. Elective.

M W 12:20-1:45. J. Eyster.
Focuses on real estate financing for hospital-ity-oriented projects. Topics include methods of measuring rates of return; feasibility and appraisal processes; equity and debt financing vehicles to include joint ventures, limited partnerships, construction mortgages, participating, convertible, and seller-financed mortgages; forms of operating agreements to include management contracts, leases, and franchises; workout strategies for distressed properties; trends in international hotel franchising; and ethical issues of real estate development. Presentations of hospitality industry real estate practitioners.

## [H ADM 324 International Financial Management

Fall. 3 credits. Prerequisites: H Adm 121, 221,222 , or equivalents, micro and macroeconomics. Elective. Not offered 1994-95.

T R 2:30-3:45. D. Ferguson.
Focuses on the international aspects of financial management important to the hospitality industry with the intention of providing an understanding of and confidence in dealing with the economic issues faced by the multinational corporation. Areas covered are the international financial management environment, the management of foreign exchange risk, international asset management, and international sources of funds.]

## H ADM 326 Corporate Finance

Fall. 3 credits. Limited to juniors and seniors. Prerequisite: H Adm 321. Elective.

M W 11:15-1:10. S. Carvell.
In-depth analysis of corporate financial management, including financing alternatives and capital structure decisions, cash management, capital budgeting decisions, risk analysis, and working capital management. Although applicable to all businesses, special attention is placed on issues important to the hospitality industry. Emphasizes analytical methods through case studies and an in-depth semester project.

## [H ADM 328 Advanced Mospitality

 Managerial AccountingFall. 3 credits. Prerequisites: H Adm 121, 221, 222, and 321, or equivalents. Elective. Not offered 1994-95.

T R 10:10-11:25. D. Ferguson. Emphasis is on the use of accounting information for managerial planning, control, analysis, and evaluation. Included are the principles of managerial accounting, cost allocation, management control, models for decision making, and the special topics of joint products, transfer pricing, responsibility accounting, and performance measurement. Explores the application of managerial accounting concepts to the hospitality industry. Case studies.]

## H ADM 421 Internal Control in

 Hospitality OperationsFall. 3 credits. Limited to 30 students. Prerequisite: H Adm 321, 722, or equivalent. Elective.

T R 8:40-9:55. N. Geller.
Hotel and restaurant operations are analyzed from the perspective of preventing fraud and embezzlement. The design and distribution of production, accounting, information systems, and supervisory tasks are studied in a manner that will ensure effective internal control and verifiable audit trails. Case studies.

## H ADM 422 Taxation and Management

 DecisionsFall. 3 credits. Limited to 50 juniors, seniors and graduate students. Elective.

W 2:30-4:25. A. Sciarabba.
Introduction to tax advantages and disadvantages of various organizational structures, including corporations, partnerships, and subchapter " S " corporations; financial information reporting to tax authorities and shareholders and how they differ; use of depreciation methods to achieve tax reductions; syndication techniques; and the role tax laws play in promoting private investment and development.

H ADM 423 Financial Management Policy
Spring. 3 credits. Limited to 30 students; non-hotel students by permission of instructor. Prerequisite: H Adm 326 or 721. Elective. (Formerly H Adm 523)

T R 11:55-1:10. Faculty.
The course will cover numerous policy issues in financial management. Each of these issues will affect the potential profitability and survivability of the firm under conditions of uncertainty. The course will concentrate on nine major policy issues including capital structure, dividend policy, lease vs. buy analysis, and working capital financing.

## [H ADM 424 Short-Term Asset Management

Fall. 3 credits. Prerequisite: H Adm 326, 721, or equivalent. Elective. (Formerly H Adm 524) Not offered 1994-95.

M W 2:30-3:45. S. Carvell.
Examines why a significant number of hospitality firms either fail or experience suboptimal performance as a direct consequence of their inability to efficiently manage working capital accounts. Topics include collection and disbursement systems, shortterm investments, accounts receivable and inventory management, liquidity, cash management, and hedging interest rate and currency exchange risk. Various quantitative techniques are applied to these topics.]

## H ADM 621 Hospitality Real Estate

 FinanceSpring. 3 credits. Limited to graduate students. Prerequisite: H Adm 725, or equivalent. Elective. (Formerly H Adm 721)

M W 12:20-1:45. J. Eyster.
Focuses on real estate financing for hospital-ity-oriented projects. Topics include methods of measuring rates of return, feasibility and appraisal processes, equity and debt financing vehicles to include joint ventures, limited partnerships, construction mortgages, participating, convertible, and seller-financed mortgages, forms of operating agreements, workout strategies for distressed properties, trends in international hotel financing, and ethical issues of real estate development. Presentations of hospitality industry real estate practitioners will tie course material to current
industry practices. This graduate section includes the H Adm 323 lectures plus an hourlong discussion session each week featuring guest speakers from industry, faculty from other colleges, and case studies.

## H ADM 624 Analysis and Interpretation

 of Financial StatementsSpring. 3 credits. Limited to seniors and M.P.S. students. Elective. (Formerly H Adm 724)

T R 10:10-11:25. G. Potter.
Covers the financial accounting issues that are encountered in reporting the results of operations for corporate enterprises. Accounting principles and future extensions are discussed. Emphasis is on the components of financial statements, how and why they are reported, and their impact on the overall financial position of the firm and its acceptance in capital markets. Emphasis is on both outsiders' views of the company and decision making through interpretation of financial statements.

## H ADM 721 Financial Economics

Fall. 3 credits. Professional master's requirement.

T R 10:10-11:25. L. Canina.
Integrates corporate finance with the framework of value minimization and the competitive analysis of product and factor markets in the hospitality industry. Topics include short-term asset management, strategic valuation, capital budgeting analysis, capital structure decisions, leasing, and international financial management.

## M ADM 722 Hospitality Financial

 ManagementSpring. 3 credits. Professional master's requirement.

T R 8:40-9:55. N. Geller.
Covers both managerial accounting and financial management as they are practiced in the hospitality industry. Topics include hospitality accounting systems and internal control, financial statement analysis and interpretation, operational analysis, cost behavior, budgeting and forecasting, pricing, and feasibility analysis.

## FOOD AND BEVERAGE MANAGEMENT COURSES

## H ADM 136 Food and Beverage

 ManagementFall or spring. 4 credits. Limited to hotel school students. Required.

M W 1:25-3:20. G. Norkus. An introduction to the principles of food and beverage management, beginning with an overview of the food service indlustry at large. Attention is focused on major industry segments, business practices, and trends. Detailed consideration is given to the components of the food service system: marketing, menu planning, logistical support, production, service, controls, and quality assurance. Product and systems differentiation in various industry segments are emphasized.

H ADM 230 Introduction to Culinary Arts Fall or spring. 2 credits. Limited to non-hotel school students only. Priority given to seniors and graduate students. S-U grades only. Attendance at first class is mandatory. Absolute drop deadline for fall is September

19; spring drop deadline is February 3. Elective.

T 1:25-5:25; T 6:30-10:30 p.m.; W 6:30-
10:30 p.m.; R 6:30-10:30 p.m.; F 1:25-5:25.
T. Neuhaus, B. Lang, A. Nash, J. Ridley

Studies of food groups, their respective methods of preparation, cooking, presenta tion, and holding. Designed for non-hotel students who are interested in learning the professional approach to food preparation and service with hands-on practice. Food product identification, preparation and service methods, and professional language of food and cooking.

## [H ADM 234 Food and Beverage Control

Fall. 2 credits. Limited to 24 students.
Prerequisite: H Adm 136. Elective. Not offered 1994-95

> R 12:20-2:20. Faculty.

Studies the food and beverage operation from the position of both the food and beverage controller and the food and beverage analyst. Control systems and analytical techniques are studied and applied to operational situations.]

H ADM 236 Culinary Theory and Practice Fall or spring. 4 credits. Prerequisite: H Adm 136. Required.

M F 8:40-9:55. T. O'Connor, B. Richmond, S. Gould.

Designed to introduce the student to food and beverage operations through three major components: fundamental food composition and properties, food products and preparation, and food safety and sanitation. Students will prepare recipes, menus, and production schedules and will develop the ability to recognize properly prepared foods through preparing, tasting, and evaluating foods. They also will develop an awareness of potential production problems and how to troubleshoot them.

H ADM 237 Seminar in Cultural Cuisines Fall. 3 credits. Limited to 20 students. Prerequisites: H Adm 165 and 236, or permission of instructor. Elective. (Formerly H Adm 437)

T 1:25-3:20. T. O'Connor
Explores various cuisines in terms of history, lifestyle, and foods peculiar to a culture Through readings, research, and meal preparation, students explore various cuisines in depth. The goal of the course is to develop an awareness of several international cuisines, enabling students to make comparisons and draw relationships among the foodways of different cultures. Students prepare research reports and oral presentations, and design menus and orchestrate their preparation.

## H ADM 330 Seminar in Chain-Restaurant

 OperationsSpring. 3 credits. Prerequisite: H Adm 136, or permission of instructor. Elective. (Formerly H Adm 532).

T R 10:10-11:40. C. Muller, G. Norkus Chain-affiliated restaurants account for an ever-increasing market share of all food service dollars. The growth of multi-unit chain operations brings out unique challenges, opportunities, and strategic orientations for restaurant management. This course will identify these present issues, the historical factors that have led to them, and the pending economic and organizational questions facing the chain restaurant segment. Case study analyses, company research, and a term project.

## H ADM 331 Food Service Distribution Management

Fall. 3 credits. Limited to 24 juniors, seniors, and graduate students; others by permission of instructor. Elective.

R 1:25-4:25. G. Norkus, E. Merberg. Designed to acquaint the student with the food service distribution industry. Analyzes the history and origins of food service distribution, the distributor's role in supporting the operations of the restaurant industry, and the specific disciplines of food service distribution

## H ADM 332 Reviewing the Restaurant: The Consumer's View of the Dining Experience

Spring. 3 credits. Field trip $\$ 200$. Limited to 20 students. Prerequisites: H Adm 165 and 335 , or permission of the instructors. Elective. (Formerly H Adm 531)

M 12:20-2:15. J. Lumley, B. Lang
Trains the student to perform a comprehensive analysis of the restaurant dining experience. The role of the restaurant critic/ reviewer will be discussed in depth. The student will examine and enhance his or her critical writing skills, as the course will require each student to complete approximately ten restaurant reviews.

## H ADM 333 Current Issues in Food Safety and Sanitation

Spring. 2 credits. Elective. (Formerly H Adm 533)

W 12:20-2:15. B. Richmond. A study of current issues in food safety and sanitation procedures and regulations that affect managerial decisions in food service and hospitality operations. Topics include risk assessment and hazard analysis; legal responsibilities related to food, food handlers, equipment and facilities; food-borne illness and other public-health concerns; and certification and training. Preparation for NIFI/NRA certification and the Food Protection (ETS) certification exam (optional) is offered.

## H ADM 334 Gastronomy: Wine and Food

 Pairing Principles and Promotion Spring. 2 credits. Limited to 20 seniors and graduate students. Prerequisite: H Adm 436 Elective. (Formerly H Adm 538)M 1:25-3:20. B. Lang.
Focuses on the pairing and creative marketing of wine and food. Students study and taste regional, varietal wines with various foods to understand wine and food pairing. Topics include wine and social issues, wine list development, special event promotion, onpremise merchandising, and training of staff. Wine and food tastings presented to industry guests.

## H ADM 335 Restaurant Management

 Fall or spring. 4 credits. Limited to 30 hotel school students per lab; others by permission of instructor. Prerequisites: H Adm 136 and 236. Approximate cost of utensils and manual, $\$ 60$. Once enrolled, students may not drop the course without permission of instructor. Required.F 11:15-1:10. C. Muller, G. Pezzotti,
R. White, B. Lang, B. Halloran.

A restaurant-management course in which each student participates as a manager of a full-service restaurant operation. Topics related to the general management of restaurants, including issues in defining a service philosophy, improving profit margins, securing adequate labor supplies, identifying
target markets, and planning for organization growth. The laboratory is based on a handson managerial component, from which students become familiar with the various requirements for success of each of the line positions in a restaurant

## [H ADM 336 Principles of Nutrition

Fall. 3 credits. Prerequisites: H Adm 136 and 236 and corequisite, H Adm 337, or permission of instructor. Field trip, $\$ 40$. Elective. Not offered 1994-95.

T R 9:05. Faculty.
Designed especially for students interested in planning menus to meet the nutritional needs of the dining public. Students learn how to market healthful foods and study computer nutrient data bases, nutrition labeling, truth in menus, special diets, fad diets, and the current and future nutritional needs of the population. Discussions include how to counteract the public's misconceptions and myths. Labora tory sessions emphasize creative production of high-quality, nutritious, safe food.]

## HADM 337 Specialty Foods

Fall. 4 credits. Limited to juniors, seniors, and graduate students. Prerequisites for hotel students: H Adm 136 and 236. Elective.

T R 10:10-11:30. T. Neuhaus.
An advanced course covering finer points of cooking and baking. A culinary, chemical, and marketing perspective will be taken using principles of organoleptical food evaluation. Topics include flavor marriages, gamishes, unusual vegetables and fruits, marinades, charcuterie, wild game, fermentations, and chocolates.

## H ADM 338 Health and Fitness in the Resort Hotel and Spa Industry

Fall. 3 credits. Limited to 20 students per section. Field trip, $\$ 40$. A previous course in nutrition or food science is helpful but not required. Elective.

M W 11:15. B. Richmond.
Especially for students who are interested in the fitness and nutrition trend in restaurants, resorts, and hotels. Nutritious menu design and the design of fitness programs, equipment, and facilities will be emphasized. Topics include personnel required, assessing personal fitness levels, and legal, medical, managerial implications, and integration of nutritious menu items into restaurant menus and their marketing and merchandising. Guest speakers from various spas, wellness centers, and fitness centers.

## IH ADM 339 Airline Food Service Management

Spring. 3 credits. Field trip, \$50. Prerequisites/Corequisites: H Adm 136, 236, or permission of the instructor. Elective. Not offered 1994-95.

M W 7-8:15 p.m. Faculty. Airline food service, unique in the food and beverage industry, involves a thorough knowledge of the airline industry and depends on the state of the economy, the financial success of the airline industry, and economies of scale. Students study the planning of airline meals, their production by vendors, their distribution by specialized companies, and their assembly and delivery by caterers. A field trip to an airline's hub city enables students to visit flight kitchens, vendors, airline representatives and distributors. Guest speakers representing various sectors of the industry (airline food and beverage managers, airline marketing personnel, entrepreneurs who provide goods
and services, and in-flight catering executives) are included.]

## H ADM 430 Introduction to Wines

Fall or spring. 2 credits. Wine glass kit and course fee, $\$ 25.00$. Limited to hotel school juniors, seniors, and graduate students, and seniors and graduate students in all other colleges. Hotel students encouraged to enroll in the fall. All students, except those in the hotel school, must be 21 years old by the first day of university classes. S-U grades only Elective.

W 2:30-4:25. S. Mutkoski, A. Nash. An introduction to the major wine-producing regions of the world and what the consumer needs to know to purchase wines, spirits, and beers at retail outlets and in a restaurant setting. Topics include flavor components in wine, pairing wine and food, responsible drinking, selecting quality and value wines, and wine etiquette. Samples from a variety of countries, regions, and vineyards are evaluated.
(Preregistered students who do not attend the first class and fail to notify the course secretary in 274 Statler of their absence before the first class are automatically dropped from the course. The student must then follow the normal drop procedure in his or her school.
Because of the high demand for this course and because a product is consumed, the absolute drop deadline for all students is September 9 in the fall and February 3 in the spring.)

## H ADM 431 Seminar in Independent

Restaurant Operations Management
Fall or spring. 3 credits. Five field trips, $\$ 250$ Limited to 20 students. Prerequisite: written permission of instructor. Flective.

T 2:30-4:25. G. Pezzotti.
Designed for students who have a strong interest in food and beverage operations and who may be considering a career as an entrepreneur. Students visit and analyze various independently owned restaurant operations. Analysis covers the restaurant's concept (market), organization, ownership, management, physical structure, staff, frontand back-of-the-house operations, and fiscal integrity. Readings relevant to current topics in the restaurant industry are required. Classes alternate weekly between field trips and seminar/case presentations.

## [H ADM 432 Seminar On Specialty Beers

 Fall. 3 credits. Field trips, \$50. Elective. Not offered 1994-95.M 1:25-3:20 (first seven weeks only). Faculty.
Designed for upper-level students who intend to pursue food and beverage careers. Advances knowledge about beers and other malt beverages in terms of managing such products in a restaurant setting or other food service outlet. Topics include the brewing process, sensory aspects of beer and other malt beverages, international beer types and styles, marketing malt products, purchasing and distribution, storage and service, beer and food pairings, staff training and education, cost controls, and third-party liability issues.]

## H ADM 433 Food Service Management in Business, Industry, and Health Care Facilities

Spring. 3 credits. Field trips, \$100. Limited to 25 students. Prerequisites: H Adm 136 and 236. Elective.

M 10:10; W 10:10-12:05. T. O'Connor.

Designed to explore and analyze food service management in business, industry, and healthcare facilities, e.g., office/industrial complexes, educational institutions, contract companies, and hospital and extended-care facilities. Characteristics of food service organization structures, job descriptions, controls, systems design, equipment, and government/legal regulations. Readings, small investigative projects, discussions, local site visits, and one field trip to a metropolitan area.
H ADM 434 Desserts Merchandising
Spring. 3 credits. Limited to 25 students with permission of instructor. Prerequisite: H Adm 236,230 , or, for graduate students, "culinary camp." Elective.

R 9:05. T. Neuhaus.
A hands-on course providing exposure to a variety of breads, pastries, cakes, and other desserts. Students develop large-scale production skills, become familiar with bakeshop utensils, and advertise and sell their products.

## H ADM 435 Selection, Procurement, and Supply Management

Fall. 3 credits. Prerequisite: H Adm 136 or 731. Elective.

T 10:10-12:05. R. Spies. Expands upon the concepts of purchasing and supply management that were developed in H ADM 136 and 731. Designed to expose the student to two specific areas: the management of the procurement system and the major commodity groups that are germane to the operation of a hotel or foodservice operation. Lectures include discussions on the comparison of the purchasing function in the hospitality industry to other industries, distribution systems, legal and ethical implications in buyer-seller relationships, procurement options, buying strategy development, price protection programs, and other contemporary issues. Students work with the major entree food groups: meats, seafood, and poultry, with emphasis placed on identification, quality and condition, market form, yield tests, and cost analyses.
H ADM 436 Beverage Management
Fall or spring. 2 credits. Limited to 30 hotel school juniors, seniors, and graduate students. Prerequisite: H Adm 430 (co-registration is not allowed). Elective.

W 10:10-12:05. S. Mutkoski, A. Nash. Designed for students who intend to pursue food and beverage as a career. Deals specifically with the management of beverage operations. Lectures develop skills in and awareness of dram shop liability; staff training and responsible customer service; beverage pricing; food and wine pairings; wine list development; purchasing, storage, and service; wine regions; cost controls and loss prevention; and creative beverage merchandising. Guest lecturers.

## H ADM 437 Specialty Food and Beverage Operations: Guest Chefs Spring. 3 credits. Limited to 20 students.

 Prerequisite: H Adm 335 or 732 . Elective.R 1:25-4:25. B. Halloran, B. Lang,
H. Winslow.

Designed for students with a strong food and beverage orientation, especially students considering careers in the hotel food and beverage environment, or those who anticipate interacting with current culinary trends. Working in groups, students market, organize, plan, produce, serve, and prepare the financial analysis and accounting relative
to four guest chef specialty production nights for the Cornell community, utilizing the Statler Hotel facility. Final project.

## H ADM 438 Catering Management

Spring. 2 credits. Limited to 20 students. Prerequisite: H Adm 335, 732, or permission of instructor. Elective.

T 12:20-2:15. R. Spies.
Examines on- and off-premise catering for business and social functions, as well as sports events and office catering. Topics include the organizational structure of catering operations; legal aspects of catering businesses; menu design for special functions and its operational implications; marketing from a caterer's perspective; function planning and management; staff recruitment, training, and supervision; and post-event analysis.

## M ADM 439 Wine: A Cultural and Historical Perspective <br> Fall or spring. 2 credits. Limited to 200

 students.M 2:30-4:25. A. Nash.
Designed to provide students with a cultural and historical perspective on wine and its place in society. Topics include history, people, culture, production of wine in specific wine-producing regions of the world, current wine and health issues, wine and food pairing, cooking with wine, and retail wine buying strategies. Regions covered will change each semester so students may take the course more than once.
[H ADM 536 Contemporary Health Foods: A Food Service Practicum in SpaStyle Cuisine
Fall. 3 credits. Limited to 20 seniors and graduate students, or by permission of instructors. Elective. Not offered 1994-95.

W 12:20. Faculty.
Builds an awareness and understanding of today's health-conscious food service consumer. Topics include marketing, menu design and implementation, and hands-on experience in carrying out a nutritionally aware or "spa-designed" food concept.]

## H ADN 731 Graduate Food and Beverage

 ManagementFall. 3 credits. Professional master's requirement.

T R 10:10-11:25. T. Kelly.
Managerial and operational principles and techniques of planning, operating, and evaluating a food and beverage operation.

## H ADM 732 Graduate Restaurant

## Management

Fall. 3 credits. Limited to 30 students. Prerequisite: H Adm 731. M.P.S. requirement. W 12:20-2:15. Production Lab: F 2:30closing. R. Spies, R. White. A food and beverage management course in which the class operates a Statler restaurant. The production lab allows students to rotate through the various line positions of a restaurant operation. In turn, each student serves as the manager with responsibilities for menu planning, marketing, pricing, scheduling, guest relations, and profitability. In-depth analysis of the operation and discussion of restaurant issues.

## MARKETING AND TOURISM

## H ADM 240 Marketing Principles

Fall or spring. Limited to non-hotel school students.

T R 2:30-3:45. R. Bell.
An introductory course providing a basic understanding of consumer purchase decision making, product planning, distribution, promotion, and pricing. Companies and their current marketing strategies will be examined to better understand these fundamental tenets of marketing and how they contribute to the crucial process of strategic planning.

## H ADM 241 Marketing Principles

Fall or spring. 4 credits. Limited to non-hotel school students. Elective.

T R 2:30-3:45. R. Bell.
Introductory course providing a basic understanding of consumer purchase decision making, product planning, distribution, promotion, and pricing. Actual companies and their current marketing strategies will be examined to better understand these fundamental tenets of marketing and how they contribute to the crucial process of strategic planning.

## H ADM 243 Principles of Marketing

Fall or spring. 3 credits. Limited to 60 hotel school students per lecture, not open to freshmen. Required.

M W 2:30-3:45; T R 10:10-11:25.
W. Kaven, L. Renaghan

Provides an overview of the discipline of marketing as it applies to the hospitality industry. Topics include understanding how a marketing strategy is devised, especially the interrelationship of company objectives, internal resources, the external operating environment, and how the special nature of services affects the development of marketing strategies in the hospitality industry.

## H ADM 244 Tourism I

Fall. 3 credits. Not open to freshmen. Elective.

T R 10:10-11:25. M. Noden.
An introductory course in the study of tourism. The origins and evolution of contemporary tourism are examined. Students are familiarized with the various supply components of the tourism industrial base and their integration on an international scale.
The effects of mass-volume tourist demand on destination development are explored through the use of selected limited case studies. Guest lectures highlight the economic operations and effects of tourism in both the public and private sectors.

## H ADM 245 The Basics of Hotel Sales

Spring. 3 credits. Field trip, $\$ 50$. Limited to 30 students. Prerequsite: H Adm 240/241/ 243,741 , or equivalent. Elective.

## F 1:25-5. R. Bell.

Emphasis on skills and knowledge leading to an understanding of the role of successful property level sales person. Topics include roles of types of sales positions at the hotel level, tools necessary to make it up the ladder, operation of a hotel sales function, and differing buying strategies of market segments.

## H ADM 343 Marketing Communications

Spring. 3 credits. Prerequisites: principles of marketing or marketing management and quantitative methods for business management courses. Elective. (Formerly H Adm 543)

M W 10:10-11:25. M. Morgan.

Covers formulating a research question, determining research design, designing data collection methods and forms, designing samples and collecting data, analyzing and interpreting the data, and reporting research results.

## H ADM 346 Marketing Planning for Hotels

Fall. 3 credits. Prerequisite: H Adm 243, 741, or equivalent. Elective. (Formerly H Adm 546)

T R 11:55-1:10. R. Bell.
Key variables in property level management and their proper application in developing a marketing plan, e.g., marketing intelligence, demand analysis, supply and competitor analysis, segment analysis, resource allocation, sales strategies and measurement of results. Upon completion of the course, the student should be able to design, develop, and implement a comprehensive, targeted, and action-oriented marketing plan for a lodging property.

## H ADM 347 Consumer Behavior

Fall. 3 credits. Limited to undergraduate students. Prerequisite: a principles of marketing or marketing management course. Elective. (Formerly H Adm 547)

M W 10:10-11:25. M. Morgan.
Introduces students to the dynamic interactions among affect and cognitions, behaviors, and environmental events that are involved in market exchanges. Covers information processing, behavior management, and market segmentation and positioning as well as using the consumer hehavior concepts and principles in the development of marketing strategy.

H ADM 349 Seminar in Selected Cases in Hospitality Marketing
Spring. 3 credits. Limited to seniors, or permission of instructor. Prerequisite: A principles of marketing course. Elective.

T R 11:55-1:10. Faculty.
An integrative course that provides senior marketing students and others an opportunity to translate concepts learned from a variety of marketing courses into sound management decisions.

## H ADM 442 Marketing Communications

Spring. 3 credits. Limited to seniors and graduate students. Prerequisite: a previous marketing course. Elective. (Formerly H Adm 542)

M 1:25-4; W 1:25. C. Dev.
Provides students with a managerial understanding of the effective use of a variety of marketing communication media, including advertising, sales promotion, public relations, direct marketing and out-of-home. Hospitality industry emphasized.

## H ADM 444 Tourism II

Spring. 3 credits. Limited to juniors, seniors, and graduate students. Prerequisites: H Adm 243 and 244, or equivalents, or written
permission of instructor. Elective.
T R 11:55-1:10. M. Noden.
An advanced course in the study of tourism. Emphasis is placed on the development of the tourism industrial base and development and financing of superstructure and infrastructure. Econometric model development for demand predictions are examined and analyzed. Students are expected to engage in a wide range of discussion and analysis of the effects of tourism on various environments in social and economic terms. Case studies, occasional guest lectures.

## H ADM 445 Services Marketing

Fall or spring. 3 credits. Limited to undergraduate students. Prerequisite: a previous marketing course or permission of instructor. Elective. (Formerly H Adm 544) Not offered spring 1995.

M W 11:55-1:10. L. Renaghan. Students preparing for ownership or management positions will develop an understanding of services marketing principles applicable across entire service sector. Topics include marketing strategies of service firms, new marketing approaches, and the reformulation of traditional marketing principles from consumers and industrial goods marketing. Four case studies, guest speakers. Emphasis on hospitality industry in fall.

## H ADM 449 International Marketing

Fall. 3 credits. Limited to 25 students. Prerequisites: Micro and macroeconomics. Elective.

T R 2:30-3:45. W. Kaven. Develops understanding of international marketing with emphasis on hospitalityindustry applications. Focuses on the similarities and differences that exist between domestic and international marketing and the conduct of international marketing in various segments of the world.

## H ADM 641 Marketing Decision Support for Service Firms

Spring. 3 credits. Limited to graduate students, others by permission of instructor. Prerequisite: a principles of marketing or marketing management course and an introductory course in quantitative methods for business management.

M W 8:40-9:55. M. Morgan. Covers a variety of tools and models for improving decision effectiveness in the marketing of services. These tools and models are drawn from the fields of consumer behavior, behavioral decision theory, economics, management science/operations research, and statistics/econometrics. Covers pricing hotel rooms, restaurant design, advertising and frequency programs, location selection, sales agent management, and competitive segmentation/positioning strategies for hotel brands.

## H ADM 642 Strategic Marketing

Fall. 3 credits. Limited to graduate students. Prerequisite; a marketing course, or permission of instructor. Elective.

W 7:30-10:15 p.m. C. Dev.
Offers theoretical and practical approaches to addressing strategic marketing challenges in hospitality and service firms. Strategic marketing concepts and principles will be learned through lectures, discussion, and development of a strategic marketing report.

## H ADM 643 Marketing Research

Spring. 3 credits. Limited to graduate students. Prerequisites: principles of marketing or marketing management and quantitative methods for business management courses. Elective.

M W 10:10-11:25. M. Morgan.
Covers formulating a research question, determining research design, designing data collection methods and forms, designing samples and collecting data, analyzing and interpreting the data and reporting research results. This graduate section includes the H Adm 343 lectures plus a group case study/ research project with additional readings and seven one-hour lab sessions.

## HADM 645 Services Marketing

Fall or spring. 3 credits. Emphasis on hospitality industry in fall. Limited to graduate students. Prerequisite: a marketing course, or permission of instructor. Elective. Not offered spring 1995.

M W 11:55-1:10. L. Renaghan.
Helps students preparing for ownership or management positions to develop an understanding of services marketing principles applicable across the entire service sector Marketing strategies of service firms from various service industries (hotels, banking, restaurants, health care, travel agencies, consulting, and airlines) will be evaluated. New marketing approaches and reformulation of traditional marketing principles are considered. Case discussions, guest speakers.

## H ADM 646 Marketing Planning For Hotels

Fall. 3 credits. Limited to graduate students. Prerequisite: H Adm 243, 741, or equivalent Elective.

## T R 11:55-1:10. R. Bell

Key variables in property-level management and their proper application in developing a marketing plan, e.g., marketing intelligence, demand analysis, supply and competitor analysis, segment analysis, resource allocation, sales strategies, and measurement of results. Upon completion, student should be able to design, develop, and implement a comprehensive, targeted, and action-oriented marketing plan for a lodging property. Text material, cases, relevant articles, lectures, and key speakers. Theoretical paper

## H ADM 647 Consumer Behavior

Fall. 3 credits. Limited to graduate students. Prerequisite: a principles of marketing or marketing management course. Elective.

M W 10:10-11:25. M. Morgan.
Introduces students to the dynamic interactions among affect and cognitions, behaviors, and environmental events that are involved in market exchanges. Covers information processing, behavior management, and market segmentation and positioning as well as using the consumer behavior concepts and principles in the development of marketing strategy. This graduate section includes the $\mathbf{H}$ Adm 347 lectures plus a group case study/ research project that involves additional readings and seven one-hour lab sessions.

## H ADM 741 Marketing Management

 Spring. 3 credits. Limited to first-year hotel school M.P.S. students. M.P.S. requirement.T R 2:30-3:45. C. Dev.
Basic concepts and principles underlying marketing decision making and the skills needed to analyze and understand complex marketing situations in order to plan and implement marketing programs

## PROPERTIES MANAGEMENT COURSES

## H ADM 255 Hotel Development and Planning

Spring. 3 credits. Limited to sophomores juniors, and seniors. Required

M W F 10:10. J. deRoos
An introduction and management overview of the problems and opportunities inherent in the development and planning of hospitality facilities. Topics include the project development sequence; conceptual and space
planning; architectural design, engineering, and construction criteria; and the interpretation of architectural and consultant drawings. Emphasis is on setting appropriate facilities requirements, understanding industry practice, and implementing properties decisions within a balanced design, operations, and financial framework

H ADM 350 Real Estate Management Fall. 3 credits. Elective.

M 1:25-3:20; W 1:25-2:15. J. deRoos. Designed for students interested in the management of residential and commercial real estate. Overview of real estate economics, the relevant law, and different aspects of property management including leases and management contracts, accounting and finance, staffing, and building operations. Examples from several types of properties.
H ADM 351 Mospitality Facilities Design Fall. 3 credits. Prerequisite: H Adm 255 or 751 or permission of instructor. Elective. M9:05. S. Robson. A lecture-studio course dealing with property development, planning, and design by focusing on the interpretation and analysis of restaurant and hotel plans. Students learn basic graphic techniques and apply them to planning problems for hospitality facilities. Final project.

## H ADM 352 Hotel Planning and Interior Design

Spring. 3 credits. Field trip, $\$ 200$; drawing supplies, $\$ 75$. Limited to 20 students. Prerequisite: H Adm 351. Elective F 1:25. R. Penner.
A project course concerned with hotel planning, interior design, and renovation. Students establish the operator's criteria for the renovation of hotel guestrooms and public areas, prepare budgets, and develop preliminary conceptual designs leading to a substantial graphic presentation. Drawing ability is essential.

## H ADM 353 Food Service Facilities

 DesignSpring. Variable, to 4 credits. Limited to 15 students. Prerequisites: H Adm 351 and 335 (coregistration is acceptable). Elective.

M W 1:25. S. Robson.
An introduction to the basic concepts of food service facilities design and planning. Students will determine space allocations for kitchens and their support areas; develop basic production work flow in the preparation and service areas; and select equipment utilizing standards for production capability, quality of construction, and ease of maintenance. Students will use studio time for planning, designing, and writing specifications for a medium-size restaurant kitchen.
H ADM 354 Computer-Aided Design Fall or spring. 2 credits. Limited to 18 students per lecture. Prerequisite: H Adm 351 or equivalent studio experience. Elective. T 11:15-1:10; W 11:15-1:10. S. Robson. The operation of microcomputer-based computer-aided design (CAD) systems. Using AutoCAD on the IBM PC, the course presents an organized and logical sequence of commands, mode settings, drawing aids, and other characteristics of CAD. Students will learn the program in the school's computer center and will develop a complete graphic presentation. Emphasis is on the use and operation of CAD systems in a commercial document production environment.

## H ADM 355 Mospitality Facilities Operations

Fall. 3 credits. Prerequisite: H Adm 255. Required.

M W F 10:10; M W F 1:25. D. Stipanuk. An overview of the operation of hospitality facilities, including operating costs for various types of facilities, types and characteristics of major building systems, and the responsibilities of the engineering-maintenance departments. The renovation needs of hospitality facilities are examined and key managerial aspects of renovations considered.

## H ADM 356 Hospitality Risk Management

 Spring. 3 credits. Elective.T R 11:55-1:10. D. Stipanuk.
Risk management within the hospitality environment as applied to issues of control and risk financing. Issues in fire protection, customer and workplace safety, OSHA and Right-to-Know requirements, and customer and corporate security are analyzed. Basic elements of insurance and crisis management are discussed.

## H ADM 357 Insurance and Risk Management

Fall or spring. 3 credits. Limited to 75 students per lecture. Prerequisite: an introductory accounting or business course. Elective.

M 7:30-10 pm; W 7:30-10 pm. J. Ferris. A comprehensive look at risk management within a general business or institutional environment. Reviews insurance and noninsurance solutions to controlling loss, the general legal environment within which risk management processes work, and the integration of crisis management into the overall corporate risk management plan.

## H ADM 450 Principles of Real Estate

Fall. 3 credits. Limited to juniors and seniors (graduate students must enroll in H Adm 651). Elective.

T R 2:30-3:45. J. Corgel, J. deRoos. Approaches real estate from four perspectives: legal, economic, financial, and business. Understanding these perspectives will enable students to make better investment and financing decisions, to use real estate resources wisely, to understand public-policy issues, and to be prepared for additional courses in real estate investment, finance, and development.

## [H ADM 455 Special Topics in Properties Management

Fall or spring. Variable, to 3 credits. Limited to juniors, seniors and graduate students. Elective. Not offered 1994-95.

Hours to be arranged. Faculty
The theme and instructor of the "special topics" course will change each year on the basis of current trends, student interest, and faculty expertise. See the school registrar or properties area coordinator for details about the current topics.]

## H ADM 456 Hospitality Facilitios

## Management

Spring. 3 credits. Prerequisite: H Adm 355, 751 , or permission of the instructor. Elective.

T R 8:40-9:55. D. Stipanuk.
Examines building engineering systems and the management of physical facilities in the hospitality industry, including the organization of the maintenance and engineering functions. Includes visits to other campus buildings to survey their engineering systems.

H ADM 457 Advanced Development and Construction
Fall. 3 credits. Limited to seniors and graduate students. Elective. Not offered 1994-95.

M W 2:30-3:45. D. Stipanuk.
Focuses on the management structure and systems, laws, regulations, and industry practices that most influence the successful development of commercial and residential real estate, including lodging and eating facilities. Topics include scheduling, budgeting, managing other professionals, and analysis of alternative materials and methods. Guest speakers, case studies, and group project.]

H ADM 458 Hospitality Real Estate Spring. 3 credits. Prerequisite: H Adm 323, 450 , or permission of instructor. Elective.

T R 10:10-11:25. J. deRoos.
Expands the student's understanding of the role of real estate in individual hospitality businesses and corporations. Designed for those who plan careers in the hospitality industry. Specific objectives are to develop an appreciation of real estate as a factor in the production of income of hospitality businesses; to develop an appreciation of real estate as an asset that can be managed, sold and otherwise used to increase the wealth of hospitality corporation shareholders; and to understand the importance of valuing real estate, gain working knowledge of valuation approaches, and be aware of contemporary hospitality valuation issues.

## H ADM 459 International Development

Fall. 3 credits. Limited to seniors and graduate students. Elective

M 12:20-2:15; W 12:20. J. Clark.
Seminar covering the strategic development of international hospitality projects. Topics include corporate expansion strategies, the international development process, viewpoints of public and private stakeholders; technology, infrastructure, environmental concems, and public policy issues. Guest lecturers

## H ADM 651 Principles of Real Estate

Fall. 3 credits. Limited to graduate students. Elective

T R 2:30-3:45. J. Corgel.
This survey course approaches real estate from four perspectives: legal, economic, financial, and business. Understanding these perspectives will enable students to make better investment and financing decisions, use real estate resources wisely, understand public policy issues, and be prepared for additional courses in real estate investment, finance, and development.

This graduate section includes the H Adm 450 lectures, plus an hour-long recitation each week which features guest speakers from industry, faculty from other colleges, and case studies. Comprehensive term project.
H ADM 658 Adyanced Real Estate
Spring. 3 credits. Prerequisite: H Adm 323, 450 or 651 . Elective.

T R 2:30-3:45. J. Corgel.
Promotes sound real estate investment and finance decision making through the use of advanced theory and techniques in financial economics. Real estate investment decisions are made through applications of the after-tax discounted cash flow model which incorporates prevailing domestic and international economic conditions in real estate markets, tax rules, and government regulations. Financing decisions are made using the
techniques of modern financial analysis. A wide array of financing options is considered including convertible, participating, and accrual mortgages. All types of residential and non-residential real estate are analyzed; however, special emphasis is placed on the analysis of hospitality properties.

H ADM 751 Project Development and Planning
Fall. 3 credits. M.P.S. requirement. M W 8:40-9:55. R. Penner
The major elements of physical assetdevelopment. Topics include the role of the real estate asset in the hospitality firm, the development process, and hotel planning and design.

## COMMUNICATION COURSES

## H ADM 165 Managerial Communication I

Fall or spring. 3 credits. Each lecture limited to 18 students. Note: Students required to take this course generally may not delay it. If extenuating circumstances exist, student must petition to drop the course by the end of the first week of classes. Required.

Lec 1, M W F 9:05; lec 2, M W F 9:05; lec 3 , M W F 10:10; lec 4, M W F 10:10; lec 5, M W F 11:15; lec 6, M W F 1:25; lec 7 M W F 2:30; lec 8 T R 8:25-9:55. D. Jameson, N. Katz, S. Kiner, J. Lumley, and B. Stevens.
An introduction to written communication within a business context. Students learn how to conceive, plan, and develop those written materials that provide much of the information that people in business need to form judgments and make decisions. Focusing on the specific principles, needs, and responsibilities of business communication, the course introduces students to the writing process: analyzing, organizing, using research sources, developing substance, and writing in a clear, precise style. Students write a variety of reports requiring different analytical approaches.

H ADM 266 Intermediate French: Le Francais de l'Hotellerie et du Tourisme
Spring. 3 credits. Limited to 15 students Prerequisite: French 123 or equivalent (CPT 560 or above), or permission of instructor. Elective.

## M W F 12:20; one hour TBA. <br> A. Grandjean-Levy

Offers continuing study of the French language with specific emphasis on the hospitality industry. Material presented considers cultural, geographic, economic, historical, political, and social contexts within which the business functions. The course is conducted in French, emphasizing a conversational approach. Specialized situations and vocabulary are used in building general comperence in practical usage. Students with special interest in the hospitality industry will be given priority for admission.
H ADM 364 Advanced Business Writing
Fall or spring. 3 credits. Limited to 20 juniors, seniors, or graduate students, or written permission of instructor. Prerequisite for undergraduates: H Adm 165 (for hotel school students) or completion of student's freshman writing requirement. Elective.

W 12:20-2:15. D. Jameson, N. Katz.
Focuses on the written communications that require special persuasiveness and control of
tone. Writing assignments will give students a chance to apply the theories of communication, semantics, and human relations covered in the course. The kinds of communications that will be analyzed, evaluated, and written include persuasive messages to subordinates and superiors in an organization; sales letters and other promotion materials; and negative messages such as refusals, rejections, and responses to complaints. A major topic is the planning and executing of a job-hunting campaign, for which students prepare résumes, letters of application, and follow-up messages adapted to their individual needs.
H ADM 365 Managerial Communication II Fall or spring. 3 credits. Limited to 24 juniors and seniors per lecture, or written permission of instructor. Note: Students required to take this course generally may not drop it. If extenuating circumstances exist, student must petition to drop the course by the end of the first week of classes. Prerequisites: Hotel undergraduates must have completed H Adm 165 and H Adm 115 or 212. Required.

Lec 1, T R 10:10-11:40; lec 2, T R 10:1011:40; lec 3, T R 10:10-11:40; lec 4, T R 12:20-1:50; lec 5, T R 12:20-1:50.
E. Huettman, S. Kiner, and B. Stevens. A broad study of communication in a management context. Emphasizes the significant role of communication in developing work relationships that enable managers to achieve their goals. It presents the theories and principles of communication that underlie effective performance. Students increase their individual communication abilities by applying these concepts in a variety of managerial contexts, including interacting one-to-one, working in groups, and formally developing and presenting ideas to larger audiences.

## H ADM 462 Communication and the Multicultural Organization

Fall. 3 credits. Elective.
W 7:30-10 p.m. E. Huettman Influence of culture, perception, and gender on communication in multicultural organizations, including international and domestic businesses with diverse work forces. Focus is on human interaction at work. Special emphasis on hospitality industry. Topics include values and beliefs, how race and gender affect language use, cultural differences in nonverbal communication, ethnocentrism and stereotyping, intercultural sensitivity and adjustment, cultural variables, persuasion, and ethics of communication in international business.

## H ADM 463 Persuasive Communication in Organizations

Spring. 3 credits. Limited to 18 students. Prerequisites: H Adm 165 and 365 for hotel school undergraduates, or permission of instructor. Elective.

W 7:30-10 p.m. E. Huettman Prepares students to communicate effectively in a variety of persuasive speaking contexts. Principles of persuasion will be thoroughly examined as they apply to managerial communication tasks. Emphasis on persuasive speaking; also relationship between written and oral communication. Studies the principles of persuasion, analyzes case studies in the hospitality industry, and applies persuasive strategies in simulated workplace settings.

## [H ADM 661 Organizational

Communication For Managers
Spring. 3 credits. Elective. Not offered 1994-95.

T R 8:40-9:55. Faculty
Focuses on the complex interactions that occur when people communicate in organizations. Structured around the communication tasks managers must accomplish to be effective on the job. Business cases. Emphasis on design of effective communication strategies. Applications and experiential exercises help students perfect their ability to write, make oral presentations, and interact effectively with others in mangerial contexts.]

## H ADM 761 Communications Modules

Year long. No credits. Professional master's requirement.
Modules based upon those skills identified as most valuable to students or those competencies that were targeted in the individual assessment sessions.

## OPERATIONS MANAGEMENT, INFORMATION TECHNOLOGY COURSES

H ADM 170 Keyboarding on the Macintosh
Spring. 2 credits. Elective. M W F 12:20. B. David.
An introduction to the computer and a beginning course in alphabetic and numeric keyboarding. Students learn word-processing skills during the second half of the course

## HADM 174 Microcomputing

Fall. 3 credits. Limited to hotel school freshmen. Spring and summer. 3 credits. Open enrollment. Maximum of 30 students per lecture. Required.

Lec 1, M W F 9:05; lec 2, M W F 10:10; lec 3, M W F 11:15; lec 4, M W F 12:20; lec 5, M W R $1: 25$; lec $6, \mathrm{M}$ W R $2: 30$; lec 7 , M W R 3:35. R. Alvarez, B. David, R. Moore. An introduction to microcomputing to develop functional computer fluency. Students develop skills in five generic areas: text, graphics, spreadsheet, presentation, and list processing. The course is entirely laboriented and students work primarily on Macintosh personal computers with secondary drill work on IBM personal computers

## H ADM 175 Quantitative Methods

Fall or spring. 3 credits. Hotel school transfers must take course in the fall, Hotel freshmen in the spring. Prerequisite: H Adm 174. Required.

T R 8:40-9:55; T R 11:55-1:10. R. Morey. An introduction to statistical and operations management methods appropriate to the hospitality industry. Topics include descriptive statistics, probability, correlation and regression, forecasting, decision analysis, quality control charts, and an introduction to yield management. Emphasis is on practical applications of the techniques to hospitality related problems.

## H ADM 374 End-User Business

 Computing ToolsFall or spring. 3 credits. Limited to 20 students per lecture. Elective.

M W F 10:10. R. Alvarez.
Explores the personal computer as a managerial tool for the hospitality industry Concepts of modeling, database, and end-user
computing are covered. Students learn to use specific software applications programs to solve original problems. All work is done on the IBM PS2.

## H ADM 375 Hotel Computing Applications

Spring. 3 credits. Limited to 20 students. Prerequisite: H Adm 174. Elective

T R 11:15. R. Moore.
An introduction to transaction processing systems as they currently are used in the hospitality industry. Specific topics include property management systems, reservation systems, communication networks, database structures, point-of-sale systems, methods of system selection, and cost justification. Laboratories provide hands-on experience with systems widely used in the hospitality industry and help to develop IBM PC/DOS skills.

## H ADM 474 Corporate Information

 Systems ManagementSpring. 3 credits. Limited to juniors, seniors, and graduate students who have not taken H Adm 774.

T R 9:05-10:20. R. Alvarez.
Explores ten key issues in information technology management through use of case studies of companies with relevant experience with the issues. A basic understanding of information technology, organizational
behavior, and general management is advised

## H ADM 572 Executive Information Systems

Spring. 3 credits. Limited to juniors, seniors, and graduate students. Prerequisite: H Adm 174. Flective.

M W 11:15-12:05. R. Moore.
Students learn to use tools to integrate data from hotel transaction processing systems and build models that form the basis of decision support systems and executive information systems. Local area networks, E-mail systems, database and presentation software are introduced. Software applications are used to access networks, query distributed databases, and build numerical and graphical models. All work is on IBM PS/2's using Excel, Paradox, Forest \& Trees, and Pilot software.

## H ADM 674 Service Operations

Management
Fall. 3 credits. Limited to 25 graduate students. Prerequisite: H Adm 775 or equivalent. Elective. (Formerly H Adm 574)

T R 11:55-1:10. M. Davis.
The objective of this course is to improve the understanding of the operations function of service organizations. The course focuses on the role and nature of service operations, the relationship of operations to other business functions, and develops skills and provides techniques for the effective management of service operations. Topics include service design, bottleneck and layout analysis, capacity management, work force management, and quality management. Intended for graduate students interested in services management

## H ADM 771 Graduate Quantitative Methods

Spring. 3 credits. Professional master's requirement.

T R 2:30-3:45. M. Davis.
Explores the framework for decision making, descriptive statistics, probability, forecasting, decision analysis, and optimization.

H ADM 772 Information Technology for Hospitality Managers
Spring. 3 credits. M.P.S. Requirement M W F 10:10. R. Moore.
Familiarizes students with issues surrounding the use of information technology in
supporting hospitality operations from a guest services perspective and decision making from the viewpoint of management.

## LAW COURSES

H ADM 385 Business Law I
Spring. 3 credits. Limited to juniors, seniors, and graduate students outside the hotel school, and hotel students by permission of the instructor. Elective.

M W 11:15. J. Sherry
Designed to enable students to acquire a basic understanding of law and legal relationships in a business context. Variety of topics aid in making decisions as an executive with managerial responsibilities

## H ADM 387 Business and Hospitality

 LawFall or spring. 3 credits. Limited to juniors, seniors, and graduate students. Required. M W 9:05. J. Sherry.
An integrated, chronological presentation of contract, agency, and tort concepts as they apply to the legal aspects of hospitality management. Appropriate federal, state, and local cases, statutes, and other materials are examined. The overall objective is to recognize, analyze, and evaluate legal issues for the purpose of making and articulating appropriate decisions.

## H ADM 487 Real Estate Law

Fall and summer. 3 credits. Recommended: completion of H Adm 387 or equivalent. Elective.

M W 2:30-3:45. J. Sherry
Familiarizes students with the nature and ownership of real estate. Describes interests in real estate and how title is transferred. Acquaints students with legal aspects of marketing residential and commercial real estate, including shopping center and commercial leases, real estate syndication, and subdividing real estate for development.

## H ADM 681 The Interplay of Law and Ethics in Service Industry

 ManagementSpring. 3 credits. Limited to 50 hotel graduate students; seniors and other graduate students by permission of instructor. Prerequisites: completion of all required hotel school M.P.S. core courses, or permission of instructor. (Formerly H Adm 781)

To be arranged. J. Sherry. Involves students in ethical aspects of traditional law problems confronting service industry managers and executives within the areas of commerce, consumerism, administrative law and practice, regulation of anticompetitive marketing activities, and federal securities regulation. The impact of the corporation on traditional notions of personal social responsibility will be stressed.

## OTHER COURSES

## H ADM 191 Microeconomics for the Service Industries

Fall or spring. 3 credits. Limited to 60 hotel school students per lecture, others by permission of instructor. Required.

T R 8:40-9:55; T R 10:10-11:25.
P. DeGraba.

Introduces the basic principles of microeconomics and teaches students how they apply to managers of enterprises associated with the hospitality industry. Emphasis on methods of market segmentation in the service industries, analyzing economic incentives involved in franchise arrangements, and the nature of competition in various segments of the hospitality industry

## H ADM 490 Housing and Feeding the Homeless

Fall and spring. Variable to 4 credits. Limited to juniors and seniors. Elective.

T R 11:55-1:10. A. Hales.
Explores the public and private sector partnership in addressing the crisis of homelessness. Through lectures, class discussions, research, volunteerism, and a field placement practicum, students will explore the economic, social, and political issues of our country's growing concern with housing and feeding homeless people Students will study the history of homelessness and the strategies to prevent and alleviate the problem. The components of successful housing programs and food assistance programs will be analyzed.

Students taking the course for four credit hours will, in small groups, work with agencies providing services to homeless persons. They will analyze the agency's mission, its opportunities and constraints, identify a specific managerial challenge, and formulate an approach and solution to that challenge. This fieldwork will require approximately eight days during the semester
Students taking the course for three credit hours will research and write a term paper about some aspect of homelessness and volunteer with a service agency twelve hours during the semester.

## H ADM 491 Hotel Ezra Cornell

Fall or spring. Variable credit (maximum, 3). Prerequisite: written permission. Elective. (Formerly H Adm 603)
G. Pezzotti.

Elected board members of Hotel Ezra Cornell may receive credit for developing, organizing, and managing the April "hotel-for-a-weekend" event.

## H ADM 493 Management Intern Program I-Operations

Fall or spring. 6 credits. Open to hotel school juniors and seniors with approval of the MIP faculty committee. Prerequisites Students are expected to have completed H Adm 103 (or 105), 121, 136, 165, 174, 211, 212 (or 115), 121, 226 (or 222), 227 (or 221), 236,243 , and 255 . In addition, completion of the following courses is strongly recommended: H Adm 303 (or 301), 325 (or 321), 335,355 , and 365 . Additional course work might be required for applicants considering specialized internships. A detailed plan for the completion of all remaining academic requirements must be approved prior to acceptance into the course. Must be taken in conjunction with H Adm 494. S-U grades
only, based on six performance evaluations. Elective. (Formerly H Adm 601)

## R. Chase

## H ADM 494 Management Intern Program

 II-AcademicFall or spring. 6 credits. Must be taken in conjunction with H Adm 493. Letter grades only, based on submission of goals and objective statement, four management reports, journals, debriefing, and oral presentation. Elective. (Formerly H Adm 602) R. Chase

## [H ADM 495 Development and

 Management of Wellness in Business OrganizationsSpring. 3 credits. Limited to juniors, seniors, and graduate students. Field trip, $\$ 25-50$.
Elective. (Formerly H Adm 599) Not offered 1994-95.

T R 8:40-9:55. M. Tabacchi.
Designed to encourage future business leaders to develop and work with a healthy work force. The effect of an unhealthy work force on productivity and profitability will be studied. Business practices, corporate policies, personnel policies, and stressors in the workplace are discussed.]

## H ADM 499 Undergraduate Independent

 StudyFall or spring. Credit to be arranged.
Elective. (Formerly H Adm 600-690)
Students are afforded an opportunity to pursue independent study projects under the direction of a faculty member. Permission in writing is required prior to course enrollment. Obtain permission form from the Hotel School Student Services Office. Independent study work must be performed in the term for which it is approved, and the usual add/drop policy applies. Retroactive credit for work commenced after an academic term has ended is not allowed.

## H ADM 692 Industry Challenges and Trends

Fall. 3 credits. Limited to 15 seniors (by permission only) and graduate students. Elective.

T R 11:55-1:10. J. Clark.
A highly participative class structure will use the most current readings and case studies to discuss and analyze the future challenges and trends of the hospitality industry. Topics such as globalization, consolidation, segmentation, technology, are examples, but actual topics will be determined each term based on their perceived future importance as well as class interest.

## H ADM 699 Graduate Independent Research

Fall or spring. Credit to be arranged.
Elective. (Formerly H Adm 700-790)
Student must have in mind a project and obtain agreement from an individual faculty member to oversee and direct the study. Permission in writing is required prior to course enrollment. Obtain permission form from the Hotel School Graduate Office, Room 172, Statler.

## H ADM 793 Industry Mentor Program

Wintersession. No credits. S-U grades only. Professional master's requirement.
Interaction with a senior hospitality industry executive. Objectives are to give the student an overview of the operating dynamics of a segment of the industry, to provide a realistic awareness of day-to-day life working as an executive in the industry, and to develop an
awareness of the skills, level of integration, and other factors required for success.

## H ADM 794 Assessment and Benchmarking for Master's Students

 Fall or spring. No credits. S-U grades only. Professional master's requirement. Individualized approach to determine and actualize management development skills and to match their strengths with the appropriate hospitality industry position. Key component is an initial two-day assessment period during which students participate in a variety of activities that will provide information on the extent to which they meet performance standards in such things as group skills, leadership skills, and communication abilities Assessment and benchmarking will continue throughout the two-year master's program.H ADM 890 M.S. Thesis Research
Fall or spring. Credit to be arranged.
H ADM 990 Ph.D. Thesis Research
Fall or spring. Credit to be arranged.

## FACULTY ROSTER

## Professorial

Arbel, Avner, Ph.D., New York U. Prof. Bell, Russell A., Ph.D., Kansas State U. Assoc. Prof.
Berger, Florence, Ph.D., Cornell U. Prof.
Brownell, Judith, Ph.D., Syracuse U. Assoc Prof.
Canina, Linda, PhD., New York U. Asst. Prof.
Carvell, Steven A., Ph.D., SUNY Binghamton. Assoc. Prof.
Chase, Robert M., M.B.A., Cornell U. Prof.
Clark, John J., Jr., Ph.D., Cornell U. Prof.
Corgel, John B., Ph.D., U. of Georgia. Assoc. Prof.
Cullen, Thomas, Ph.D., Cornell U. Assoc. Prof.
Dev, Chekitan S., Ph.D., Virginia Polytechnic. Asst. Prof.
Dittman, David A., Ph.D., Ohio State U. Dean and E. M. Statler, Professor.
Enz, Cathy A., Ph.D., Ohio State U. Assoc. Prof.
Eyster, James J., Ph.D., Cornell U. Hospitality Valuation Services Professor of Finance and Real Estate
Ferguson, Dennis H., Ph.D., Cornell U. Assoc Prof.
Fulford, Mark D., M.S., Auburn U. Asst. Prof.
Geller, A. Neal, Ph.D., Syracuse U. Prof. and Richard J. and Monene Bradley Director of Graduate Studies
Hinkin, Timothy, Ph.D., U. of Florida. Assoc. Prof.
Jameson, Daphne A., Ph.D., U. of Illinois. Assoc. Prof.
Kelly, Thomas J., M.S., Cornell U. Assoc. Prof.
Kimes, Sheryl E., Ph.D., U. of Texas. Assoc. Prof.
Lundberg, Craig C., Ph.D., Cornell U.
Blanchard Professor of Human-Resources Management
Moore, Richard G., M.B.A., Cornell U. Assoc Prof.
Morgan, Michael S., Ph.D., U. of Texas. Asst. Prof.
Muller, Christopher C., M.P.S., Ph.D., Cornell U. Asst. Prof,

Mutkoski, Stephen A., Ph.D., Cornell U. Banfi Vintners Professor of Wine Education and Management

Penner, Richard H., M.S., Cornell U. Prof.
Potter, Gordon S., Ph.D., U. of WisconsinMadison. Assoc. Prof.
Rainsford, Peter, Ph.D., Comell U. Assoc. Prof.
Redlin, Michael H., Ph.D., Cornell U. Assoc. Dean and Prof.
Renaghan, Leo M., Ph.D., Pennsylvania State U. Assoc. Prof.

Sherry, John E. H., J.D., Columbia U. Prof.
Simons, Tony L., Ph.D., Northwestern U. Asst. Prof.
Stevens, Betsy, Ph.D., Wayne State U. Asst. Prof.
Stipanuk, David M., M.S., U. of Wisconsin. Assoc. Prof.
Tabacchi, Mary H., Ph.D., Purdue U. Assoc. Prof.
Tracey, J. Bruce, Ph.D., SUNY Albany. Asst. Prof.

## Adjunct, Visiting, and Other Teaching Staff

Alvarez, Roy, M.Ed., Lecturer
Blanchard, Kenneth, Ph.D., Visiting Assoc. Prof.
David, Betty B., Lecturer
Davis, Mark, D.B.A., Visiting Assoc. Prof.
DeGraba, Patrick J., Ph.D., Visiting Asst. Prof.
deRoos, Jan A.. M S.. Cornell U., Lecturer
Ferris, J. David, Ph.D., Visiting Lecturer
Gould, Shelly, B.S., Teaching Support Specialist
Hales, E. Ann, Ph.D., Senior Lecturer
Huettman, Elizabeth, Ph.D., Senior Lecturer James, Robert, M. B.A., Visting Lecturer Katz, Norman, Ph D., Lecturer
Kiner, Susan W., M.A., Lecturer
Lang, Barbara, B.S., Lecturer
Lowenhar, Jeffrey, Ph D., Visting Assoc. Prof.
Lumley, Jane, M.A., Senior Lecturer
Merberg, Elliot, B.S., Visiting Lecturer
Morey, Richard C., Ph.D., Visiting Professor
Nash, Abby, B.A., Visting Lecturer
Neuhaus, Thomas W., M.S., Lecturer
Noden, Malcolm A., Senior Lecturer
Norkus, Gregory X., M.S., Senior Lecturer
O'Connor, Therese A., M.S., Senior Lecturer
Pezzotti, Giuseppe G. B., B.S., Lecturer
Richmond, Bonnie S., M.S., Senior Lecturer
Ridley, Jane S., B.A., Teaching Support Specialist
Robson, Stephani K.A., B.S., Visiting Lecturer
Sciarabba, Andrew, B.B.A., Visiting Lecturer
Spies, Rupert, Studienassessor, Lecturer
White, Robert, A.O.S., Teaching Support Specialist
Yesawich, Peter C., Ph.D., Visiting Assoc. Prof.

## COLLEGE OF HUMAN ECOLOGY

## ADMINISTRATION

Francille M. Firebaugh, dean
Charles McClintock, associate dean
Lucinda A. Noble, associate dean; director of Cornell Cooperative Extension
Carol L. Anderson, assistant dean; associate director of Cornell Cooperative Extension

Christine Olson, assistant dean; assistant director, Comell University Agricultural Experiment Station
Brenda Bricker, director, admissions
Mary Rhodes, college registrar and director, student services

## FACILITIES

The College of Human Ecology anticipates and responds to human needs in the areas of nutrition and health, economic and social well-being, environmental design and technology, and human development through education, basic and applied research, and the extension of knowledge. The college is distinctively characterized by the quality of its research in the natural and social sciences and the design arts, a global perspective in academic programs, a preventive approach to contemporary societal problems, multidisciplinary departments and programs, development of leadership in students and citizens, and a commitment to diverse populations. Faculty and students examine individuals in relation to their family, neighborhood, workplace, and community, seeking a balance between theory and practice that will improve the quality of everyday life.

The college is housed in Martha Van Rensselaer Hall. The Division of Nutritional Sciences, an intercollege division supported jointly by the College of Human Ecology and the College of Agriculture and Life Sciences, has space in Savage Hall and in Martha Van Rensselaer Hall.

The buildings include administrative and faculty offices, classrooms, auditoriums, and lecture halls; wet chemistry and biochemistry laboratories for nutrition, food science, and textile science; experimental food laboratories; design studios and a computer-aided design laboratory; woodworking shops; experimental observation rooms with one-way vision screens and sound-recording equipment; educational television studios; and a printing and reproduction facility. Also included are learning resource centers for career planning, field and international study, a historical costume collection, a human metabolic research unit, a research animal facility, cold rooms, a constant temperature and humidity laboratory, and an early childhood research and care program

Specialized equipment for teaching and research includes biochemical and chemical instruments for spectroscopy, chromatogra-
phy, radioisotope analysis, electrophoresis, microscopy, and ultracentrifugation; physical testing equipment; and cameras, videotape, and sound recording equipment.

DEGREE PROGRAMS
Biology and Society
Consumer Economics and Housing
Design and Environmental Analysis
Human Development and Family Studies B.S
Human Service Studies
B.S.
Nutritional SciencesB.S.
Policy Analysis
B.S.
Textiles and Apparel B.S
Individual CurriculumB.S.

Degree

## DIVISION OF STUDENT SERVICES

Brenda Bricker, director, Office of Admissions
Mary Rhodes, college registrar and director Office of Student Services

Persons interested in undergraduate study in human ecology should contact the Office of Admissions, 170 Martha Van Rensselaer Hall. Those interested in graduate study should contact the graduate field representative identified among the faculty of each department. Department faculty are listed at the beginning of the course descriptions for each department
Matriculated students can find assistance with matters of academic credit, graduation requirements, academic advising, career planning and placement, and personal counseling from the Office of Student Services, N101 Martha Van Rensselaer Hall International students should contact their student counselor in the Office of Student Services.

## The Students

The College of Human Ecology undergraduate enrollment is 1,300 with 57 percent in the upper division. About 351 students are graduated each year, and last year 251 freshmen and 102 transfer students matriculated. One hundred faculty members serve as advisers for undergraduates.

The college's undergraduate admissions committee selects applicants who are academically well prepared and appear most likely to profit from the college's various curricula. Admission is selective.

Approximately 72 percent of the student body comes from New York State, with the remainder from other parts of the United States and abroad. Twenty-five percent were identified as members of minority groups in 1993.

Approximately 218 graduate students have members of the college's faculty chairing their special committees. The college awarded 64 master's degrees and 19 doctorates last year.

## ACADEMIC PROGRAMS

## Majors

Selection of a major begins with selection of career goals. In their freshman and sophomore years, students can explore ways to relate their personal interests and capabilities to their career goals. As a result, they sometimes decide to change their major. The counselor for career development in the Office of Student Services (N101 Martha Van Rensselaer Hall), and resources in the Student Resource Center (N139 MVR) can help students through their career exploration process.
Each department offers a major, and within most departmental majors there are specific options. The college also offers two interdepartmental majors. Selecting a major means choosing one option in one department. Although a student may satisfy the requirements of more than one major option, he or she is officially certified to graduate under only one. (The college urges students who satisfy more than one major or option to make note of this in the credentials they file in the university's Career Center and to seek recommendations from faculty associated with the options completed.) Majors include the following options.
Consumer Economics and Housing (CEH): The department supervises the department major and the policy analysis major.

Design and Environmental Analysis (DEA): Interior design, facility planning and management, human environment relations.

## Human Development and Family Studies

 (HDFS): Does not have separate options. Courses focus on cognitive, social, and personality development; phases of development; and family studies and life course. The department administers an honors program for selected students.Human Service Studies (HSS): Does not have separate options. Courses focus on three content clusters: human service environments, programs, and processes. A professional internship and senior seminar are required. Students may meet the requirements of an accredited bachelor's degree program in social work.

Nutritional Sciences (NS): The division supervises the department major. (By careful planning, students may also meet the minimum academic requirements of The American Dietetic Association.) The division administers an honors program for selected students

Textiles and Apparel (TXA): Apparel design, apparel-textile management, fiber science

Interdepartmental Major in Biology and Society (ID-BS).
Interdepartmental Major in Policy Analysis (ID-PA).
Individual Curriculum: It is possible to develop an individual program of study if none of the above programs fits particular educational and career objectives

## Changing Majors

Because any student's interests and goals may change as new options emerge, the college provides ways for students to change their majors. It is important for a student to discuss a possible change of major with her or his faculty adviser or counselor. If the student decides to make a change, a completed change-of-major form (available from the Office of Student Services, N101 Martha Van Rensselaer Hall) will officially record the change so that a new adviser can be assigned to the student

## Students of Mature Status

The college recognizes that students who interrupted their formal education and are returning to school have needs different from those of younger undergraduates. To facilitate the education of mature students, defined as those twenty-four years old or older at first matriculation, the college has adopted certain procedures specifically for that group. The counselor for mature students in the Office of Student Services (N101 MVR) can provide information of interest to mature students.
Mature students are permitted to enroll for as few as 6 credits without petitioning for permission and are also permitted to extend their residency beyond the normal eight terms.

It is highly recommended that mature students contact the director of the Continuing
Education Information Service, B20 Day Hall, for information on resources available through that office.

## Special Students

Students eligible for special status are those visiting from other institutions and interested in particular programs in the college; those with a bachelor's degree preparing for graduate study or jobs and careers in human ecology-related fields; or those who have interrupted their education and are considering completing degree programs. Students accepted in the non-degree status of special student may enroll for a maximum of two semesters. During the second semester of attendance, a special student must either apply for admission as a transfer student or plan to terminate studies in the college at the end of the semester.

Special students are expected to take a minimum of 12 credits each semester and to take one-half to two-thirds of their work in the state divisions of the university. Work taken while a person is classified as a special student may be counted toward the requirements of the bachelor's degree.

## Empire State Students

Occasionally a student who is completing requirements for a degree through the Empire State College Program is interested in taking a human ecology course. This can be done by registering through the Division of Summer

Session, Extramural Study, and Related Programs, B20 Day Hall. All rules of the extramural division apply, and registrations will be accepted only on a space-available basis and with the written approval of the course instructor.
At the time of registration, Empire State College students provide the extramural division with a completed copy of Empire State College's notification of cross-registration form number, SA-22, F-031, to verify enrollment in Empire State College. Such students will be charged 25 percent of the standard extramural tuition per credit.

## CONSUMER ECONOMICS AND HOUSING

The behavior of people as consumers and family members and their interactions with private markets and public sectors of the economy are increasingly important as the economy becomes more service-based. One result has been an increasing demand from business and government for trained individuals who understand consumers, families, the markets in which they deal, and how public policies affect the markets and through them consumers and families. The demand has been sufficient to elevate salaries for well-trained individuals

The consumer economics and housing major provides such training. The major combines economics with statistics, sociology, and family resource management to study how consumer markets work, how firms and consumers behave, the role governments play in consumer protection, how functions shift between households and markets as prices, incomes, social values, and legislation change, and how changes in the family affect consumer markets. Students interact with the faculty and with each other both in the classroom and in field-based learning experiences in the Ithaca area, New York City, Washington, or abroad.
Graduates in consumer economics and housing are prepared for a wide variety of consumer- and family-related positions in business and government. The major also provides an excellent foundation for further studies in economics, law, graduate business, and policy analysis.

The consumer economics and housing major is flexible. Students are assigned a faculty adviser by the advising coordinator unless the student wants a particular adviser. The earlier the decision to major in CEH is made, the greater the freedom to develop a program to meet individual educational or career goals. Transfer students are urged to discuss their plans with a faculty adviser as soon as possible. Students may make an appointment directly with an adviser or with the advising coordinator, Jennifer Gerner, 132 Martha Van Rensselaer Hall.

## DESIGN AND ENVIRONMENTAL ANALYSIS

The Department of Design and Environmental Analysis (DEA) is concerned with planning, designing, and managing interior environments to satisfy human needs. Most people
spend over 90 percent of their lives inside buildings. Those settings have substantial and far-reaching effects on the quality of our lives.
The processes for creating and maintaining the built environment face enormous challenges. These include frequent social and organizational change, technological advances, new building methods, and finite resources. The program in DEA is dedicated to preparing professionals who can meet these challenges.
Diverse faculty backgrounds and teaching approaches help students to develop their multidisciplinary problem-solving and creative abilities, aesthetic judgment, and analytical thinking. Excellent laboratory, shop, studio, and computer facilities permit exploration of innovative concepts for the design and management of interior environments. The relationship between people and their physical surroundings is explored through a combination of academic courses, field experience, and applied research. Examples of student class projects and faculty work are frequently on display in the department's gallery. The DEA Resource Center includes books, journals, newsletters, and materials samples for student use.

## Options

The department offers undergraduate education in three professional areas: interior design, facility planning and management, and human-environment relations. The interior design option is accredited by the Foundation for Interior Design Education Research (FIDER).

To take full advantage of the course sequences and electives, it is important to select an option as early as possible. This is particularly true in the interior design option. Transfer students in the interior design option may need one or two extra semesters to complete the program.

## Option I: Interior Design

The interior design option prepares students for professional careers in the planning and design of interior spaces and associated products. The program emphasizes a problem-solving approach based upon knowledge of buildings and their associated systems, furnishings and interior products, human-environment relations, and design principles. Some students combine this program with one of the other options.
Careers are available in interior design and space planning, interior architecture, facility planning, interior product design, and housing. This program also serves as an excellent preparation for graduate study in interior design, facility management, architecture, and product design

## Option II: Facllity Planning and Management

This option is designed to prepare students for professional careers in facility management. The program focuses on the planning, design, and management of facilities for large, complex organizations such as corporations, health-care institutions, research and development laboratories, and universities Facility planning and management is a basic management function that coordinates and integrates information and expertise from areas such as planning and design, real estate and business administration with human factors, ergonomics, environmental psychol-
ogy, telecommunications, and building operations for the purpose of developing and managing facilities that support individual and organizational effectiveness.
Excellent career opportunities exist in the facility management divisions of private companies, institutions, the health-care industry, and with private consulting firms offering facility management services. The program is also a good preparation for graduate study in business, planning, or one of the design disciplines and for advanced study in facility planning and management.

## Option III: Human-Environment Relations

Human-environment relations focuses on the interaction between people and their physical surroundings. This option seeks to expand understanding of how the environment affects human perception, cognition, motivation, performance, health, safety, and social behavior, and to use that knowledge to help architects, planners, interior designers and product designers to plan, design, and manage safe and effective environments. The effect of human capabilities or characteristics such as family structure, life-style, social class, and stage in life cycle on environmental needs and requirements is also a focus of the program. Career opportunities are available in design firms and in urban planning and other public agencies as well as in the facility management and product design division of private companies. Human-environment relations is good preparation for graduate study leading to a Ph.D. degree in the social sciences and a career in academic or other research-oriented settings in either the public or private sector. It can also serve as the basis for graduate study in an environmental planning or design discipline such as architecture, facility planning and management, interior design, landscape architecture, or city and regional planning, Electives in the social sciences and in research methods and statistics are encouraged.

## Academic Advising

All DEA majors are matched with a faculty adviser during their first semester by advising coordinator Michael Boyd, in E206 Martha Van Rensselaer Hall.
Consultation with faculty advisers about future goals, departmental requirements, sequences of courses, and electives inside or outside the college to meet special needs helps students develop their programs. Students majoring in interior design, especially, must begin early to plan and collect materials for a portfolio of their work, which is necessary for many positions and for application to graduate schools. Faculty advisers can make recommendations on what to include. Students are free to change advisers. Although advisers must sign the schedule card during course enrollment each term, it is the student's responsibility to keep track of his or her courses and to make sure that the program meets graduation requirements for the major and the college.

## Ownership and Exhibition of Student Work

All design work done in studios as part of an academic program is the property of the department until it has been released by the instructor. The department is not responsible for loss or theft of student work.

## HUMAN DEVELOPMENT AND FAMILY STUDIES

The programs of the Department of Human Development and Family Studies (HDFS) are concerned with how people develop throughout the life course. Of equal interest is the family as a context for individual development and as a part of the larger structure of society. An ecological perspec-tive-the person in interaction with complex biological, situational, and environmental conditions of everyday life-is featured in many departmental courses.
Major social science disciplines concemed with the development of individuals and with the structure and function of families are represented among faculty members with backgrounds in psychology, sociology, history, and education. The department's programs of instruction, extension, and research provide diverse opportunities for students to prepare for career development or to acquire the bases for graduate study. Many of the department's majors are interested in clinical psychology, counseling, law, medicine, special education, or university teaching and research that require some graduare study. Others may go directly into employment in business or industry or take bachelor's-level positions such as youth counselors, day-care workers, personnel assistants, research technicians, and social program assistants.

## Academic Advising

Every HDFS major is assigned a faculty adviser in the department, and advising conferences are required at least twice a year. An adviser helps plan the course work and consults with the student about career options. The adviser can also help students find special opportunities for individual study or for experience outside the classroom. Although advisers must sign course schedule cards, it is the student's responsibility to keep track of his or her courses and to make sure that the program meets graduation requirements for the major and the college. Students who need an adviser or who want to change advisers for any reason should check with the undergraduate advising coordinator, Joan Brumberg, or the department office, in NG14 Martha Van Rensselaer Hall.

## Curriculum

HDFS majors usually combine a broad liberal education with a more specialized focus on either a problem of human concern or a substantive area of concentration. Areas of specialization available within HDFS include infant, child, adolescent, and adult development; abnormal development; family studies; and social-personality and cognitive development. Some students combine an HDFS major with premedical or prelaw training or with specialized work in an area outside the department, such as communication arts, nutrition, business, or government.
During their first two years, students are expected to combine a variety of liberal arts courses with HDFS core courses HDFS 115 (Human Development); HDFS 150 (Families and the Life Course); and intermediate courses in phases of development, cognition, or social-personality. This encourages diversity yet ensures a common base for upper-level courses in the major. Courses within the
department vary from lectures and discussions to research and independent study.
All students are encouraged to participate in an experiential learning course in their particular area of interest. The course may focus on a naturalistic or laboratory setting (e.g., nursery school, youth detention center, retirement home) or on a research setting (e.g., interviewing, administering tests, observing behavior).
An HDFS major also takes a number of upperlevel departmental courses in particular areas as described in the Student Guide. Additional information is available in the HDFS Office of Undergraduate Education, NG14 Martha Van Rensselaer Hall.

## Math Requirement

HDFS majors are required to fulfill a math requirement by passing Education 115 or demonstrating equivalent competency by scoring 650 or higher on the math SAT examination.

## Teaching Certification Option

The cooperative Cornell HDFS-State University College at Cortland education program is designed to meet New York State certification requirements for teaching grades $\mathrm{N}-6$ while simultaneously earning the Cornell bachelor's degree in HDFS. The program requires that the student spend three years at Cornell and the senior year and part of two summers registered in absentia at SUC Cortland. Students keep their Ithaca housing, since Cortland is just 18 miles away and the onesemester teaching internship is based in Ithaca.
This highly selective undergraduate program offers an alternative to the option of seeking a master's degree in education after the undergraduate studies at Comell have been completed. Students interested in the program should discuss the merits of each option with the Coordinator of Undergraduate Education in NG09 MVR.
Course work at Comell must be carefully planned. Elective options will be somewhat limited because it will be necessary to consider the twenty-seven Cortland credits plus three education courses at Cornell as electives. More information is available in the HDFS Office, NG14 Martha Van Rensselaer Hall.

## Honors Program

The honors program leading to a Bachelor of Science degree with honors in HDFS is designed to provide in-depth research experience for students interested in graduate school and to challenge students who enjoy research. Interested students should consult the coordinator of the honors program during their sophomore year.
A grade-point average of 3.3 is recommended for entry into the program, although promising students who lack the grade-point average also may apply if they can otherwise
demonstrate their potential for honors work. Honors students must take an approved course in research design, preferably in the sophomore or junior year.
Students spend part of their junior and senior year working on a thesis under faculty supervision, completing the project before March 15 of the senior year when the
student's oral examination is held. More information is available in the department's Office of Undergraduate Education, NG14 Martha Van Rensselaer Hall.

## Language Competency

The HDFS faculty believe that competence in a foreign language is an essential liberal arts goal for the educated HDFS student. Such exposure opens another culture for exploration at both the instrumental and expressive levels, helps students understand language itself, and encourages knowledge of language as a fundamental intellectual tool and as an essential communicative asset with potential applied benefits. While this is not a graduation requirement, it is strongly recommended that HDFS majors develop competency in a second language.

The following departments teach foreign languages or literature or both in the College of Art and Sciences: Africana Studies and Research Center, Asian Studies, Classics, German Literature, Modern Languages and Linguistics, Near Eastern Studies, Romance Studies, and Russian Literature.

Work toward foreign language competency should be undertaken in the freshman and sophomore years. Please note that high school or transferred language courses can be used for advanced standing credit, even if the student does not want to do any further language work at Cornell.
Speakers of languages other than English may be awarded credit for their bilingual ability. Their English achievement is measured by the Test of English as a Foreign Language (TOEFL), a requirement for matriculation. Their performance in one other language learned outside the academic environment is measured by examination, and evidence of abilities in reading and writing, as well as speaking, is required. A maximum of 6 advanced placement credits are granted to students who demonstrate PROFICIENCY equivalent to course work at the 200 level or above at Cornell. Students may not earn credit both for PROFICIENCY in their native language and for studying English as a second language at Comell.

## Language Course Placement and Credit

Students who have had two or more years of high school study in a language may not register in any course in that language without being placed by examination. Nor may transfer students register without examination, even though they may have been given credit for language work elsewhere.
The type of examination depends on the language course and the level of achievement:

1) French, German, Italian, Russian, and Spanish courses: the standardized College Placement Test (CPT). Entering students who have not taken the CPT in high school and who want to continue their language study must take the CPT at Cornell during orientation week. Students may retake this examination at Cornell if they have studied the language a year or more since last taking the test. To do this, students register with the Academic and Career Counseling services, 203 Barnes Hall, and pay a fee.
2) Latin (all courses except 105 and 107): departmental examination.
3) Greek (all courses except 101, 104, and 111): departmental examination.
4) Arabic: departmental examination.
5) Hebrew: departmental examination.
6) Other languages: special examinations: see the professor in charge.
7) High achievement (students with a CPT score of 650 or better in French, German, Hebrew, Italian, Russian, and Spanish): the Cornell Advanced Standing Examination (CASE).

An entering or continuing student with high achievement scores should take the Cornell Advanced Standing Examination (CASE).
See section on College of Arts and Sciences, Language Requirement, for further information.

## HUMAN SERVICE STUDIES

Faculty in the Department of Human Service Studies (HSS) prepare students for a variety of careers in programs that serve individuals, families, and the community. HSS graduates work in schools, social services, Cornell Cooperative Extension, health and mental health programs, and community development agencies.
They are employed in such positions as counselors, school teachers, social workers, community educators, planners, and researchers. Many HSS graduates pursue graduate study in law, education, medicine, social work, health, and a variety of social sciences. HSS majors come from diverse backgrounds, but they share a common goal of wanting to serve the needs of others.
HSS is unique in that it integrates a broad spectrum of courses offered by several departments and colleges and focuses them for professional practice in the human services. All HSS students take courses that provide a knowledge base in three content clusters:

1. Human service environments - course choices provide students with knowledge about the working context within which the human service provider functions, including a base in social psychology, group and organizational behavior, social system perspectives, power and leadership.
2. Human service programs - courses for this requirement are selected to provide the student an introduction to historical and current program models, barriers to service delivery, developments in health, education and social welfare-all in the context of both the client and the work done by the human service professional.
3. Human service processes - courses for this requirement are designed to provide students with methods to work effectively in human service programs and environments. Courses include planning and development content, program delivery modes, decision-making processes, basic social planning methods, and program evaluation.

All students take a professional internship and an integrative senior seminar. Regardless of their specific career goals, students acquire a broad understanding of human services and
the ways they can collaborate to improve the human condition. In addition, students specialize in an area of concentration such as health, education, social welfare, policy, planning, or evaluation.

## Academic Advising

It is important for a student who is interested in majoring in Human Service Studies to declare that major as early as possible. Once that is done, students work with their assigned faculty advisers to plan course work and related educational activities. Students are free to change advisers. Although faculty advisers must sign the schedule card during course enrollment each term, it is the student's responsibility to keep track of courses and make sure that the program meets graduation requirements of the major and the college. Students may make an appointment with an adviser or with the undergraduate advising coordinator, Don Tobias, in 183 Martha Van Rensselaer Hall.

## Social Work Program

The undergraduate social work major at Comell has as its principal educational objective the preparation of students for beginning professional social work practice. In addition, the major prepares students for graduate education in social work and contributes to the enrichment of a college education by helping students understand social welfare needs, services, and issues.
The social work program is accredited by the Council on Social Work Education. Students who complete all requirements are eligible to apply for beginning-level employment as professional social workers or to apply for advanced standing in a graduate school of social work.

## TEXTILES AND APPAREL

The Department of Textiles and Apparel (TXA) focuses on the use of textiles and fibrous materials for apparel, durable and nondurable household goods, composites, geotechnical, and biomedical applications. Programs in the department, in keeping with the overall mission of the college, emphasize the use of materials to meet human needs. The curriculum includes the application of design principles, physical and materials science, economics and marketing, government policy/regulation, management of products and their delivery, and technological developments.
Practical problem-solving skills are developed in the department's laboratories and studios. Academic course work is further enhanced by field and international experiences. Gallery space provides the setting to display design work. In addition, the Comell University Costume Collection, housed in the depart ment, provides a valuable resource; items from the collection are made available to students for classroom and special-study use.

## Academic Advising

All TXA majors are matched with a faculty adviser by the advising coordinator, Peter Schwartz (201 Martha Van Rensselaer Hall). Students are strongly urged to discuss their goals, course selection and sequence, electives, and career plans with their faculty
adviser. Students in apparel design must begin early to work with their advisers to develop a professional portfolio of their work. Students are free to change advisers; changes must be recorded with the advising coordinator. Although advisers must sign the schedule card during course enrollment each term, it is the student's responsibility to keep track of his or her courses and to make sure that the program meets graduation requirements for the major and the college

## Ownership and Exhibition of Student Work

All apparel design work done as part of the academic program is the property of the department until it has been released by the instructor. Certain exceptional work may be retained by the department to exhibit for academic purposes. The department is not responsible for loss or theft of student work.

## Course Fees

No grade will be given in a course unless the course fee has been paid by the last week of classes.

## Key Policy for Apparel Design Studios

To allow design students access to studios for out-of-class work at any hour in which Van Rensselaer Hall is open, and to provide security for the studios, the department has instituted a key policy. Each student in TXA $040,145,264,367,375,425,446$, and 465 who submits a security deposit of $\$ 50$ will be given a key to the studio in which his or her class is held. In the event that any key is lost, the studio will be rekeyed, and the cost will come from the security deposit of the student who lost the key. At the end of each semester, the studio will be assessed for missing and damaged equipment. The total amount assessed will be deducted from the security deposits of all students assigned to that studio If all keys are returned and no damage or theft is reported, the security deposits will be retumed at the end of the semester. Students who do not wish to work in the studio outside of class hours may elect not to have a key and therefore will not be required to submit a security deposit. Under no circumstances will these students be admitted to the studio outside of class hours.

## Optlons

Students may select options in apparel design, apparel-textile management, or fiber science. The curriculum is based on manipulation of form, color, and the physical characteristics and structures of fabric to solve functional and aesthetic apparel problems; the application of economic and marketing principles to consumer and industry problems in the textile-apparel sector; and the study of chemical, physical, and engineering properties of fibrous structures and polymers. Depending on previous course work, transfer students may need one or two extra semesters to fulfill the requirements of the major.

## Option I: Apparel Design

The study of apparel design includes both functional and aesthetic considerations in the design of body coverings. The program emphasizes a problem-solving approach that enables the student to bring a background in apparel, textiles, and human factors to the design process.

## Option II: Apparel-Textile Management

Apparel and textile management combines the fields of apparel and textiles with those of economics, business management, and organizational policy. Students combine theory with case studies to find solutions to everyday problems. Course work is drawn from many interrelated disciplines, including textiles, apparel, economics, business management, and communication, as well as practical field experiences. This provides students with the experience of working with professionals from a wide variety of disciplines. Students often combine this option with either Option I (Apparel Design) or III (Fiber Science).

## Option III: Fiber Science

Applications for textile structures include advanced engineering composites, protective clothing for industrial and military environments, and biomedical materials, as well as the more traditional applications found in apparel and home furnishings. The fiber science option provides a strong base in mathematics and the physical sciences combined with supporting courses in engineering, consumer economics, and the social sciences.

## Career Opportunities

Graduates of programs in the Department of Textiles and Apparel have found challenging employment within the textile and apparel sector, in independent and governmentsponsored research, and in community organizations. Recent graduates are working in the fields of new product development, design, management, engineering, communications, and marketing. In addition, the program prepares students for graduate or professional study in fiber and polymer science, textile marketing, apparel design, textiles, or business and management.

## INTERDEPARTMENTAL MAJOR IN BIOLOGY AND SOCIETY

Biology and society is a multidisciplinary program for students with special interests in such problems as genetic engineering, environmental quality, food and population, the right to medical care, and the relation between biology, society, and ethics and/or public policy, as well as for students who plan postgraduate study in management, health, medicine, law, or other related fields.

Because the biology and society major is multidisciplinary, students must attain a basic understanding of each of the several disciplines it comprises, by including introductory courses in the fields of biochemistry, chemistry, mathematics, genetics, ecology, ethics, and history. In addition, majors are required to take core courses in biology and society, a set of electives, and a special senior seminar.
Course work in the College of Human Ecology must be taken in two of the following three concentrations: human development and the environment, health, or social policy and human services. The other basic requirements of the college must also be met. Programs incorporating those required courses are designed in consultation with a faculty adviser to accommodate each student's
individual goals and interests. For further information on the major, including courses of related interest, specific course requirements, and application procedures, see the Human Ecology Student Guide, available in the Office of Student Services, N101 Martha Van Rensselaer Hall.

## INTERDEPARTMENTAL MAJOR IN POLICY ANALYSIS

As our economy has become more complex, so too has the role of the public sector in our society. An understanding of governmental processes and of how public policies affect the several segments of society has become more important. Individuals with the ability to evaluate government programs critically and trace their impacts quantitatively to consumers, families, business, and industry are in demand at all levels of government and business. Supervised by the Department of Consumer Economics and Housing, the policy analysis major uses the resources of the college and the university to trace and estimate government's influence in the economy.

In the policy analysis major, the student gains a basic understanding of the role of government in the economy and the political environment in which policy is made. Students concentrate on learning the economic, cost/benefit, and statistical skills necessary to evaluate the performance of government programs and policies-consumer policy, housing policy, welfare policy, environmental policy, foreign policy, for example. Because experience in legislative, regulatory, and public administration activities is helpful in providing the context for policy analysis, involvement in Field and International Study, Cornell-in-Washington, and Cornell Abroad is encouraged. The specific requirements for policy analysis are listed under the interdepartmental majors.
Graduates in policy analysis are attractive to business and industry as well as to government because of their analytical skills in economics and statistics, and their knowledge of political processes. Students also use the major for further work in policy studies, law, and business administration.

The policy analysis major is flexible and allows individual program planning. The faculty adviser assigned by the undergraduate advising coordinator can help develop a program to meet individual educational and career goals. This is particularly important in constructing the appropriate policy concentrations. Transfer students are urged to contact their faculty adviser as soon as possible. An appointment may be made directly to talk either with an adviser or with the advising coordinator, Jennifer Gerner, 132 Martha Van Rensselaer Hall.

## INDIVIDUAL CURRICULUM

A student who has educational and professional objectives that cannot be met satisfactorily within the framework of existing majors in the College of Human Ecology may petition to develop an individual curriculum. To be approved, the curriculum must be within the focus of the college and be interdisciplinary in
design, include at least 40 credits in human ecology courses, and not exceed the nommal number of credits allowed in the endowed divisions. A student develops an individual curriculum in consultation with faculty advisers from at least two subject-matter fields and the program coordinator.
Such a program of study should encompass a substantial part of the student's undergraduate education and must include at least three semesters. For this reason, a request to follow an individual curriculum should be made as early as possible and must be made before the second semester of the junior year.
If an individual curriculum seems advisable, Patti Papapietro, the individual curriculum coordinator in the Office of Student Services, N101 MVR, will provide direction in formally developing a program of study. Although the individual curriculum coordinator must sign the course enrollment schedule during course enrollment each term, it is a student's responsibility to follow the curriculum as planned or to have any necessary revision approved in writing by his or her advisers and the program coordinator in advance of the program change.

## SPECIAL OPPORTUNITIES

Several programs allow students to receive academic credit for fieldwork and internship experience, study abroad, study in absentia, college-wide certificate programs, and joint programs with other schools and colleges at Cornell. Students may petition the college registrar to have concentrations that are formally recognized elsewhere within the university noted on their transcripts, when accompanied by appropriate documentation from the program.

## The Urban Semester Program in New York City

The Urban Semester Program is a set of creditbearing courses spanning the academic yearfall and spring semesters, winter intercession, and the summer session. During the fall and spring semesters, students focus on multicultural issues in urban affairs. Each term, course work in two separate seminars investigates multicultural concepts as they are implemented in professional, community, or public policy settings. Students study the possibilities and barriers that a multicultural society presents and their articulation with professional practices, cultures, and identities. Students intern between 20 and 30 hours each week. The three-week winter (intercession) course enables students to explore community service opportunities through fieldwork in New York City by working full time in community-based organizations. Over the course of an eight-week summer semester, students carry out research projects on the nature of professional practice by interning full time in settings of their choice. Students who seek to contribute to their own communities are encouraged to participate in any of the program offerings. For further information, contact the Urban Semester Program at (212) 746-2273, or the Student Resource Center, N139 Martha Van Rensselaer Hall

Field and internship placements also are available through each academic department in the college, in the Ithaca area, Albany,

Washington, Boston, and elsewhere. Students should contact their faculty adviser or the Student Resource Center, N139 Martha Van Rensselaer Hall, for more information.

## International Study

Study abroad allows students to focus on international issues and intercultural understanding through sponsored programs of study abroad for which academic credit is available. Course work in a foreign institution will, in general, be planned to increase knowledge of the people and institutions of the country concerned; fieldwork may provide guided experience in family, community, or agency situations of the country concerned and in an area related to individual student interest in human ecology
Opportunities for study abroad are available for human ecology students in several ways: through Comell Abroad, through U.S. collegesponsored programs abroad, and through direct enrollment in a foreign university. In all cases, students remain registered at Cornell during the overseas study, and their study abroad will be credited as part of their Cornell degree program. Application packets for study abroad can be obtained from and should be submitted to the study-abroad adviser in the Office of Student Services, N101 Martha Van Rensselaer Hall. The Student Resource Center, N139 Martha Van Rensselaer Hall, has catalogs and other information about study abroad opportunities.

## Gerontology Concentration

## Gerontology Certificate Program

This program develops students' understanding of and competence in dealing with the processes and issues of aging. Study in gerontology provides practical experience and preparation for professional work. Students draw on resources of several departments and colleges at Comell and Ithaca College to shape a curriculum suited to their professional goals and interests. Contact the Gerontology Coordinator, Life Course Institute, 259 Martha Van Rensselaer Hall.

## Teacher Certification in Home Economics

Students can combine any major in the college with additional course work that leads to home economics teacher certification (kindergarten through twelfth grade) in New York State and a number of other states. Interested students should contact the Office of Student Services in N101 Martha Van Rensselaer Hall.

## University Programs

## Africana Studies and Research Center

Courses taken in the Africana Studies and Research Center (ASRC) may be used to meet some of the distribution requirements of the college. Up to two courses or 8 credits of such courses may be applied toward the 12 additional credits in natural and social sciences (section I-C of the graduation requirements) or toward the 9 additional credits in communication, analysis, and the humanities (section II-B). This allowance is in addition to the freshman writing seminar credits that may be taken in ASRC. Other courses taken in the center count as endowed division electives (area IV).

A list of ASRC courses approved to meet distribution requirements or as electives is available in the Office of Student Services (N101 Martha Van Rensselaer Hall).

## Double-Registration Programs

Johnson Graduate School of Management
A limited number of highly qualified students from Cornell undergraduate divisions, including human ecology, may be accepted by the Johnson Graduate School of Management after the junior year. Students need the approval of the admissions office and the registrar in the College of Human Ecology Accepted students should be aware that if the management course work taken in the senior year is in excess of the 21 additional credits allowed in the Cornell endowed divisions, they will be charged for the additional credits on a per-credit basis. Students entering this program must also complete requirements for the degree and major in Human Ecology.

## Law School

A small number of highly qualified applicants may be admitted to the Comell Law School after only three years of undergraduate education. The requirements for admission under these circumstances are more stringent than for acceptance after four years of undergraduate study. Applicants must present outstanding qualifications and strong professional motivation. The junior-year applicant follows the ordinary application procedures for Cornell Law School admission. Interested students should contact the Law School director of admissions to discuss the extraordinary admissions criteria. Because students accepted to this program will spend their senior year in the Cornell Law School. they need to plan ahead to ensure that distribution requirements for the B.S. degree from the College of Human Ecology will be met. Successful applicants need the approval of the college registrar.

## Cornell Medical College

A limited number of highly qualified students from three Comell divisions, including the College of Human Ecology, may be accepted by the Cornell Medical College after the junior year. To be considered for this program, the student must have completed 105 credits toward graduation by the end of the junior year. Students also need to plan ahead to ensure that distribution requirements for the bachelor of science degree will be met. Accepted students receive 15 credits toward the B.S. degree from their first year of study at the College of Medicine. Interested students should contact the Health Careers Program office in 103 Barnes Hall.

## Off-Campus Programs

## New York State Assembly Internships

A limited number of session internships with the New York State Assembly are available in spring semester. Intern applicants must be sophomores or higher and enrolled in New York State colleges or universities. Human ecology students apply to the program through the student's major department. The New York State Assembly also sponsors a summer internship. Further information about internship programs may be obtained through the Office of Student Services, N101 Martha Van Rensselaer Hall.

## Cornell-in-Washington

For information on Cornell-in-Washington, see page 19 .

## Ithaca College

Full-time undergraduate students at Comell may petition to enroll in courses at Ithaca College. Students pay regular tuition to Comell and only special fees to Ithaca College, if any are charged. Students are allowed to register for one course a term and may take no more than 12 credits in four years. Exceptions will be granted to Comell students enrolled in methods and practiceteaching courses at Ithaca College

Cornell students are eligible to register only in Ithaca College courses that are relevant to their program and that do not duplicate Cornell courses. Acceptance of Cornell students into Ithaca College courses is on a space-available basis. Participation in this program is not guaranteed, and Ithaca College has the right to accept or reject students for any reason it deems appropriate. The program is available only during the fall and spring semesters.
For further information students should contact the college registrar, N101 Martha Van Rensselaer Hall.

## Wells Collage

Full-time undergraduate students at Cornell may petition to enroll in courses at Wells College. Students pay regular tuition to Cornell and only special fees to Wells College, if any are charged. Students are allowed to register for one course a term and may take no more than 12 credits in four years. Exceptions will be granted to Cornell students enrolled in methods and practice-teaching courses at Wells College.
Cornell students are eligible to register only in Wells College courses that are relevant to their program and that do not duplicate Cornell courses. Acceptance of Cornell students into Wells College courses is on a space-available basis. Participation in this program is not guaranteed, and Wells College has the right to accept or reject students for any reason it deems appropriate. The program is available only during the fall and spring semesters.

For further information students should contact the college registrar, N101 Martha Van Rensselaer Hall.

## PLANNING A PROGRAM OF STUDY

## Academic Advising

Students who choose to major in a particular department are assigned to a faculty adviser by that department's advising coordinator. The advising coordinator can help match a student's needs with the special interests of a faculty member. Students may change advisers as their own interests change and should see the advising coordinator to discuss such a change. Faculty advisers, and counselors in the Office of Student Services (N101 Martha Van Rensselaer Hall), are available to discuss course requirements and sequences, and electives inside or outside the college, as well as future goals and career opportunities. Although advisers must sign the course enrollment schedule card during course enrollment each term, it is the student's
responsibility to make sure that her or his program meets graduation requirements for the major and the college. Advising coordinators in each department are available to answer questions about the advising system and the undergraduate major. Students who are exploring alternative majors should work closely with college counselors who are available for planning and referral to department resource faculty.

## Completing Graduation Requirements

A summary of record is kept for each student in the Office of Student Services, N101 Martha Van Rensselaer Hall. At fall registration each continuing student receives a copy showing which major and graduation requirements have already been met. It is important to check this summary and to bring any questions to the attention of staff members in the Office of Student Services. Although a student may complete the requirements of more than one major, he or she is officially certified to graduate under only one.

## Electives

Students have individual objectives in choosing courses beyond the minimum requirements of the major. The university is diverse; the departments, centers, and special programs numerous; the fields of study almost unlimited. Counselors and department advisers are available to discuss which courses may interest students and round out their educations.

Students should consult the index of this Announcement for information on where different subjects are taught in the university. Some subjects are taught in more than one division of the university.

## Foreign Language Study and Placement

Students who studied a foreign language before coming to Cornell and who want to continue must take either the College Entrance Examination Board (CEEB) achievement test in that language or a departmental language placement test. The latter is given during orientation week in September and again in December, January, and May. Students in human ecology who plan to work with non-English-speaking people in this country or abroad often find it necessary to be proficient in another language. Students who wish to study abroad may find that many study-abroad programs in non-Englishspeaking countries require the equivalent of two years of college-level language study. For more detailed information, see the section "Advanced Placement of Freshmen."

## GRADUATION REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

## General

Students applying as undergraduates who do not have the required academic unit in biology, chemistry, or physics are required to show evidence of having met this deficiency before matriculation in the college.

Freshmen and sophomores are required to enroll in at least one human ecology course per semester.
To graduate, students need to

1) meet college credit and distribution requirements,
2) complete requirements for a major,
3) achieve a cumulative average of 1.7 (C-) or better,
4) fulfill residency requirements, and
5) complete two terms of physical education within the first two semesters

## College Requirements

These are the general areas of study and specific courses and credits required of every student in the college. The major you choose may require specific courses listed below or may leave you free to choose among certain courses listed there
I. Natural and Social Sciences ( 24 credits)
A. Natural sciences ( 6 credits) selected from Biological Sciences 101-103,102-104, 105-106, 109-110; Chemistry 103-104, 207-208, 215-216; and Physics 101-102,112, 201 or 202, 207-208. Biological sciences courses must be taken sequentially.
B. Social sciences ( 6 credits) selected from economics (including CEH 110,111 but excluding Agricultural Economics 221 and 310); psychology (including Education $110,311,317$; DEA 150; HDFS 115, 216, 217, 218, 219); sociology (including rural sociology, CEH 148, and HDFS 150). Do not take both Economics 101 and CEH 110; Economics 102 and CEH 111; Psychology 275 and HDFS 360; Rural Sociology 101 and Sociology 101; or Sociology 243 and HDFS 150; they are equivalent courses.
C. Additional credits ( 12 credits) selected from any subjects listed above or from courses in anthropology (except archaeology); Astronomy 101 or 102; biochemistry; microbiology; genetics and development; Geological Sciences 101; and government
II. Communication, Analysis, and the Humanities ( 15 credits)
A. Fresbman writing seminars ( 6 credits) selected from courses listed in the freshman writing seminar brochure.
B. Additional credits (9 credits) selected from art; communication; comparative literature; computer science; drawing; English; ancient or modern foreign languages; history; history of art; history of architecture; mathematics; music; Natural Resources 407; philosophy; statistics (students should not take both Industrial and Labor Relations 210 and Agricultural Economics 310, since the courses are substantially the same); theatre arts; DEA 101,111, or 115; HSS 292; TXA 117, 125, 375; and selected ASRC courses (list available in the Office of Student Services, N101 Martha Van Rensselaer Hall).
III. Human Ecology ( 40 credits)
A. Requirements for the major (the number of credits required varies by major and option).
B. Other credits in Human Ecology (15) The following specific qualifications apply:

- No credit for HE 00 courses, HE 100, HE 101 , or any 403 course can be counted to fulfill this requirement.
- A maximum of three credits of special studies credits ( 400,401 , and 402 ) or of any internship credit can be used.
- A maximum of six credits of HE 408 can be used.
Transfer students (external and internal) can meet this requirement by completing 15 credit hours comprised of transfer credit and credit earned in the college, or comprised of credit hours all taken in the college and prorated according to the student's status at matriculation. (Refer to "Policies Related to College Requirements" in the Human Ecology Student Guide for details of this policy.)


## All students, including internal and external transfer students, must complete a total of 40 credits in Human Ecology.

IV. Additional Credits ( 41 credits)
A. Requirements for the major (number of credits varies from 0 to 15 credits).
B. Electives (number of credits varies from 26 to 41 credits).
Credit requirements in this section are met through courses in the state divisions of Cornell:

- College of Human Ecology (in addition to courses in sections I, II, and III)
- College of Agriculture and Life Sciences
- School of Industrial and Labor Relations
- College of Veterinary Medicine
and through courses in the endowed divisions of Cornell:
- Africana Studies and Research Center
- College of Architecture, Art, and Planning
- College of Arts and Sciences
- College of Engineering
- School of Hotel Administration
- Johnson Graduate School of Management

Courses in the endowed divisions in this section may not exceed a total of 21 credits.

## V. Physical Education ( 2 credits)

Students who have successfully fulfilled these requirements should have completed at least two terms of physical education in their freshman year.

## Related Policies

College course requirement. Freshmen and sophomores are required to enroll in at least one course in the College of Human Ecology each semester. Students who fail to comply with this requirement will be reviewed by the Committee on Academic Status for appropriate action.
Section II. Students who score 4 or 5 on the Princeton AP Exam are awarded 3 credits in English. Students who score 5 on the Princeton Exam are exempt from one freshman writing seminar in addition to the 3 English credits awarded.

In sections I, II, and III, the required credits listed are the minimums; credits taken in excess of those minimums (section I, 24 credits; section II, 15 credits and section III, 40 credits) count toward electives (section IV, 41 credits).
In sections I and II, courses specified by the major to meet the requirements in the sections may either be used as meeting the credit requirements in those sections or be applied toward the additional credits in section IV.
Section IV. There is no limit to the number of credits that may be taken in the state divisions of Cornell, and therefore students may choose to take additional state credits and graduate with more than 120 credits.
Credits in the endowed divisions in this section may not exceed 21. Any course taken in an endowed division for which a grade of $F$ or $U$ is received will be counted as part of the 21 endowed credits allowed.
Elective credits eamed in Cornell's endowed divisions during summer session, in absentia credits, and transfer credits are counted as credits eamed in the state divisions and therefore do not count as part of the 21 credits allowed in the endowed divisions in meeting the requirements of this section.
Not more than 21 credits in section IV may be taken in the endowed divisions of the university except under both of the following conditions:

1) The students must have senior status (must be in the final two semesters prior to graduation);
2) Payment must be made for each credit taken in excess of the 21 allowed, whether or not the courses are passed. For the fee per credit charge, students should call the Office of the Bursar.

## Related Policies for Transfer Students

Section 1-A. Transfers who enter human ecology programs in consumer economics and housing, design and environmental analysis, human service studies (with the exception of the social work program), and policy analysis can satisfy the College of Human Ecology's natural science graduation requirements with any course(s) taken to meet a former college's natural science requirements as long as the course(s) transferred dealt with matter, energy, and their interrelationships and transformations. Courses in areas such as psychology and mathematics are not included, even though courses in these areas may have been taken to meet a former institution's natural science requirement.
Section II-A. Transfer students should have taken at least 6 credits in courses in English composition or in courses requiring substantial writing and offering instruction in writing equivalent to that offered in the freshmen writing seminar program at Cornell. Students who have not fulfilled this requirement before transferring must fulfill it after matriculation.
Section III-B. External transfer students can meet the requirement for course work outside the major in the College of Human Ecology by completion of either of the following:

1) 15 credits of work, outside their department, comprised of transfer credit and credit earned in the college,
2) credits all taken in this college (no transfer credit is allowed to meet this requirement), on the basis of the status of the student's matriculation and prorated as follows:

Cornell
Human Ecology
Credits to Satisfy
Work outside
the Major
Status at Matriculation
Freshman (1-25 transfer credits) 15
Sophomore (26-55 transfer credits) 12
Junior (56-85 transfer credits) 9
Senior (86-120 transfer credits) 9
Transfer students from other Cornell divisions are required to take the full 15 credits outside the major.
Note that transfer students are still responsible for completing a total of 40 human ecology credits under section III.
Section IV. Transferred credits for courses applied toward electives do not reduce the 21 Cornell endowed credits that students are allowed. Courses with a passing grade below C- will not transfer to meet human ecology degree requirements.
Section V. Transfer students who have had the equivalent of two semesters of college (and therefore enter as sophomores) are not required to take physical education at Comell, regardless of whether they took physical education at their first college. Exemption or postponement for medical reasons must be cleared by Gannett Health Center. For further information about exemption from, or postponement of, physical education, students should consult the college registrar, Mary Rhodes, in N101 Martha Van Rensselaer Hall.

## Related Policies for Freshmen

Section $V$. Freshmen are required to take two semesters of physical education during their freshman year. Freshman transfer students entering with 12 or more credits have their physical education requirement reduced to one term.

## Residency Requirements

All college curricula are planned to fit within an eight-semester program. An average schedule of 15 credits a semester (in addition to physical education) is considered standard, and if pursued for eight semesters will provide the credits needed for graduation. If the student completes all the requirements-for the major, for distribution, for total credits, and for cumulative average-in fewer than eight semesters, the degree may be conferred at the end of the semester in which the last requirements are met. Students who plan to receive their degrees early should notify the college registrar at the beginning of the semester so that their names can be placed on the list of degree candidates.
Sometimes a student (particularly a transfer student) may need an additional semester to complete a program. To register for a semester beyond the eighth, the student submits a petition to the college registrar in the Office of Student Services, N101 Martha Van Rensselaer Hall. The petition should detail the reasons for wanting to enroll for the extra semester and include a list of courses planned for the additional semester. Such
requests are usually granted when there appears to be no feasible way for the student to complete the professional curriculum or the degree requirements without the extra semester.

Freshmen entering the college with 15 transfer credits have seven semesters in which to complete the degree. Transfer students must complete at least 60 credits at Cornell.

Mature students (those at least twenty-four years old at the time of matriculation) are not required to petition the college registrar for approval to study beyond the usual eight semesters.

## Exemptions from Requirements

Students who want an exemption from a specific graduation or major requirement may petition, and approval may be given under certain circumstances. Full information about the petition process is given in the Human Ecology Student Guide. Petition forms are available in the Office of Student Services, N101 Martha Van Rensselaer Hall.

## PROCEDURES

## Course Enrollment and Registration

Course enrollment occurs in two steps. During enrollment students request courses, and at university registration students complete information forms, receive their schedules, and have their university IDs validated.

Students are expected to complete course enrollment during specified times each semester. It is the student's responsibility to learn the dates of course enrollment.

Freshmen and transfer students enrolling for the first time in the university in the fall term enroll in their courses during the summer before they arrive on campus. Enrollment materials are mailed to new students in May. Because new students starting at midyear do not have an opportunity to enroll in courses until after they arrive on campus, the college tries to reserve places for them in human ecology courses. The orientation schedule given to all new students lists a specified time to enroll in such courses.

Continuing students enroll for fall semester in March or April, and enroll for spring semester in October or November preceding the beginning of the term. They are notified of course enrollment dates by poster and by notices in the Comell Daily Sun. Course enrollment materials are available for continuing students in the Office of Student Services, N101 Martha Van Rensselaer Hall. For the first three weeks of the term, students have an opportunity to add courses in other divisions of the university as well as in human ecology.

## Enrollment

Before or during course enrollment, students discuss their program plans with a department adviser or a college counselor in the Office of Student Services. For their advising sessions, students need the list of last-minute changes issued by the college registrar, and the Course and Time Roster issued by the university registrar. Students must have their course enrollment schedule signed by their depart-
mental major faculty adviser, or if they have not declared a major, by a college counselor.

Students file completed enrollment materials by the announced deadline in the Office of Student Services, N101 Martha Van Rensselaer Hall.

The following policies and procedures apply to course enrollment.

## Permission of Instructor

Certain courses may be taken only with the permission of the instructor as indicated in Cornell University: Courses of Study. For such courses, students must obtain the instructor's permission before filing their course enrollment form during the pre-enrollment period. Instructors indicate their permission to take the course by signing the student's course enrollment form.
Students interested in taking a course in the Department of Art in the College of Architecture, Art, and Planning are required to register with the departmental secretary ( 100 Olive Tjadan Hall) before enrolling in the course. Seniors who want to take an elective course in the Johnson Graduate School of Management are required to obtain permission of the instructor on a course authorization form that the student then files with that school's registrar in 312 Malott Hall.

## Special Studies Courses

Each department in the College of Human Ecology (CEH, DEA, HDFS, HSS, DNS, and TXA) offers special studies courses that provide opportunities for students to do independent work not available in regular courses. One of those courses, designated 300, Special Studies for Undergraduates, is intended primarily for students who have transferred from another institution and need to make up certain course work.
The other special studies courses are 400, Directed Readings; 401, Empirical Research; and 402, Supervised Fieldwork. Those courses are normally taken by upperclass students, and work is supervised on an individual basis by a faculty member in the department in which the course is offered. It is important for students to use the appropriate course number $(300,400,401$, or 402$)$ for a special project.
A student who wants to take special studies courses talks with the faculty member under whose supervision the study would be done and then prepares a plan of work. If the faculty member agrees to supervise the study, the student completes a multicopy special studies form, a multicopy description of the study to be pursued. The student obtains the signatures of the instructor and the department chair as well as the student's department adviser before submitting it to the Office of Student Services. The student also must complete a course registration form in the Office of Student Services. Special studies forms and instructions are available in the Office of Student Services, N101 Martha Van Rensselaer Hall.

To register in a special studies course taught in a department outside the college, students should follow the procedures established for that department.

## Course Loads

The normal course load in the college ranges from 12 to 18 credits. During the course enrollment period no student may enroll for more than 15 credits or five courses, whichever is greater, without special permission from the college registrar. To receive permission, a student attaches a note to the course schedule, citing reason(s) for carrying a heavier load, before submitting it to the Office of Student Services, N101 Martha Van Rensselaer Hall.

Credits beyond 15 may be added during the first three weeks of the semester without special permission.

Students should avoid planning excessive work loads; the time required to keep abreast of courses tends to increase as the semester progresses. Courses cannot be dropped after the seventh week of classes without petitioning, so students should try to avoid the need to drop courses.
Except for those with mature student status, students must carry at least 12 credits (exclusive of physical education). In special cases, a student may petition to carry between 8 and 12 credits. Forms for petitioning and advice on how to proceed are available from the Office of Student Services, N101 MVR.
Except for mature students, it is seldom possible to have tuition prorated if a student carries fewer than 12 credits during a semester. (See the college registrar for more information.)
Students of mature status may carry 6 to 12 credits without petitioning and may have their tuition prorated. However, at the beginning of each term, mature students planning to take a light course load should pick up a proration of tuition form from the Office of Student Services, fill it out, have it signed by the college registrar, and return it to the bursar's office in Day Hall.

## Oversubscribed Courses

Enrollment in many human ecology courses is limited. When a course is over enrolled, students are generally assigned on the basis of seniority or by criteria defined for each course as listed in Cornell University: Courses of Study. Student's professional goals may be considered. Those students not admitted to a course may be placed on a waiting list.

## Late Course Enrollment

Students who do not file a course enrollment form during the course enrollment period usually must wait until the beginning of the semester to enroll. Extensions are rarely granted and usually only for documented illness.
Students who do not meet the deadline for any reason should see the college registrar in N101 MVR as soon as possible. The college registrar can explain available options on course enrollment procedures under such circumstances.

## University Registration

University registration for human ecology students occurs in the auditorium of MVR Hall during the week preceding the start of classes. The Office of the University Registrar announces the specific times of registration.
At registration, students first have their ID validated and then pick up a college

## HUMAN ECOLOGY•1994-1995

registration card at the university table immediately inside the door of MVR auditorium.

Next, students fill out the college registration card and proceed to the college table where they submit their college registration card; in return, they receive a computer printout of courses for which they are officially enrolled.
Important: Students are responsible for checking their course schedule for accuracy of course numbers, credit hours, and other data. Students must correct errors immediately. Procedures for correcting enrollment errors as well as making changes for other reasons are described below under Course Enrollment Changes.
Students also receive a Course and Room Roster which indicates the locations of their classes.

During university registration in the fall semester, each continuing student receives a copy of his or her summary of record from the Office of Student Services. This summary shows graduation and major requirements that the student has completed. Students are responsible for assuring that their academic program meets graduation requirements. They resolve any questions about graduation requirements with the appropriate staff person in the Office of Student Services. Students may direct questions about their academic programs to their faculty adviser or to a counselor in the Office of Student Services.

## Late University Registration

A student clearing his or her financial obligations after the deadline date on the bursar's bill is considered late. Late registrants are assessed a finance charge on the bursar's bill starting from the date the bill is due.

All students must be registered according to university policy before the end of the third week of classes. If for any reason a student registers after that time, there will be a $\$ 200$ additional charge.
After completing late university registration, the student submits the college registration card to the Office of Student Services and receives a computer printout of the courses for which he or she is officially registered.
Students who fail to register by the third week of the term will be withdrawn from the university. Sbould uithdrawn students wish to return, they must reapply through the admissions committee.

## Course Enrollment Changes

## Deadlines

- During the first three weeks of the term, courses may be added or dropped.
- From the fourth through the seventh week of the term, course changes may be made with the permission of the instructor (instructor's signature on the add/drop form).
- From the fourth week of the term, instructors have the right to consider students' requests for course changes on an individual basis or to announce at the beginning of the term a specific date between the fourth and seventh weeks beyond which they will no longer approve course changes.
- From the eighth week of the term, no course change may be made without petitioning for approval. Petitions are usually granted only in circumstances beyond a student's control (for example, illness). A student petitioning for medical reasons should provide substantiating medical evidence with the petition.
- A student who submits a petition after the seventh week of the term requesting permission to drop a course must attach a statement from his or her faculty adviser to that petition indicating whether or not the advisor supports the request.
- After the seventh week of the term, any student granted permission to drop a course after petitioning will automatically receive a grade of $\mathbf{W}$ (Withdrawn), and the course will remain on the official transcript


## Deadlines for Half-Term Courses

Students may drop half-term courses within the first three-and-one-half weeks of the course. Students may add classes after the first week of classes only with the permission of the instructor. After the first three-and-onehalf weeks, students must petition to drop the course. (See Petition Process, General Petition Form for information on the procedure.)

## Procedures

It is to the student's advantage to make any necessary course enrollment changes as early in the term as possible. Adding new courses early makes it easier for the student to keep up with course work. Dropping an unneeded course early makes room in the course for other students who may need it for their academic programs.
Ideally, students evaluate their course work load carefully at the beginning of the term. If, in the first week or two, the instructors do not discuss the amount of material to be covered and the extent of student assignments, students need to ask about course requirements.
Some procedures required for course enrollment are also required for course enrollment changes. For example, the instructor's permission must be obtained for a course requiring it, and the same forms for special studies courses must be completed. Aside from the procedures listed below for course enrollment changes, all course change forms for nutritional science majors must be signed by the faculty department adviser.
Waiting List: The Office of Student Services maintains waiting lists for students who want to enroll in courses that have been filled. Waiting lists are maintained on a first-come, first-served basis without regard to seniority or other factors. To keep their names active on a waiting list, students must check in person every 48 hours with the Office of Student Services; names of students who do not check in are automatically dropped from the list.
Limited enrollment classes: Students who do not attend the first two class sessions of courses with limited enrollment may be dropped from the course list. Students can avoid being dropped from a class by notifying the instructor that unavoidable circumstances have prevented their attendance.

There is no charge for course changes. To make course changes during the first three weeks, a student takes the following five steps:

1) Obtains a course-change form from the Office of Student Services, N101 MVR.
2) Completes the form and takes it to the appropriate office for signature: for human ecology courses, the forms should be taken to the Office of Student Services; for courses outside the college, the forms should be taken to the appropriate departmental office in the other college.
3) Makes sure that his or her name is added to the list of enrolled students for a course being added, or removed from the class list for a course being dropped. Asks the person recording the change to sign the form.
4) Submits all signed forms to the Office of Student Services, including the forms for out-of-college courses. Changes are not completed until the signed forms are filed in that office. If a student does not drop a course that he or she no longer attends, the student is in danger of receiving an $\mathbf{F}$ in the course.
5) Receives carbon copies of each course change form at the time it is submitted. It is important for students to keep these copies to verify later that the forms were filed.
To make course changes during the fourth through seventh weeks of the term, a student takes the following steps:
6) Completes the five steps listed above for changes made during the first three weeks.
7) Obtains the instructors' signatures on the course change form for human ecology courses.

To make course changes after the seventh week of the term, a student must file a general petition form. (See the section below, Petition Process.) Students are expected to attend classes and to do assigned work until the petition has been formally approved or denied.

## In absentia Study

Under certain conditions, credit toward a Cornell degree may be given for in absentia study, that is, study done at an accredited institution away from Comell after the student matriculates in the College of Human Ecology To be eligible for in absentia study, a student must be in good academic standing and must receive permission in advance from the college registrar. Students not in good standing may study in absentia but will not receive transcript credit until they have been returned to good standing by the Committee on Academic Status. In some cases, students may petition for in absentia credit after the work has been completed, but there is no guarantee that such credit will be awarded without advance approval.
In absentia petition forms are available in the Office of Student Services, N101 MVR. The student completes the form, has it signed by his or her faculty adviser, attaches catalog descriptions for the courses that will be taken, then submits the form to the Office of Student Services, N101 MVR.

Students receive notice of the petition decision by means of a letter from the college registrar.

A student may take up to 15 credits in absentia as long as the courses do not duplicate courses already taken and the in absentia courses are applicable to the requirements of the college. A student's petition for more than 15 credits in absentia may be allowed under the following conditions: (1) the work taken represents a special educational opportunity not available at Cornell, (2) it relates to the student's particular professional goals, and (3) those goals are consistent with the focus of the college. The in absentia petition form is used to request more than 15 credits in absentia.
The college registrar requests approval from the appropriate department if a student wants to apply in absentia credit to requirements for his or her major. If in absentia credit is sought for a modern foreign language in which the student has done work, approval by the Department of Modern Languages and Linguistics (College of Arts and Sciences) must be obtained. The department will recommend the number of credits the student should receive and may require the student to take a placement test after returning to Comell.
The student is responsible for having the registrar of the institution where in absentia study is taken send transcripts of grades to the Office of Student Services in the College of Human Ecology. Only then will credit be officially assessed and applied to the Comell degree. Credit for in absentia study will be granted only for those courses with grades of C- or better. Only credits (not course names and grades) for in absentia study appear on the Cornell University transcript
A student who holds a Regents' or Children of Deceased or Disabled Veterans Scholarship may claim that scholarship for study in absentia if the study is done in a college in New York State and if it is for a maximum of 15 credits acceptable to the College of Human Ecology
The rules regarding study in absentia apply to transfer students with the additional stipulation that at least 60 credits must be taken at Cornell. At least 40 of the 60 credits must be in the College of Human Ecology at Cornell unless the student has transferred equivalent human ecology credit. (No more than 20 credits of equivalent credit may be applied to the 40 credits required in human ecology course work.)

## Leaves of Absence

A student may request a leave of absence before the beginning of the semester or during the first seven weeks of the semester for which a leave is sought. A leave may be extended for a second semester by requesting an extension in writing from the Office of Student Services.

A student considering a leave of absence is urged to discuss plans with a counselor in the Office of Student Services. The counselor can supply the necessary forms for the student to complete and file with the Office of Student Services, N101 MVR.

Requests for a leave of absence received after the first seven weeks of the semester, or
requests for a leave of absence from students who have already had two semesters' leave of
absence, will be referred for action to the Committee on Academic Status. The committee may grant or deny such requests, attaching conditions as it deems necessary. Leaves of absence after the first seven weeks are generally granted only when there are compelling reasons why a student is unable to complete the semester, such as extended illness.
A student who requests a leave of absence after the first seven weeks is advised to attend classes until action is taken on the petition. A student whose petition for a leave of absence is denied may choose to withdraw or to complete the semester.
The academic records of all students who are granted a leave of absence are subject to review, and the Committee on Academic Status may request grades and other information from faculty members to determine whether the student should return under warning or severe warning or in good academic standing.

## Withdrawal

A withdrawal is a termination of student status at the university. Students may voluntarily withdraw at any time by notifying a counselor in the Office of Student Services and filing a written notice of withdrawal in the Office of Student Services. A student considering such an action is urged to discuss plans with a counselor in the Office of Student Services, N101 MVR.

In some instances a student may be given a withdrawal by the college registrar. A student who leaves the college without an approved leave of absence or does not return after the leave has expired will be given a withdrawal after the seventh week of the term in which he or she fails to register.
A student who has withdrawn from the college or who has been given a withdrawal by the college registrar and who wishes to return at a later date must reapply through the Committee on Admissions for consideration along with all other applicants for admission. If the student was in academic difficulty at the time of the withdrawal, the request for readmission will be referred to the Committee on Academic Status for consideration, and that committee may stipulate criteria under which the student may be readmitted to the college.

## Petltion Process

The petition process permits students to request exceptions to existing regulations. Petitions are considered individually, weighing the unique situation of the petitioning student with the intent of college and university regulations.
Students can avoid the necessity to petition by carefully observing the cleadlines that affect their academic program. See the Course Enrollment Changes section above for some of the important deadlines. If unsure about a deadline, check with a counselor in the Office of Student Services, N101 MVR

Although many kinds of requests can be petitioned in the college, options other than petitioning may be preferable in some cases. To explore whether a petition is appropriate, the student may discuss the situation with a college counselor or the college registrar in the Office of Student Services.

Students may appeal petitions denied by the college registrar to the Committee on Academic Status. Students who appeal a denied petition must attach a statement from the student's faculty adviser before CAS will consider the appeal.
Two kinds of petition forms are available. The uses for both forms are described in the Human Ecology Student Guide

## General Petition Form

The general petition form is available in the Office of Student Services, N101 MVR. After completing the form, submit it to the Office of Student Services. Students learn the result of the petition process for the general petition form by checking their mail folder in the student mail center, 138 MVR.

## In absentia Petition Form

The in absentia petition form is available in the Office of Student Services, N101 MVR. After completing the form, submit it to the Office of Student Services. In absentia petitions must have attached to them the catalog descriptions of the courses for which credit is requested from the other institution. In absentia petition decisions usually are sent to students via the U.S. postal service.

## GRADES

See the "Grading Guidelines" section for information on the official university grading policies.

## S-U Grades

Some courses in the college and in other academic units at Cornell are offered on an S-U basis; that fact is indicated in the Comell University: Courses of Study. University regulations concerning the S-U system require that a grade of $S$ be given for work equivalent to a C- or better; for work below that level, a U must be given. No grade point assignment is given to S , and S or U grades are not included in the computation of semester or cumulative averages. A course in which a student receives an $S$ is, however, counted for credit. No credit is received for a $U$. Both the S and U grades appear on a student's record. A student who is attempting to qualify for the Dean's List must take at least 12 credits for the usual A-F grades.
Only juniors and seniors may take an S-U grade in courses in which the grade of $S$ or U is optional; however, sophomores may take courses in which only the grade of $\mathbf{S}$ or $\mathbf{U}$ is offered. A student may take no more than four courses (or 12 credits) on an S-U basis during his or her college career; however, more than one S-U course may be taken in one semester. S-U courses may be taken only as electives or in the 15 credits required in the college outside the major unless the requirements for a specific major indicate otherwise. Freshmen enrolled in English 137 and 138 (offered for S-U grades only) are permitted to apply those courses to the freshman writing seminar requirement.
To take a course for an S-U grade, a student must check the course description to make sure that the course is offered on the S-U basis; then either sign up for S-U credit on the course enrollment form, or file an add/drop/ change form in the Office of Student Services
before the end of the third week of the term. After the third week of the term, students must petition the college registrar to change grade options. Forms are available in the Office of Student Services.

## Grades of Incomplete

A grade of incomplete is given when a student does not complete the work for a course on time but when, in the instructor's judgment, there was a valid reason. A student with such a reason should discuss the matter with the instructor and request a grade of incomplete.
Beginning fall 1984, a grade of incomplete may remain on a student's official transcript for a maximum of two semesters and one summer after the grade is given, or until the awarding of a degree, whichever is the shorter period of time. The instructor has the option of setting a shorter time limit for completing the course work.
If the work is completed within the designated time period, the grade of incomplete will be changed to a regular grade on the student's official transcript. If the work is not completed within the designated time period, the grade of incomplete will be automatically converted to an F.
When a student wants to receive a grade of incomplete, the student should arrange a conference with the instructor (preferably before classes end and the study period begins) to work out the agreement. A form, called explanation for reporting a final grade of $\mathbf{F}$ or incomplete, which has been signed by both the instructor and the student, must be submitted by the instructor to the Office of Student Services. This form is submitted with the final grade sheets whenever a grade of incomplete is given.
This form is for the student's protection, particularly in the event that a faculty member with whom a course is being completed leaves campus without leaving a record of the work completed in the course.
If circumstances prevent a student from being present to consult the instructor, the instructor may, if requested by the student, initiate the process by filling out and signing part of the form and tuming it in to the Office of Student Services with the grade sheet. Before a student will be allowed to register for succeeding semesters, he or she must go to the Office of Student Services to fill out and sign the remainder of the form.
If the work is satisfactorily completed within the required time, the course appears on the student's official transcript with an asterisk and the final grade received for the semester in which the student was registered for the course.
A student who completes the work in the required time and expects to receive a grade must take the responsibility for checking with the Office of Student Services (about two weeks after the work has been handed in) to make sure that the grade has been received. Any questions should be discussed with the course instructor.
NOTE: Grades received more than three weeks after the end of a term are NOT computed in the student's term average when computing the Dean's list. Therefore, students who feel a missing grade or a grade change will make them eligible for the Dean's list
must have that grade reported to the Office of Student Services no later than the end of the third week after the term has ended. For purposes of this rule, the last day of final exams is the last day of the term.

## ACADEMIC HONORS

The college encourages high academic achievement and recognizes outstanding students in several ways.
Dean's List. Excellence in academic achievement is recognized each semester by placing on the Dean's List the names of students who have completed satisfactorily at least 12 credits with letter grades other than S or U and who have a semester grade point average of 3.5 or above. No student who has received an F or U in an academic course will be eligible.
Kappa Omicron Nu seeks to promote graduate study and research and to stimulate scholarship and leadership toward the wellbeing of individuals and families. As a chapter of a national honor society in the New York State College of Human Ecology, it stimulates and encourages scholarly inquiry and action on significant problems of livingat home, in the community, and throughout the world.
Students are eligible for membership if they have attained junior status and have a cumulative average of not less than $\mathbf{B}$. Transfer students are eligible after completing one year in this institution with a B average.

## Current members of Kappa Omicron Nu elect

 new members. Not more than 10 percent of the junior class may be elected to membership and not more than 20 percent of the senior class may be elected. Graduate students nominated by faculty members may be elected.Bachelor of Science with Honors recognizes outstanding scholastic achievement in an academic field. Programs leading to a degree with honors are offered to selected students by the Department of Human Development and Family Studies and the Division of Nutritional Sciences. Information about admission to the programs and their requirements may be obtained from the appropriate department or division. Students in other departments who wish to qualify for honors should contact Gret Atkin, N115A Martha Van Rensselaer Hall, their sophomore year or the first semester of their junior year.

## Bachelor of Science with Distinction

 recognizes outstanding scholastic achievement. Consideration will be given to seniors whose academic standing at the end of seven semesters is in the top 10 percent of the graduating class. The honor is conferred on those seniors who are in the top 5 percent of the class after grade point averages have been adjusted by including grades for transfer work and after grades earned in the fifth, sixth, and seventh terms have been given double weighting in the final average. The graduating class includes students who will complete requirements for Bachelor of Science degrees in January, May, or August of the same calendar year.To be eligible for consideration, transfer students must have completed 45 credits at Cornell. In determining the academic standing of a transfer student, previous work
taken at another institution is included in the computation of the student's academic average. Names of seniors who meet these requirements are presented to the faculty of the college for approval.
The primary objectives of the honor society, Phi Kappa Phi, are to promote the pursuit of excellence in higher education and to recognize outstanding achievement by students, faculty, and others through election to membership. Phi Kappa Phi is unique in that it recognizes scholarship in all academic disciplines.
To be eligible for membership students must rank in the top ten percent of the senior class, or in the top five percent of the junior class. Provisions also exist for the election of faculty members and graduate students whose work merits recognition.

## INTERDEPARTMENTAL COURSES

HE 100 Critical Reading and Thinking
Fall, spring, or summer. 2 credits. Enrollment limited. Priority is given to freshmen and sophomores; juniors and seniors are admitted with permission of the instructor. S-U grades only.

Fall and spring: sec, T R 10:10 or 11:15, plus two 1 -hour labs to be arranged. H. Selco.

The objective of this course is to enable students to increase critical reading and thinking abilities. Theory and research associated with a wide range of reading, thinking, and learning skills are examined. Emphasis is placed on developing and applying analytical and evaluative skills. Laboratory instruction is individualized and provides the opportunity to focus intensively on increasing comprehension, reading rate, and vocabulary.
HE 101 College Achievement Seminar 6 -week summer session. 2 credits. Enrollment limited to and required of Prefreshman Summer Program students. S-U grades only.
H. Selco and staff.

The objective of this course is to improve the study and leaming skills of incoming freshmen. Emphasis is placed on acquisition of skills necessary to achieve academic success. Topics include time management, note-taking, mapping, textbook comprehension, exam preparation, and exam strategies. The application of theory to the demands of Cornell course work is stressed. In addition, students are introduced to library and computing resources through hands-on projects.

## THE URBAN SEMESTER PROGRAM IN NEW YORK CITY

## Sam Beck, Ph.D., director

The Urban Semester Program is a set of courses spanning the entire year. During fall and spring semesters students enroll in two separate seminars focusing on the opportunities and barriers that a multicultural society presents and their articulation with professional, community, or public policy settings ( 15 -credit residential program). Students intern three to four days each week and are encouraged to live in the Olin Hall clormitory of the Cornell University Medical College.

The three-week winter intercession course ( 1 credit) enables students to do fieldwork in New York City by working full time in community-based organizations or through research supervised by the director. In the eight-week summer semester ( 3 credits), students carry out research projects on the nature of professional practice by interning full time in settings of their choice. Students who seek to contribute to their own communities are encouraged to participate in any of the program offerings. Most students work with the program staff to locate internships For further information, contact the Urban Semester Program at (212) 746-2273 or the Student Resource Center, N-139 Martha Van Rensselaer Hall.

New York City offers a wide variety of intership settings. Many bilingual and bicultural internship settings are available in Chinese, Spanish, Creole, Russian, Yiddish, and other languages. Examples of internships follow:

## - Health and medicine-New York

Hospital/Comell Medical Center, Chinatown Health Clinic, New York City Department of Public Health, Bellevue Hospital, Queens Medical Center for Women and Children, Community Health Project

- Private and public law-NOW Legal Defense and Education Fund, Neighborhood Defender Service of Harlem, Legal Aid, Puerto Rican Legal Defense and Education Fund, NAACP Legal Defense and Education Fund, Gay and Lesbian Anti-Violence Project, Kane Kessler, P.C.
- Government and community agencies-

Women's Action Alliance, The Center for Puerto Rican Studies, New York City Commission on the Status of Women, New York City Council offices, Cornell University Cooperative Extension, New York City Department of Consumer Affairs

- Wall Street firms and other private businesses-Bloomingdales, Prudential Securities, Oppenheimer, Inc., The Aclvertising Council, GKN Securities, Rogers and Cowan, Inc., Kidder Peabody, Co., Hill and Knowlton, Young and Rubican, Altschiller Reitzfeld, Terry Williams Agency
- Private not-for-profit organizations Grant Street Settlement House, Neighborhond Housing Services, Abyssinian Baptist Church Development Corporation, University Settlement Society of New York, Urban Development Corporation, Greater Chinatown Community Association, Lesbian and Gay Community Services Center
- Private and public schools-United Federation of Teachers, Central Park East, River East, Manhattan Center for Math and Science, PS 41, City and Country, Churchill School, Little Red School House, St. Ann's School
- Design and arts organizations-Harlem Textile Works, Perry Ellis International, Caribbean Cultural Center, Delacour \& Ferrara Architects, P.C., New York Shakespeare Festival Theatre, New York Theatre Workshop, Cynthia Rowley Company, SOHO20 Gallery, Museum of African Art, Lower East Side Tenement Museum
- Communication and media-Good Housekeeping, Mirabella, William Morrow Co., MTV, NBC-TV, ABC-TV, Good Morning America, WBAI-Radio, The Village Voice, The

New Yorker, Telemundo Group, Inc., Essence, McNeil-Lehrer News, Ad Council, McCalls, Child, Children's Television Workshop, Time Warner, Inc.

HE 401 Empirical Research
Fall, spring, winter, and summer
$1-15$ credits. Permission of instructor
S. Beck.

This course is available to juniors and seniors who wish to pursue a well-defined, independent research project sponsored by one or more faculty members. Honors projects are welcome. Such students must participate in the course work of HE 402, HE 406, or HE 408. Students must provide a project proposal no longer than five pages, an annotated biobliography representing the fields of interest to be researched or explored, and a letter of approval from one faculty member who will sponsor the investigation.

## HE 402 Supervised Fieldwork in Urban

 AffairsWinter. 1 credit. Limited to 12 students. Permission of instructor.
S. Beck.

This course allows students to participate in Urban Semester Program research or internship opportunities in New York City. Research projects are carried out under the supervision of the program director and will include opportunities for field observation, interviewing, and library and archival inquiry, focused on socioeconomic processes in urban settings. Students interested in internships locate their own placements with assistance from the Urban Semester Program staff. Students keep a journal that reflects on their community service experiences with a focus on specific learning objectives. Applications and placement information are available in the College of Human Ecology Student Resource Center, N-139 Martha Van Rensselaer Hall. Applications must be accompanied by a résumé, a statement of learning objectives, a letter from the placement supporting the student's plan, and a rationale for participating in this activity. The research or community service must take place during the Cornell winter session period.

## HE 403 Teaching Apprenticeship

## Fall, spring, winter, and summer

S. Beck.

For study that includes assisting faculty with instruction. Prerequisite: Students must have taken the course (or equivalent) in which they will be assisting and have demonstrated a high level of performance.

## HE 406 Fieldwork in Professional

Practice: Summer in the City
Summer. $1-3$ credits. 8-week session Limited to 12 students.
S. Beck.

This is a seminar that examines the culture of professional practice, how professionals think and behave, and the role of professionals in society through internships and weekly discussions with practitioners in a variety of fields. Students will carry out fieldwork in internship placements by researching professional practice in New York City. They will intern for a minimum of eight weeks in organizations and fields such as business, government, private not-for-profit services, education, medicine and health, law, media and communications. Students locate their own internships with assistance from the Urban Semester Program staff. Applications and placement information are available in the

College of Human Ecology Student Resource Center, N-139 Martha Van Rensselaer Hall.

## FIS 408 The Urban Semester Program:

 Multicultural Issues in Urban Affairs Fall or spring, $9-15$ credits. Limited to $30-35$ students, depending on housing availability. Preference given to juniors and seniors. Applications and placement information available in the College of Human Ecology Student Resource Center, N-139 Martha Van Rensselaer Hall.R 1:00-5:00 p.m., F 9:00-12:00 p.m.
S. Beck.

This course is a study of multicultural issues in urban affairs as students enhance their academic foundations in career development. Students examine issues of diversity (e.g., race, ethnicity, religion, class, gender, sexual orientation) in relationship to: (1) professional life in different sectors of the economy; (2) the development of neighborhoods and communities; and (3) the basis of a just and democratic society. Students intern three to four days each week and attend seminars that include site visits and discussions on multicultural issues with representatives of community, education, government, business, medical organizations and health, legal, and private not-for-profit organizations. In addition, students can enroll in a three-credit companion course offered in New York City through one of the academic departments in the College of Human Ecology.

## CONSUMER ECONOMICS AND HOUSING

W. K. Bryant, chair; P. Chi, graduate faculty representative; J. Gerner, undergraduate advising coordinator; R. B. Avery, R. J. Avery, W. K. Bryant, P. Chi, F. Firebaugh, J. Gerner, R. Heck, J. Hogarth, N. Kutty, D. Lillard, A. Mathios, D. Mont, L. Morton, E. Peters, P. Pollak, M. Rendall, P. Zorn.

CE\&H 110 Introductory Microeconomics Fall. 3 credits. S-U grades optional. Students who have taken Economics 101 or the equivalent should not register. Required course packets available from the Campus Store

M W F 9:05; sec. to be arranged. B. Rosen.

This course introduces students to the operation of markets. The focus is on understanding the motivation and behavior of households and firms, and the market outcomes that result from their interaction. Special attention is paid to the role of market structure, issues of equity and efficiency, and governmental regulation and public policy.
CE\&H 111 Introductory Macroeconomics
Spring. 3 credits. S-U grades optional. Students who have taken Economics 102 or another introductory macroeconomics course should not register for this course.

M W F 11:15. B. Rosen.
Principles of macroeconomics with an emphasis on the relevance of economic policies to consumers and households. Topics include national income accounting, aggregate demand and aggregate supply, the role of monetary and fiscal policy in confronting the problems of inflation and unemployment, and international economics.

## CE\& 210 Intermediate Microeconomics

Fall or spring. 4 credits. Prerequisite: CEH 110 or equivalent. Fall: preference to sophomores and juniors. Spring: preference to juniors and seniors. Limited to 80 students per lecture in fall and spring.

Fall: Lecs, T R 12:20-1:35. Two prelims.
N. Kutty. Spring: M W F 1:25.
A. Mathios.

Theory of demand and consumer behavior including classical and indifference curve analyses; theories of production and cost; models for the following markets-competitive, monopoly, monopolistic competition, oligopoly, and inputs; general equilibrium; welfare economics; public goods; risk.

## CE\&H 226 Household and Family

 DemographySpring. 3 credits. Prerequisite: RSOC 101 or equivalent. S-U grades optional.

T R 2:30-3:45. M. Rendall.
This course identifies important trends in U.S. household and family structure, examines the demographic, social, and economic forces behind recent changes in household structure, and evaluates current and future consequences and policy implications of these changes for both households and society. Topics include historical and contemporary trencls in the size and composition of families and households, trends in marriage, divorce, remarriage. contraception, childbearing, and living arrangements, and interrelationships between household division of labor. Policy implications of all of the above are also considered.
[CE\&H 233 Consumers in the Market Fall. 4 credits. Prerequisites: CEH 110 or equivalent. Not offered 1994-95.

M W F 2:30. R. J. Avery.
A study of the structure and functioning of consumer retail markets with emphasis on the role and activities of the major players in these markets-firms, consumers, and governments. The nature and consequences of various types of market failures are studied from the perspective of the firm, the consumer, and the role of government. Case studies and outside lecturers are used to impart reality to the course.)

## CE\&H 247 Housing and Society

Spring. 3 credits. S-U grades optional. M W F 10:10. Two evening prelims. P. Chi.

A survey of contemporary American housing issues as related to the individual, the family, and the community. The course focuses on the current problems of the individual housing consumer, the resulting implications for housing the American population, and governmental actions to alleviate housing problems.

## CE\&H 300 Special Studies for Undergraduates

Fall or spring. Credits to be arranged. Hours to be arranged. Staff. Special arrangement for course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they want to undertake, on a form available from the Student Services office. The form, signed by both the instructor directing the study and the head of the department, is filed at course registration or during the change-of-registration period.

CE\&H 307 Introduction to Econometrics Fall. 4 credits. Prerequisites: Ag Econ 310 or equivalent.

M W F 10:10. D. Lillard.
The course introduces students to basic econometric principles and the use of statistical procedures in empirical studies of economic models. Assumptions, properties, and problems encountered in the use of multiple regression procedures are discussed, and simultaneous equation models are introduced. Students are required to specify, estimate, and report the results of an empirical model.

## CE\&H 315 Personal Financial Management

Spring. 3 credits. Preference given to human ecology students; limit 200; not open to freshmen. S-U grades optional.

M W F 10:10. Evening prelim. R. Heck. The study of personal financial management at various income levels and during different stages of the family life cycle. Topics include the use of budgets and recordkeeping in achieving family economic goals, the role of credit and the need for financial counseling, economic risks and available protection, and alternative forms of saving and investment.

## CE\&H 320 Economics of Family Policy-

 AdultsFall. 4 credits. Limited to 40 students. Junior or senior standing; non-CEH or PA majors by permission of instructor.

M W F 1:25. J. Gerner.
This course examines the economics of family policy issues that have a particular impact on adult family members. Emphasis in this course is on the economic behavior surrounding the policy and the incentives set up by the policy. Policies considered include marriage and divorce, family leave policy, policies assisting single parents, and policies affecting caregiving.

## CERH 321 Economics of Family PolicyChildren

Spring. 4 credits. Limited to 40 students. Junior or senior standing; non-CEH or PA majors by permission of instructor.

M W F 1:25. J. Gemer.
This course examines the economics of family policy issues that particularly affect children. This course focuses on a) the economic behavior that generates the policies and b) the economic incentives and behavior that result from the policies. Topics include child welfare, education, day care provision, child support, and adoption.

## CE\&H 325 Economic Organization of the

 HouseholdFall. 3 credits. Prerequisite: CEH 110 or equivalent. S-U grades optional.

T R 10:10-11:25. W. K. Bryant.
Economic models are used to help explain a wide variety of family and individual behavior. Topics include the demand for consumer goods and services; consumption and saving; time allocation in the household including labor supply, household production and leisure; human capital investment; fertility; marriage and divorce.

## CE\&H 330 The Economics of Consumer

 PolicySpring. 4 credits. Open to juniors, seniors, and graduate students. Prerequisites: CEH 110-111 or permission of instructor. Class packets on sale at Campus Store.

T R 8:40-9:55. D. Lillard.

Students are acquainted with the basic approaches to consumer policy and perform economic analyses of specific consumer policy issues. Three specific areas of policy intervention are addressed: externalities and public goods; anti-trust and regulation of "natural" monopolies; and markets characterized by imperfect information. Policy discussions are reinforced through the use of specific real-world examples. Students are required to submit a research paper focusing on one specific area of policy intervention discussed in class.
CEAH 348 Urban Economics and Policy Fall. 4 credits. Prerequisite: CEH 110 or equivalent. S-U grades optional.

T R 2:30-3:45. B. Rosen.
This course explores the economics of cities and urban problems. The course starts by studying the location choices of firms and households. The remainder of the course is spent using these insights, as well as standard economic theory, to gain an understanding of urban problems-poverty, housing, transportation, education, and crime. An analysis of existing and proposed public policies is an important component of the course.

## CE\&H 355 Wealth and Income

Fall. 3 credits. Open to sophomores, juniors, and seniors; graduate students may elect to audit and write a research paper for 1 to 2 credits under CEH 600. Prerequisites: CEH 110-111 or equivalent. S-U grades optional.

M W F 9:05. D. Lillard.
The wealth and income positions of American households are defined and described and their economic determinants discussed along with the impacts of tax and expenditure policies and the economics of the political positions for and against such policies.

## CE\&H 356 The Economics of Welfare

 PolicySpring. 4 credits. Prerequisite: CEH 110 or equivalent. S-U grades optional.

M W F 9:05. D. Mont.
Using the tools of economics, this course examines welfare policy. Included are an examination of which populations are affected, what behavior various policies are likely to engender, and how much income redistribution occurs as a result of various welfare policies. Also evaluated are various proposals for welfare reform.
[CE\&H 365 Economics of Consumer Law Spring. 3 credits. Prerequisite: CEH 110 or equivalent. S-U grades optional. Not offered 1994-95.

M W F 11:15. A. Mathios.
Economic analysis of the roles played both by the courts and by federal and state regulatory legislation in altering consumer markets, consumer behavior, and consumer welfare. Topics include economic analyses of contract law, products liability, and accident law, as well as the activities of such agencies as the Federal Trade Commission, the Food and Drug Administration, and the Consumer Product Safety Commission.]

## CE\&H 400-401-402 Special Studies for Undergraduates

Fall and spring. Credits to be arranged. S-U grades optional.

Hours to be arranged. Staff.
For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of CEH not otherwise provided through
course work in the department or elsewhere at the university. Students prepare a multicopy description of the study they want to undertake, on a form available from the Student Services Office. This form must be signed by the instructor directing the study and the department chair and filed at course registration or within the change-of-registration period after registration. To ensure review before the close of the course registration or change-of-registration period, early submission of the special studies form to the department chair is necessary. Students, in consultation with their faculty supervisor, should register for one of the following subdivisions of independent study.

CEsH 400 Directed Readings
For study that predominantly involves library research and independent reading.

CEsH 401 Emplirical Research
For study that predominantly involves data collection and analysis.

## CE8H 402 Supervised Fieldwork

For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice.
[CE\&H 411 Time as a Human Resource Spring. 3 credits. Prerequisite: one course in sociology. Recommended: one course in microeconomics. S-U grades optional. Class notes for sale at Campus Store. Offered alternate years. Not offered 1994-95

M W F 10:10. R. J. Avery.
A set of historical and contemporary readings examining time management concepts and applications. Investigates changes in time use of family members in relation to social change. Explores meanings of market work, household work, and leisure in the context of family choices at different stages of the life cycle. Investigates current research concerning time allocations made by family members to household and market work. Examines use of time as a measure of household production.]

## [CEAH 434 Financial and Credit Markets

 and PolicySpring. 3 credits. Prerequisite: CEH 111 S-U grades optional. Not offered 1994-95.

M W F 10:10-11:15. R. B. Avery. This course studies the structure of financial markets in the United States. A number of different markets and institutions will be examined including: banks, savings and loans, insurance companies, pension funds, government bond markets, credit unions, and finance companies. The principles underlying government regulation of these institutions will be explored, as well as management problems and concerns. The emphasis will be on learning the institutional environment, not on personal finance.]

## CE\&H 435 Families in Business

Spring. 3 credits. Prerequisites: Ag Econ 310 or permission of instructor. S-U grades optional.

T R 10:10-11:25. Ramona Heck.
This course explores the economic impacts and implications of business viability for the family involved in a business. Topics include an overview of families who own businesses, profiles of their businesses, use of resources for the family and the business, unpaid transfers made within the family for the
business, economic well-being measures for the family and the business, and the transfer of wealth and business ownership among family members and between generations. Topics are explored relative to stages of business activity including feasibility, start-up, on-going maintenance, expansion or redirection, and exit or transfer. The course also surveys the conceptual issues and methodological approaches and issues related to the study of family-owned businesses.

## CE\&H 436 Survey Fieldwork on Family

 Owned BusinessesFall. 3 credits. Prerequisites: Ag Econ 310 and CEH 435. S-U grades optional. Offered alternate years

T R 10:10-11:15. Ramona Heck Allows students to develop research skills by providing opportunities for hands-on survey and fieldwork. Topics and activities include research design, sampling, questionnaire development, and statistical analyses related to family-owned businesses; critical review of current research approaches and extant databases used to research business ownership; and implementation and completion of an actual survey of fieldwork project of selected family business owners, or the use of extant databases for descriptive analyses of family-owned businesses.

## CE\&H 444 Housing for the Elderly

Spring. 3 credits. Prerequisite: CEH 247 or permission of instructor. S-U grades optional. M W F 2:30-3:20. P. Chi.
This course focuses on the housing needs of the elderly, their current housing conditionsliving arrangements, tenure patterns, housing quality and housing expense burden-and socioeconomic and psychological aspects of the housing environment of the elderly Attention is also given to government housing programs for the elderly, integrating housing and related social service activities, and options for alternative housing.
[CE\&H 446 Housing Demography
Spring. 3 credits. Prerequisite: CEH 247 and one course in statistics or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95. This course focuses on the interface between population and housing from different vantage points. From a housing perspective, the subjects covered in this course include (1) empirical assessment of housing quality and affordability; (2) social, demographic, and health effects of housing environment; (3) housing filtering and spatial patterns From a population perspective, the emphasis is on (1) household composition and housing adjustments, (2) household formation and future housing needs, and (3) housing issues for special population groups.]

## [CERH 448 Empirical Research in

 Housing and Mortgage Markets Fall. 4 credits. Prerequisites: CEH 210 and Ag Econ 310 or the equivalent. Not open to freshmen and sophomores. Not offered 1994-95The purpose of this course is to provide students with the opportunity to actively engage in empirical research. Using data from Syracuse, New York, the class (as a whole) will conduct a small-scale research project on a public policy issue.]

CE\&H 485 Evaluation of Public Policies
Fall. 3 credits. Prerequisites: CEH 110 or equivalent and an introductory statistics course. Recommended: CEH 210 or equivalent.

T R 2:30-3:45. N. Kutty
This course provides an introduction to the techniques used to evaluate public policies and programs. It will begin with a review of basic concepts in evaluative research: causal inference, validity, and experimental and quasi-experimental designs. The remainder of the course will concentrate on the tools of cost benefit analysis as a device for evaluating the effectiveness of government programs. Discussions of the techniques, issues, and problems of cost benefit analysis will be highlighted by examples of its use in a variety of public policy areas. Economic analysis and statistical techniques will be emphasized.

## CE\&H 600 Special Problems for

 Graduate StudentsFall and spring. S-U grades optional. Hours to be arranged. Staff.
Independent advanced work by graduate students recommended by their chair and approved by the department chair and the instructor

## CE\&H 601 Research Workshop in

 Consumer Economics and Housing Fall and spring. $1-3$ credits. S-U grades only. W 12:20. Staff.Research seminar designed to provide a forum for graduate students in consumer economics and housing to present their own thesis research at an early stage and to provide critical input for other graduate students.
CE\&H 606 Demographic Techniques Fall. 3 credits. S-U grades optional. T R 12:20-1:35. M. Rendall. This course provides an introduction to the methods, measures, and data used in the analysis of human populations. Topics include demographic rates, life-table analysis, cohort vs. period analysis, sources and quality of demographic data, population estimation and projection, and stable population models.

## [CE\&H 607 Econometric Topics

Fall. 3 credits. S-U grades only. Prerequisite Ag Econ 710 or equivalent. Offered alternate years. Not offered 1994-95.

M W F 2:30-3:20. R. B. Avery An advanced econometric course consisting of two separate modules. The first module will cover household survey methodology including sample design, questionnaire development, data weighing, and imputation. The second module will focus on limited dependent variable models. Linear probability, logistic probit, and tobit models will be examined as well as problems of sample section bias.]

## CEEAH 613 Economics of Consumer

 DemandFall. 3 credits. Prerequisite: CEH 210, Economics 311 or 313 , or concurrent enrollment in one of the three. S-U grades optional

T R 8:40-9:55. K. Bryant.
Introduction at the graduate level to theory and empirical research on household demand, consumption, and saving. Emphasis on the use of the theory in empirical research Topics include neo-classical theory of demand, duality, complete demand systems, demographic scaling and translating,
consumption and savings. As time allows, Becker and Lancaster models of demand will be introduced.

## CE\&H 624 Economics of Household

 BehaviorSpring. 3 credits. Prerequisite: CEH 210 or Economics 311 or 313 or concurrent enrollment in one of the three. S-U grades optional. M W F 1:25. E. Peters.
Examination of theoretical and empirical literature concerning market work, human capital formation, household production, and family formation.

CEsH 627 Advanced Family Demography Spring. 3 credits. Prerequisite: CEH 606 or equivalent. S-U grades optional. Offered alternate years.

T R 12:20-1:35. M. Rendall.
This course examines the size and composition of households and families, variations in family and household structure among major subgroups, and changes in family and household structure over time and over the life cycle. The demographic processes underlying changes in families and households are examined, including marriage, divorce, fertility, mortality, and migration. The determinants of changes in these underlying processes and in family and household structure are analyzed, along with the consequences of these changes for labor force participation, household division of labor, living arrangements, intergeneration relations, and economic well-being and poverty.

CE\&H 635 Information and Regulation Spring. 3 credits. Prerequisite: CEH 613. Class packets on sale at Campus Store. M W F 2:30. A. Mathios. A survey of the problems and policies accompanying informational failures and other market failures with regard to consumer wellbeing. Governmental regulation of products, of producers, of consumers, and of prices is examined. Antitrust activity, disclosure requirements, advertising restrictions, and regulatory agencies are examined in terms of their ability to serve the public interest or to serve special interests. Economic analysis, rather than institutional structure, is emphasized.

## [CE8H 639 Consumer Decision Making

Fall. 3 credits. Not offered 1994-95.
Hours to be arranged. R. J. Avery. Individual and family decision making with respect to their market purchases will be investigated from a multidisciplinary perspective. Topics to be covered in the course include cognitive theories of information processing; theories of group interaction in decision making; and the effect of advertising, imperfect information, and uncertainty on consumer product evaluation and purchase behavior. Special attention will be given to decision making by consumers in various market segments, e.g., low-income consumers, children, and the elderly. Specific attention will be paid to how consumers in these segments process marketer-provided information and their related consumption decisions.]

## CE\&H 648 Housing Economics

Spring. 3 credits. Prerequisite: CEH 210 or Economics 311 or 313.

T R 12:20. N. Kutty.
Introduction at the graduate level to economic theory and empirical research in the housing market. The course will generally take a micro perspective, focusing on housing demand (households' housing mobility, tenure, and consumption decisions), housing supply (maintenance, home improvement,
and new construction), and housing finance (mortgage markets, mortgage choice, mortgage termination). Attention will be paid to the operation of the housing market as well as to relevant public policy issues (governmental tax policy, rent control, discrimination).

## [CE\&H 720 Household Resource

 AllocationSpring. 3 credits. S-U grades optional Offered alternate years. Not offered 1994-95. TBA. Staff.
Family resource allocation is studied in the context of decision processes, and the behavior of decision makers. The relationship of decision making to family management is also explored.]

## [CE\&H 724 Family Policy

Fall. 3 credits. Prerequisite: CEH 624 or permission of instructor. S-U grades optional Offered alternate years. Not offered 1994-95.

## TBA. Staff.

This course examines the public sector policies that influence family time-allocation decisions. Particular attention will be given to the time allocated by female family members to non-household activities and how these activities are influenced by outside economic forces and by internal family characteristics.]

## [CE\&H 735 Consumer Policy

Fall. 3 credits. Prerequisite: intermediate microeconomics. S-U grades optional. Offered alternate years. Not offered 1994-95. TBA. Staff.
An examination of consumer policy in the United States. An interdisciplinary approach will be used in which the theoretical rationale for consumer protection laws, the political processes that mold the shape of current consumer policy, and the administrative, legal, and organizational constraints under which consumer policies operate are explored. In addition, techniques for the economic evaluation of government programs and regulations will be taught and applied to current consumer-protection policies.l

## CE\&H 899 Master's Thesis and Research

Fall and spring. Prerequisite: permission of the chair of graduate committee and instructor. S-U grades optional.

> Graduate faculty.

CE\&H 999 Doctoral Thesis and Research
Fall and spring. Prerequisite: permission of the chair of graduate committee and instructor. S-U grades optional.

Graduate faculty.

## DESIGN AND ENVIRONMENTAL ANALYSIS COURSES

W. R. Sims, chair; F. D. Becker, graduate faculty representative; M. Boyd, undergraduate advising coordinator; A. Basinger, S. Danko, P. Eshelman, G. Evans, K. Gibson, A. Hedge, J. Jennings, J. Laquatra, L. Maxwell, E. Schrank

Note: A minimal charge for photocopied course handouts may be required.

## DEA 101 Design I: Fundamentals

Fall. 3 credits. Each section limited to 18 students. Permission of instructor required. Priority given to interior design majors. Option I majors must take DEA 101 in fall. Approximate cost of materials, $\$ 60$. Fall: M W 1:25-4:25, or T R 10:10-1:10.

A studio course introducing the fundamental vocabulary and principles of two-dimensional design. Students experiment with the development of form through problem-solving approaches.

DEA 102 Design II: Fundamentals Spring. 2 credits. Permission of instructor required. Option I DEA majors only. B- or higher in DEA 101 required to register for this course. Option I majors must take DEA 102 and 115 concurrently. Approximate cost of materials, $\$ 200$; shop fee, $\$ 10$.

T R 1:25-4:25. P. Eshelman
A studio course in three-dimensional design with an interior design emphasis. Problems in spatial organization are explored through drawings and models.

## DEA 111 Introduction to Design

Fall. 3 credits. Limit 300.
M W F 12:20-1:10. Staff.
Introduction to the field of design for students in any academic area. The course reviews the spectrum of design activities, examining various movements in design and differences among designers in philosophical premises, social and functional roles, and cultural positions. Also examined are how requirements in the built environment are affected by the interaction of people, design, and materials. Lectures and visual material are presented by DEA faculty members and visiting design professionals.
DEA 115 Drawing for Interior Design
Spring. 3 credits. Option I DEA majors only. Prerequisite: DEA 101; must take DEA 102 and DEA 115 concurrently. Minimum cost of materials, $\$ 100$. Permission of instructor only.

T R 10:10-1:10. P. Eshelman.
A studio drawing course for interior designers. Discussion groups on drawing techniques are held to develop a visual understanding and vocabulary. Students are introduced to the functions of line, shape, and value. Perspective, spatial, and conceptual drawing are emphasized.

## DEA 143 Inside Out: The American

 Everyday InteriorSpring (alternate years). 3 credits. S-U option.

T R 10:10-11:30. J. Jennings. A study of late nineteenth- and twentiethcentury everyday interiors in socio-cultural contexts, with an emphasis on design dissemination, consumer patterns, and gender issues. Topics include women's walls, power in the parlor, photographs as a mirror, the love of the colonial.

## DEA 150 Introduction to HumanEnvironment Relations

## Spring. 3 credits.

M W F 12:20-1:10. G. Evans. Introduction to the influence of physical environment on human behavior. Topics include environmental influences on crowding, community, crime, and friendship; environmental needs associated with characteristics such as stages in life cycle, life styles, social class, family structures, and handicaps; person-environment fit for lighting, acoustics, indoor air quality and ventilation, and thermal comfort; introduction to human factors and systems analysis; effects of environment on perception-cognition; userresponsive design; participatory design programming; and post occupancy evaluation.

## DEA 201 Design III: Basic Interior Design

Fall. 5 credits. Limited to 18 students. Prerequisites: DEA 101,102, and 115 (minimum grades of $\mathrm{B}-$.) Recommended: DEA 111 and 150 . Coregistration in DEA 203 and DEA 251 is required. Minimum cost of materials, $\$ 150$; shop fee, $\$ 10$; optional field trip, approximately $\$ 100$; diazo machine fee, \$8.

M W F 1:25-4:25. J. Jennings. Beginning interior design studio. Focus is on development of basic proficiency in interior design skills. The course is structured around a series of elementary interior and interiorproduct design problems of 3 to 5 weeks in length.

DEA 202 Design IV: Basic Interlor Design Spring. 5 credits. Each section limited to 18 students. Prerequisites: DEA 201 and 203. Prerequisites or corequisites: DEA 111 and 204. Minimum cost of materials, $\$ 120$; diazo machine fee, $\$ 8$; field trip fee.

T R 12:20-4:25. Staff
Second interior design studio. Emphasis of the course is on continued development of basic proficiency in design skills through exposure to a selected set of interior design problems of limited complexity. Each problem of 3 to 5 weeks duration is structured to emphasize different aspects of the design process.

## DEA 203 Design Communications

Fall. 1 credit. Priority given to DEA majors. Lab fee $\$ 10$.

T R 11:15-12:05. S. Danko.
Communication techniques for architectural and interior designers. Students study the various forms of communication used throughout the design process, from programming and conceptualization through construction documentation, and the most effective utilization of those forms. Both verbal and visual presentation methods are stressed.

## DEA 204 Introduction to Building Technology

Spring. 1 credit.
M 2:30-4:25. W. Sims.
Introduction to building technology for interior designers and facility managers. Emphasis is placed on developing basic understanding of buildings and building systems and their implications for interior design and facility management. Covers basic building types; structural systems; construction materials and methods; HVAC systems; plumbing, electrical, lighting, fire, and security systems; and telephone, computer, and other communication systems.

## DEA 250 The Environment and Social Behavior

Fall. 3 credits. Prerequisite: DEA 150 or permission of instructor.

T R 2:30-4:00. G. Evans. A combination seminar-and-lecture course for students interested in the social sciences, design, or facility management. Through projects and readings the influence of environmental form on social behaviors such as aggression, cooperation, communication, community, and crime is explored. Also covered are the influences of stage in life cycle, family structure, and social class on environmental needs and purposes. Implications for the planning, design, and management of complex environments such as offices, hospitals, schools, and housing are emphasized.

## DEA 251 History and Theory of Interior Design

Fall. 3 credits. Prerequisites: DEA 101 and 111.

M W F 9:05-9:55. J. Jennings.
An historic study of interior architecture and design with an emphasis on the concepts of design theory. Overarching themes encompass several time periods from the classical to the twentieth century and isolate cultural patterns, spatial ideas, dialectics, design elements and theorists. Reading, discussion, analytical exercises, essays, examinations. Field trip.

## DEA 300 Special Studies for

 UndergraduatesFall or spring. Credit to be arranged.
Hours to be arranged. Department faculty. Special arrangement for course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they want to undertake on a form available from the Student Services Office. The form, signed by both the instructor directing the study and the head of the department, is filed at course registration or during the change-of-registration period.

## DEA 301 Design V: Intermediate Interior Design

Fall. 5 credits. Prerequisites: DEA 111,150, 201, 202, 203, and 204. Corequisite: DEA 303 and 459. Minimum cost of materials, $\$ 150$; shop fee, $\$ 10$; optional field trip, approximately $\$ 100$; diazo machine fee, $\$ 8$.

M W F 1:25-4:25. P. Eshelman.
Intermediate-level interior design studio. The course is organized around a series of interior and interior-product design problems of intermediate-level complexity, 3 to 5 weeks in duration. Focus is on development of design skills and on understanding of a selected set of generic problem types.

## DEA 302 Design VI: Intermediate

 Interior DesignSpring. 4 credits. Prerequisites: DEA 301 and 303 or permission of instructor. Corequisites: DEA 304 and DEA 305. Minimum cost of materials, $\$ 150$; shop fee, $\$ 10$; diazo machine fee, $\$ 8$.

M W F 1:25-4:25. K. Gibson. Intermediate-level interior design studio with an introduction to computer applications. Emphasis on using the microcomputer as a design tool in the process of creating and planning interior spaces. Continued development of design skills and problem solving in relation to a selection of problem types.

## DEA 303 Introduction to Furnishings, Materials, and Finishes

## Fall. 1 credit.

T 2:30-4:25. P. Eshelman.
Basic understanding of furniture types and systems; interior products and equipment such as work-stations; window, wall, and floor coverings; ceiling and lighting systems; and materials and finishes. Emphasis is placed on criteria for selection of furnishings materials and finishes for typical interior design and facility management problems.

## DEA 304 Introduction to Professional

 Practice of Interior Design Spring. 1 credit.T 2:30-4:25. A. Basinger.
Introduction to organizational and management principles for delivery of interior design and facility management services. Covers
basic organizational structures and basic management functions within interior design and facility management organizations, work flow and scheduling, business practices, legal and ethical responsibilities and concerns, contracts, basic contract documents such as working drawings and specifications,
supervision of construction and installation, and cost estimation.
DEA 305 Construction Documents and Detailing
Spring. 1 credit. Prerequisites: DEA 301 and DEA 303. Corequisites: DEA 302 and DEA 304. Minimum cost of materials $\$ 50$. Field trips, \$50.

R 2:30-4:25. K. Gibson.
Comprehensive study of drafting, detailing, schedules and specifications. Emphasis on drawing conventions, symbols, dimensioning, detailing of interior elements, terminology, construction methods and materials.
DEA 325 Human Factors: ErgonomicsAnthropometrics
Spring. 3 credits. Recommended: A 3-credit statistics course and DEA 150.

T R 9:05-10:30. A. Hedge.
Implications of human physical and physiological characteristics and limitations on the design of settings, products, and tasks. An introduction to engineering anthropometry, biomechanics, control/display design, work physiology, and motor performance. Course includes practical exercises and field project work.

## DEA 349 Graphic Design

Spring. 3 credits. Enrollment limited to 18 students. Recommended: design background. Priority given to DEA majors. Approximate cost of materials, $\$ 50$.

M W 10:10-1:10. M. Boyd.
The fundamentals of lettering, typography, layout, presentation techniques and the functional and visual aspects of environmental graphics. Printing processes and the application of photography and illustration are also covered. A series of projects explores problems typical of the graphic design field, and in interior and exterior graphics, signing, and directional systems.

## DEA 350 Human Factors: The Ambient Environment

Fall. 3 credits. Recommended: DEA 150. T R 11:15-1:10. A. Hedge. An introduction to human-factors considerations in lighting, acoustics, noise control, indoor air quality and ventilation, and the thermal environment. The ambient environment is viewed as a support system that should promote human efficiency, productivity, health, and safety. Emphasis is placed on the implications for planning, design, and management of settings and facilities. Course includes a field project.

## DEA 400-401-402-403 Special Studies for Undergraduates

Fall or spring. Credits to be arranged. S-U grades optional.

Hours to be arranged. Department faculty. For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of DEA not otherwise provided through course work in the department or elsewhere at the university. Students prepare a multicopy description of the study they want to undertake on a form available from the Counseling Office. This form must be signed
by the instructor directing the study and the department head and filed at course registration or within the change-of-registration period after registration. To ensure review before the close of the course registration or change-of-registration period, early submission of the special studies form to the department head is necessary. Students, in consultation with their advisers and the instructor should register for one of the following subdivisions of independent study.

## DEA 400 Directed Readings

For study that predominantly involves library research and independent reading.

## DEA 401 Empirical Research

For study that predominantly involves data collection and analysis, or laboratory or studio projects.

## DEA 402 Supervised Fieldwork

For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice

## DEA 403 Teaching Apprenticeship

For study that includes teaching methods in the field and assisting faculty with instruction. Students must have demonstrated a high level of performance in the subject to be taught and in the overall academic program.
[DEA 404 Design VII: Advanced Interior Design
Fall. 4 credits. Prerequisites: DEA 302, DEA 303, DEA 304, and DEA 305. Minimum cost of materials, $\$ 150$. Diazo machine fee $\$ 8$. Field trip $\$ 50$. Not offered 1994-95.

T R 12:20-4:25. Staff.
Advanced interior design studio organized around a series of interior design problems, 3 to 5 weeks in duration. Focus is on development of design skills and on competence in solving a selected set of generic interior design problem types.]

## DEA 405 Portfolio Preparation

Spring. 3 credits. Enrollment limited to 18. Prerequisites DEA 301. S-U option. Minimum cost of materials, $\$ 200$. Required field trip $\$ 20$.

M W 1:25-4:25. M. Boyd.
Students apply graphic design principles to develop a professional portfolio of their work. Also covered are resume and job search plans, the use of computer-aided graphic tools.

## [DEA 443 American Vernacular Interiors

Spring (alternate years). 3 credits. Enrollment limited to 15 students. S-U option. Field trips \$50. Not offered 1994-95.

T R 10:10-11:30. J. Jennings. A topical study of nineteenth- and twentiethcentury American vernacular interiors, exploring the relationship between interior design theory and social and cultural values. Sources include historic interiors, literature and art, architectural and material culture studies. Reading, discussion, comparative analysis, and critical writing.]

## DEA 454 Facility Planning and Management Studio

Spring. 4 credits. Prerequisite: IDEA 459 or permission of instructor. Letter grades only. Minimum cost of materials, $\$ 100$.

T R 1:25-4:25. W. Sims.
For advanced undergraduates interested in facility planning and management. Purpose is
to provide basic tools, techniques, and concepts useful in planning, designing, and managing facilities for large, complex organizations. Covers strategic and tactical planning for facilities, organizing to deliver facility management services, project management, space forecasting, space allocation policies, programming, site selection, building assessment, space planning and design, furniture specifications, and moves. Sociopsychological, organizational, financial, architectural, and legal factors are considered.

## DEA 455 Research Methods in MumanEnvironment Relations

Fall. 3 credits. Prerequisites: DEA majors only or permission of instructor, and a statistics course.

M W 1:25-2:15. G. Evans.
The course develops the student's understanding and competence in the use of research and analytical tools to study the relationship between the physical environment and human behavior. Emphasis is placed on selection of appropriate methods for specific problems and the policy implications derived from research. Topics include research design, unobtrusive and obtrusive data-collecting tools, the processing of qualitative and quantitative data, and effective communication of empirical research findings.

## DEA 459 Programming Methods in Design

Fall. 3 credits.
T R 9:05-10:30. F. Becker. Introduction to environmental programming. Emphasis on formulation of building requirements from user characteristics and limitations. Diverse methods for determining characteristics that will enable a particular environmental setting to support desired behaviors of users and operators. Methods include systems analysis, soft system, behavior circuit, behavior setting, and user characteristic approaches. Selection of appropriate methods to suit problems and creation of new methods or techniques are emphasized.

## DEA 499 Design VIII: Advanced Interior

 DesignSpring and fall. 6 credits. Prerequisites: DEA $301,302,303$, and 304. Minimum cost of materials, $\$ 150$; diazo machine fee, $\$ 8$ per semester.

T R 12:20-4:25. S. Danko.
Design-problem-solving experiences involving completion of advanced interior design problems. Problems are broken into five phases: programming; schematic design and evaluation; design development, including material and finish selection; design detailing; and in-process documentation and the preparation of a professional-quality design presentation.

## DEA 600 Special Problems for Graduate

 StudentsFall or spring. Credit to be arranged. S-U grades optional.

Hours to be arranged. Department faculty. Independent advanced work by graduate students recommended by their special committee chair and approved by the head of the department and instructor.
[DEA 643 American Vernacular Interiors Spring (alternate years). 4 credits. Enrollment limited to 15 students. S-U option. Field trips $\$ 50$. Not offered 1994-95.

T R 10:10-11:30 and one hour to be arranged. J. Jennings.

A course intended for graduate students who want a more thorough grounding in the history of vernacular interiors than is provided by DEA 443. A topical study of nineteenthand twentieth-century American vernacular interiors, exploring the relationship between interior design theory and social and cultural values. Sources include historic interiors, literature and art, architectural and material culture studies. Reading, discussion, comparative analysis and critical writing. Each student is required to attend DEA 443 lectures, meet with the instructor and other graduate students for an additional class hour each week, and do additional readings and projects.]

## DEA 645 Design Process and Methods

Spring. 3 credits. Limited to 15 graduate and advanced undergraduate students. Prerequisite for undergraduates: permission of instructor.

T 4:30-7:30. S. Danko. Focuses on thinking processes and techniques that support creative problem solving. Design methodologies of famous designers such as da Vinci, Ben Franklin, and Charles Eames will be examined through discussions and applications to short studio problems by the students. Topics include a historical overview of the design process and methods in both professional practice and education, creative problem solving in management and design, perceptual blocks to creativity, and the inherent merits and pitfalls in the four realms of thinking: analytical, intuitive, synthetic, and evaluative.

## DEA 648 Advanced Applications In Computers Graphics

Fall. 3 credits. Limited to 12 graduate and advanced undergraduate students. Prerequisites for undergraduates: DEA 201 and 202 or permission of instructor. Minimum cost of materials $\$ 150$.

Lec, T R 9:05-9:55; lab 1, T R 10:10-12:05.
K. Gibson.

Advanced use of computer technology to create and analyze interior environments. Emphasis will be on the use of 3-D modeling, animation, photorealistic rendering and emerging technologies to investigate dynamic design issues.

## DEA 650 Programming Methods in Design

Fall. 4 credits. Recommended prerequisites: DEA 660,652 , and 656.

T R 9:05-10:30 and an hour to be arranged. F. Becker. A course intended for graduate students who want a more thorough introduction to environmental programming methods than is provided by DEA 459. Each student is required to attend DEA 459 lectures, meet with the instructor and other graduate students for an additional class each week, and do additional readings and projects.
DEA 651 Human Factors: ErgonomicsAnthropometrics
Spring. 4 credits. Recommended: DEA 150 and a 3-credit statistics course.

T R 9:05-10:30 and an hour to be arranged. A. Hedge.
A course intended for graduate students who want a more thorough grounding in human factors than is provided by DEA 325.
Implications of human physical and physiological characteristics and limitations on the design of settings, products, and tasks. An introduction to engineering anthropometry,
biomechanics, control/display design, work physiology, and motor performance. Course includes practical exercises and field project work. Each student is required to attend DEA 325 lectures, meet with the instructor and other graduate students for an additional class each week, and do additional readings and projects.

## DEA 652 Human Factors: The Ambient Environment

Fall. 4 credits. Recommended: A 3-credit statistics course and DEA 150.

T R 11:15-1:10 and one hour to be arranged. A. Hedge.
A course intended for graduate students who want a more thorough grounding in human factors than is provided by DEA 350: humanfactors considerations in lighting, acoustics, noise control, indoor air quality and ventilation, and the thermal environment. The ambient environment is viewed as a support system that should promote human efficiency, productivity, health, and safety. Emphasis is placed on the implications for planning, design, and management of settings and facilities. Course includes a field project. Each student is required to attend DEA 350 lectures, meet with the instructor and other graduate students for an additional class each week, and do additional readings and projects.
DEA 653 Plan/Manage the Workplace Spring. 3 credits. Prerequisite: DEA 250/660 or permission of instructor.

M 7:30-10:30 p.m. F. Becker
Intended for students interested in the planning, design, and management of facilities for complex organizations. The purpose of the course is to explore how characteristics of the workplace, including furniture and equipment and policies governing their use and allocation, affect individual and organizational effectiveness. Special topics, such as the human implications of new information technologies and work at home, are also covered.

## DEA 654 Facility Planning and Management Studio

Spring. 4 credits. Prerequisite: DEA 650 or permission of instructor. Letter grades only. Minimum cost of materials, $\$ 200$.

M W 1:25-4:25. W. Sims. For graduate students in facility planning and management. The purpose of the course is to provide basic tools, techniques, and concepts useful in the planning, design, and management of complex facilities. Covers strategic and tactical planning for facilities, organizing to deliver facility management services, project management, space forecasting, space allocation policies, programming, site selection, building assessment, space planning and design, furniture specifications, and moves. Sociopsychological, organizational, financial, architectural, and legal factors are considered.

## DEA 656 Research Methods in Human-

 Environment RelationsFall. 4 credits. Prerequisites: DEA majors only or permission of instructor, and a statistics course. Letter grades only.

M W F 1:25-2:15 plus 1.5 hr TBA.
G. Evans.

The course develops the graduate student's understanding and competence in the use of research and analytical tools to study the relationship between the physical environment and human behavior. Emphasis is
placed on selection of appropriate methods for specific problems and the policy implications derived from research. Topics include research design, unobtrusive and obtrusive data-collecting tools, the processing of qualitative and quantitative data, and effective communication of empirical research findings Students attend DEA 455 lectures but have more extensive readings and projects and meet an additional hour each week.

## DEA 659 Seminar on Facility Planning and Management

Fall. 1 credit. For graduate students and advanced undergraduates interested in careers in facility planning and management. S-U grades only

M 4:30-5:45, F. Becker, W. Sims. Series of seminars led by Cornell faculty members and other professionals directly involved in facility planning and management. Topics include strategic and tactical facility planning, space standards, project management, computer and facility management, facility maintenance and operations, energy conservation and building systems.

## DEA 660 The Environment and Social Behavior

Fall. 4 credits. Prerequisite: DEA 150 or permission of instructor. S-U grades optional T R 2:30-4:00, plus 1.5 hr . TBA.
G. Evans.

A combination seminar-and-lecture course for graduate students with interests in social sciences, facility management, or design Through projects and readings, the influence of environmental form on social behaviors such as aggression, cooperation, communication, community, and crime is explored. Also covered are the influences of stage in life cycle, family structure, and social class on environmental needs and purposes. Implications for the planning, design, and management of complex environments such as offices, hospitals, schools, and housing are emphasized. Graduate students attend DEA 250 lectures but have more extensive readings and meet an additional hour each week.

## DEA 668 Design Theory Seminar

Fall. 3 credits. Enrollment limited to 15 students.

T 4:30-7:30 p.m. Staff.
Directed toward advanced undergraduate and graduate students with interest in the theory of design. The purpose is to provide an understanding of major theoretical ideas underlying design movements of the twentieth century. Explores these ideas through readings, lectures by faculty and visitors, student presentations of research papers, and seminar discussions.

## DEA 670 Environmental Analysis I:

 Applied Ergonomics Methods Fall (alternate years). 4 credits. Enrollment limited to 20. Prerequisite: DEA 651.T R 2:30-4:00. A. Hedge.
This course covers ergonomics methods and techniques and their application to the design of modern work environments. Emphasis is also placed on understanding key concepts. Coverage includes conceptual frameworks for ergonomic analysis, systems methods and processes, a repertoire of ergonomics methods and techniques for the analysis of work activities and work systems
[DEA 671 Environmental Analysis Il: Indoor Alr Guality Methods
Fall (alternate years). 3 credits. Enrollment limited to 20. Prerequisite: DEA 652.

T R 2:30-4:00. A. Hedge.
This course provides in-depth coverage of the nature of indoor air pollutants and techniques for analyzing indoor air quality in modern work environments. Emphasis is placed on understanding key concepts in environmental exposure, toxicology, epidemiology and on understanding the procedures for assessing indoor air quality conditions. Coverage also includes detailed consideration of the design of modern ventilation systems.]

## DEA 899 Master's Thesis and Research

Fall or spring. Credits to be arranged. Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.

Hours to be arranged. Department graduate faculty

## HUMAN DEVELOPMENT AND FAMILY STUDIES COURSES

S. Hamilton, chair; G. Suci, graduate faculty representative; J. Brumberg, undergraduate advising coordinator; C. Anderson,
U. Bronfenbrenner, R. Canfield, S. Ceci, M. Cochran, S. Cornelius, D. DempsterMcClain, R. Depue, J. Doris, J. Eckenrode, J. Haugaard, C. Hazan, B. Koslowski,
L. C. Lee, M. Lenzenweger, B. Lust, P. Moen, K. Pillemer, M. Potts, H. Ricciuti, S. Robertson J. Ross-Bernstein, R. Savin-Williams, S. West,
E. Wethington

HDFS 115 Human Development
Fall or summer. 3 credits. S-U grades optional.

M W F 1:25. Staff
Provides a broad overview of theories, research methods, and current knowledge of human development from conception into adulthood. Course material primarily covers infancy and childhood with considerably less focus on adolescent and adult development. Topics include biological, intellectual, linguistic, social and emotional development as well as the cultural, social, and interpersonal contexts that affect developmental processes and outcomes in these domains.
HDFS 150 Families and the Life Course
Spring or summer. 3 credits. S-U grades optional.

M W F 1:25. M. Cochran.
This course provides an introduction to social scientific research on family roles and functions. Families are examined in regard to how they appear in U.S. history, how they change over the life course, and how they are influenced by cultural and economic forces.

## HDFS 216 Human Development:

 Adolescence and YouthSpring or summer. 3 credits. Prerequisite: HDFS 115. S-U grades optional.

TBA. R. Savin-Williams. Provides a broad overview of theories, issues, and research in the study of human development from early adolescence to early adulthood (youth). Attention is focused on the interplay of biological and cognitive factors, interpersonal relationships, social structure, and cultural values in shaping the individual's development. The role of adolescence in both the individual's life course and the evolution of the culture as a whole is also considered. Familial, peer group, educational, and work contexts for development are discussed.

HDFS 218 Human Development: Adulthood and Aging
Spring. 3 credits: Prerequisite: HDFS 115.

## S-U grades optional.

TBA. Staff.
Provides a general introduction to theories and research in adult development and aging. Psychological, social, and biological changes from youth through late adulthood are discussed. Both individual development within generations and differences among generations are emphasized.

## HDFS 241 History of Childhood in the United States

Spring. Limited to 30 students. 3 credits. M W F 10:10. J. Brumberg. An examination of childhood and adolescence in various historical contexts: Puritan New England, slave plantations, evangelical revivals, the Western frontier, Victorian families, reform schools, early high schools and colleges, the sexual revolution of the 1920s, immigrant communities, the Depression and World War II, the 1950s, and more recent social and cultural changes affecting families. Students will evaluate continuities and changes in the lives of American children as well as changing scientific ideas about children. Students have an opportunity to reflect on and write about their own childhood and adolescence. This course is designed to give students a humanities perspective on approaches to childhood central to many different disciplines.

## HDFS 242 Participation with Groups of

 Young ChildrenFall or spring. 4 credits ( 3 credits possible, but not recommended). Limited to 20 students (limit depends on availability of placements and of supervision). Prerequisites: HDFS 115 and permission of instructor. S-U grades optional.

W 10:10-12:05, plus 2 half-days of field work (for 4 credits) or 1 half-day of field work (for 3 credits). In morning or aftemoon. S . West.
This course is designed to integrate developmental theories with supervised experience in child care centers, with the intention of enhancing the student's abilities to understand and to relate effectively with young children. Participation, observation, reflection, reading, writing, and sharing of viewpoints are some of the means used to these ends. Placements are in local nursery schools, day care centers, Head Start programs, and kindergartens.

## HDFS 243 Participation with Groups of Children, Ages 6-12

Fall. 4 credits ( 3 credits possible, but not recommended). Limited to 20 students (limit depends on availability of placements and supervision). Prerequisites: HDFS 115 and permission of instructor during preregistration. S-U grades optional.

W 12:20-2:15, plus 2 half-days of field work (for 4 credits) or 1 half-day of field work (for 3 credits). Placements are 3 hours per day, twice a week.
J. Ross-Bernstein.

This course is designed to allow students to gain a working developmental perspective on the school-aged child (ages 6-12). Students will participate in area elementary schools for 6 hours per week as a classroom assistant, attend a weekly 2 -hour resource and discussion seminar, and complete readings in developmental theory, current trends, and issues regarding children's learning and growth. The application of readings and
discussions to the field experience via written assignments will give the student the opportunity for a well-integrated understanding of the school-aged child.
MDFS 258 Historical Development of Women as Professionals, 1800 to the Present (also Women's Studies 238 and Mistory 238, American Studies 258)
Spring. 3 credits. S-U grades optional. Human ecology students must register for HDFS 258.

T R 10:10-11:40. J. Brumberg.
The historical evolution of the female professions in America (midwifery, nursing, teaching, librarianship, home economics, and social work) as well as women's struggles to gain access to medicine, law, and the sciences. Lectures, reading, and discussion are geared to identifying the cultural patterns that fostered the conception of gender-specific work, and the particular historical circumstances that created these different work opportunities. The evolution of "professionalism" and the consequences of professionalism for women, family structures, and American society are also discussed
[HDFS 259 Socialization, Social Control, and Deviance across the Life Course Spring. 3 credits. Prerequisites: HDFS 150 or Sociology 101 or Rural Sociology 101. Not offered 1994-95.

T R 8:30-9:55. E. Wethington. Provides an overview of sociological theories and research on how social structures, values and relationships regulate individual behavior. Theories and research on social control, crime, delinquency, and creativity are emphasized.]

## HDFS 300 Special Studies for Undergraduates

Fall or spring. Credit to be arranged. Permission required.

Hours to be arranged. Department faculty. Special arrangement for course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they want to undertake on a form available from the Student Services Office. The form, signed by both the instructor directing the study and the coordinator of undergraduate education, is filed at course registration or during the change-of registration period.

## HDFS 313 Problematic Behavior in

 AdalescenceSpring. 3 credits. Prerequisite: HDFS 115 or Psychology 101; HDFS 216 recommended. T R 2:30-3:55. J. Haugaard. This course will explore several problematic behaviors of adolescence, including depression, drug abuse, eating disorders, and delinquency. Various psychological, sociological, and biological explanations for the behaviors will be presented. Appropriate research will be reviewed; treatment and prevention strategies will be explored.

## HDFS 331 Learning in Children

Fall. 3 credits. Prerequisite: HDFS 115 or equivalent. Limited to 20 students.

W 10:10-12:05. Field experience to be individually arranged. M. Potts. Examines diverse theories and models of learning and their differing implications for real-world situations that require learning or relearning. Considers the interrelations of learning and development and of learning and
intelligence. Through fieldwork, application is made to the assessment of learning processes in the cognitive domain and to implementation of the variables which affect learning

## HDFS 333 Cognitive Processes in Development

Spring. 3 credits. Prerequisite: HDFS 115 or equivalent.

R 10:10-12:35. G. Suci.
A survey of theories and problems in the development of selected cognitive processes: attention, perception, mediation processes, and language. The focus is on the first two years of life.
[HDFS 334 The Growth of the Mind Spring. 4 credits. Open to undergraduate and graduate students. Graduate students should also enroll in HDFS 635, a supplemental graduate seminar. Prerequisites: A course in human experimental psychology, statistics, or HDFS 115 or equivalent; or permission of the instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

T R 3:10-4:25. B. Lust. In this course the fundamental issues of cognition are introduced. What is the nature of human intelligence? of logical and scientific reasoning? How are knowledge and understanding acquired and represented in the human mind? What is the nature of mental representation? What are the cognitive characteristics of the mind at birth? What is the relation of the acquisition of knowledge and understanding to their final representation? What are the relations between language and thought? In the study of those issues, how can epistemology and experimental psychology be related through the experimental method?
Basic debates in the study of cognition are introduced and discussed throughout: for example, the roles of innateness and learning, the distinction between competence and performance, and the relation between induction and deduction in the acquisition of knowledge. Those psychological issues are set in a context of basic epistemological issues involving the tension between rationalism and empiricism.
The course will analyze Piaget's comprehensive theory of cognitive development and experimental results. Current research in cognitive development will be contrasted.]

## HDFS 344 Infant Behavior and Development

Fall. 3 credits. Prerequisites: HDFS 115, a biology course, and a statistics course. Not open to freshmen.

T R 12:45-2:00. S. Robertson.
Behavior and development from conception through the first two years after birth will be examined in traditional areas (e.g., perception, cognition, socioemotional, language, motor). The fundamental interconnectedness of these aspects of development will be strongly emphasized, as well as their relation to the biology of fetal and infant development. Topics with implications for general theories of development will be emphasized (e.g., the functional significance of early behavior, the nature of continuity and change, the role of the environment in development). Conditions which put infants at risk for poor development (e.g., premature birth, exposure to environmental toxins, maternal depression) and topics with current social, ethical, or political implications (e.g., infant day care, fetal rights) will also be considered. An
emphasis on research methodology in the study of early behavior and development will be maintained throughout the course

HDFS 346 The Role and Meaning of Play Spring. 2 credits. Limited to 30 juniors and seniors. Prerequisite: HDFS 115

W 7:30-9 p.m. J. Ross-Bemstein.
The aim of this course is to examine the play of children ages three through seven. Through seminar discussions, workshops, films, and individualized research, the student will explore the meanings and validity of play in the lives of young children, the different ways that children play and the value of each, and the effect of the environment in enhancing and supporting play.

## HDFS 347 Human Growth and Development: Biological and Behavioral Interactions (also Biology and Society 347 and Nutritional Sciences 347)

Spring. 3 credits. Prerequisites: Biological Sciences 101 or 109 or equivalent, and HDFS 115 or Psychology 101. Offered alternate years. Limited to 100 students.

M W F 1:25. J. Haas, S. Robertson. This course is concerned with the interrelationships between physical and psychological growth and development in humans, particularly during infancy. Intrinsic and extrinsic causes of variations in growth, including various forms of stimulation, are considered. In addition, the consequences of early growth and its variations for current and subsequent behavioral, psychological, and physical development are examined. The interaction between physical and behavioral or psychological factors is emphasized throughout the course.

## HDFS 348 Advanced Participation with

 ChildrenFall or spring. 4 or 8 credits. Limited to 20 students (limit depends on availability of placements and supervision). Prerequisites: HDFS 115 and HDFS 242, 243 or 331; and permission of instructor. Recommended: HDFS 346. S-U grades optional.

Two or 3 half-days' participation (morning or afternoon) and an hour group confer-
ence each week. W 1:25-3:20.
J. Ross-Bernstein/S. West.

An advanced, supervised field-based course, designed to help students deepen and consolidate their understanding of children. Students are expected to define their own goals and assess progress with supervising teachers and instructor; to keep a journal; and to plan, carry out, and evaluate weekly activities for children in their placement. Conference group and readings focus on contexts of development and on ways to support children's personal and interpersonal learning. Each student is expected to do a presentation and paper on a self-selected topic within the scope of the class. Participation is in settings that serve typical and/or special needs children from two to ten years of age and provide education, care, or specialpurpose interventions for them.

## HDFS 354 Families in Cross-cultural Perspective

Spring. 3 credits. Prerequisites: HDFS 115 or HDFS 150 or Rural Sociology 101 or 102 or Anthropology 101 or 102, or equivalent. S-U grades optional. Limited to 75 students M W 10:10; additional section TBA F. Cherry.

This course will be taught with an emphasis on the life cycle of families and individuals. Focus will be on the rites/rituals, both subtle and obvious, that mark an individual's movement through the stages of life. The approach will be both anthropological and historical. Students will see correlations between diverse family forms in the United States and around the world.

## [HDFS 359 American Families in Mistorical Perspective (also Women's Studies 357, History 359, American Studies 359)

Spring. 3 credits. Prerequisite: HDFS 150 or one 200 -level social science or history course. S-U grades optional. Human ecology students must register for HDFS 359. Not offered 1994-95.

T R 10:10-11:40. J. Brumberg
This course provides an introduction to and overview of problems and issues in the historical literature on American families and the family life cycle. Reading and lectures demonstrate the pattern of American family experience in the past, focusing on class, ethnicity, sex, and region as important variables. Analysis of the private world of the family deals with changing cultural conceptions of sexuality, sex roles, generational relationships, stages of life, and life events. Students are required to do a major research paper on the history of their family, covering at least two generations, and demonstrating their ability to integrate life-course development theory, data drawn from the social sciences, and historical circumstances.]

## HDFS 360 Personality Development

Spring. 3 credits. Prerequisites; HDFS 115 or Psychology 101, plus one other course in HDFS or psychology. Students cannot receive credit for both HDFS 360 and Psychology 275. Offered alternate years.

T R 12:20-2. C. Hazan.
This course is designed as an introduction to theory and research in personality development. It covers the major theories of personality as well as the major developmental tasks and trends as they relate to personality development (e.g., affect regulation, sociability, impulse control, perceived competence). Special emphasis is given to the processes by which individual differences emerge out of interactions between persons and their environments

## HDFS 361 The Development of Social

 BehaviorSpring. 3 credits. Prerequisite: HDFS 115 or Psychology 128. Offered alternate years.

M W F 12:20. Staff.
Issues in the development of social behavior are viewed from the perspective of theory and research. An attempt is made to apply our understanding of social behavior to education, childrearing, and group behavior. Likely topics include bases of social behavior in early childhood, the role of peers, the development of aggressive behavior, the development and functioning of attitude and value systems, conformity and deviation, and the function and limits of experimental research in the study of social development.

## HDFS 362 Close Relationships across the Lifespan

Fall. 3 credits. Prerequisite: HDFS 115 or Psychology 101. S-U grades optional.

T R 12:20-1:45. C. Hazan.
This course analyzes the nature and function of close relationships from infancy through
adulthood. Special emphasis is given to the interplay between biology and culture. The material presented is drawn from a wide variety of theoretical and empirical literatures Topics include attachment in human infants, childhood relationships with parents and peers, interpersonal attraction, intimacy and commitment, marriage, divorce, and the role of close relationships in physical and mental health.

HDFS 370 Abnormal Development and Psychopathology
Spring. 3 credits. Limited to sophomores, juniors, and seniors. Prerequisites: HDFS 115 , Psychology 101, or Education 110; a course in statistics (e.g., Psych 350, Soc 301, Educ 352 or 353 , Ag Ec 310 or equivalent); and an introductory biology course

T R 10:10-11:40. M. Lenzenweger A research-based survey of the cognitive, emotional, and biological aspects of abnormal development across the life span. The major mental illnesses will be covered, including schizophrenia, anxiety disorders, affective disorders, and personality disorders as well as psychopathological disorders of childhood. Emphasis will be placed on the development of psychopathology, current theories and models of etiology, and intervention strategies. This course is intended to be a rigorous introduction to the scientific study of psychopathology and psychopathological development; minimal attention to psychotherapy.

## [HDFS 397 Experimental Child

 PsychologyFall. 4 credits. Prerequisites: one course in statistics and permission of instructor. Intended primarily for students interested in entering graduate programs involving further research training. Not offered 1994-95

M W 10:10-12:05. L. C. Lee
A study of experimental methodology in research with children. Includes lectures discussions, and practicum experiences covering general experimental design, statistics, and styles and strategies of working with children.]

## HDFS 400-401-402-403 Special Studies for Undergraduates

Fall or spring. Credits to be arranged.
Enrollment limited to juniors and seniors with a minimum 3.0 G.P.A. Permission required. Prerequisites: either HDFS 115, 150, and two intermediate level HDFS courses, or four courses in pyschology or sociology. S-U grades optional.

Hours to be arranged. Department faculty For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of HDFS not otherwise provided through course work in the department or elsewhere at the university. Students prepare a multicopy description of the study they want to undertake, on a form available from the Student Services Office. This form must be signed by the instructor directing the study and the student's faculty adviser and submitted to NG14 MVR, the Office of Undergraduate Education. After clearance that all prerequisites are met, the student picks up the form in NG14 to file at course registration or within the change-of-registration period after registration. To ensure review before the close of the periods, early submission of the special studies form to the Office of Undergraduate Education is necessary. Students, in consultation with their supervisor, should
register for one of the following subdivisions of independent study (guidelines for each are available in NG14 Martha Van Rensselaer
Hall):

## HDFS 400 Directed Readings

Prerequisites: In addition to the general prerequisite courses, a statistics or methods course and at least one course directly linked to the area of study. Permission required. For study that predominantly involves library research and independent study.

## HDFS 401 Empirical Research

Prerequisites: In addition to the general prerequisite courses, a statistics or methods course and at least one course directly linked to the area of study. Permission required. For study that predominantly involves data collection and analysis, or laboratory or studio projects.

## HDFS 402 Supervised Fieldwork

Prerequisites: In addition to the general prerequisite courses, an observation or participation course. Permission required. For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice.
HDFS 403 Teaching Apprenticeship Prerequisites: In addition to the general prerequisite courses, must have taken the course or equivalent and received a grade of $\mathrm{B}+$ or higher. Permission required. For study that includes assisting faculty with instruction.

## [HDFS 417 Female Adolescence in Mistorical Perspective (also Women's Studies 438 and History 458)

Fall. 3 credits. Limited to 25 students. Prerequisites: HDFS 258 or 359 or a 200 - or 300 -level history or women's studies course. Permission of instructor required Not offered 1994-95.

## W 2-4:25. J. Brumberg.

A reading, writing, and discussion course that will attempt to answer a basic historical question that has consequence for both contemporary developmental theory and social policy: How has female adolescence in the United States changed in the past 200 years? The focus will be on the ways in which gender, class, ethnicity, and popular culture shape adolescent experience. Although the required readings are primarily historical in nature, students are encouraged to think about the interaction of biology, psychology, and culture. Students are required to do a primary source research paper.]

## [HDFS 432 Cognitive Development and

 EducationSpring. 3 credits. Prerequisite: HDFS 115 or equivalent. Limited to 20 students. Not offered 1994-95.

T 10:10 12:05; field experience to be individually arranged. M. Potts.
This course defines basic cognitive processes that underlie education (for example, linguistic processes that underlie language comprehension and production; numerical processes that underlie mathematics; perceptual processes that underlie reading) and reviews research on the development and learning of these processes in children. A laboratory component focuses on assessment and facilitation of
cognitive competencies as they bear on one educational subject.]

## HDFS 436 Language Development (also

 Psychology 436 and Linguistics 436) Spring. 4 credits. Open to undergraduate and graduate students. Graduate students should also enroll in HDFS/LING 633, a supplemental graduate seminar. Prerequisite: at least one course in developmental psychology, cognitive psychology, cognitive development, or linguistics. S-U grades optional. Offered alternate years.T R 3:10-4:25. B. Lust.
This course surveys basic issues, methods, and research in the study of first-language acquisition. Major theoretical positions in the field are considered in the light of experimental studies in first-language acquisition of phonology, syntax, and semantics from infancy on. The fundamental issues of relationships between language and thought are discussed, as are the fundamental linguistic issues of Universal Grammar and the biological foundations for language acquisition. The acquisition of communication systems in nonhuman species such as chimpanzees is addressed, but major emphasis is on the child.

## HDFS 438 Thinking and Reasoning

Spring. 3 credits. Prerequisite: HDFS 115 or Psychology 101

W 2-4:25. B. Koslowski.
The course will examine problem solving and transfer, pre-causal thinking, logical thinking, practical syllogisms, causal reasoning, scientific reasoning, theories of evidence, expert vs. novice differences, and non-rational reasoning. Two general issues will run through the course: the extent to which children and adults approximate the sorts of reasoning that are described by various types of models, and the extent to which various models accurately describe the kind of thinking that is required by the types of problems and issues that arise and must be dealt with in the real world.

## HDFS 439 Cognitive Development:

 Infancy through AdolescenceFall. 3 credits. Prerequisites: HDFS 115 or Psychology 101. Letter grades only.

W 2-4:25. R. Canfield/B. Koslowski. The course will be an overview of current and classic issues and research in cognitive development. Central topics of both "hard cognition" (e g., information processing and neuropsychological functioning) and "soft cognition" (e.g., problem solving, concepts and categories) will be covered. Selected topics will be linked to methodological issues and to important social issues such as crosscultural cognitive development and putative racial and social class differences.
HDFS 440 Internship in Educational Settings for Children
Fall or spring. 8-12 credits. Prerequisites: HDFS 115,242 , or 243 or 331 and 348. Recommended: HDFS 346. Permission of instructor required. S-U grades optional. Hours to be arranged. Time commitment includes 24 ( 8 credits) to 36 ( 12 credits) hours per week divided among a placement with children and preparation,
reflection, and supervisory contact.
S. West/J. Ross-Bernstein.

Opportunity to integrate theory with practice at an advanced level and to further develop understanding of children ages two to ten and their families. Interns will function as student
teachers in a preschool or elementary school classroom and participate in curriculum planning, evaluation, staff meetings, home visits, parent conferences, and parent meetings. Supervision by head teacher and instructor. Students are expected to define their own goals and to assess their progress, to do assigned and self-directed readings, and to keep a critical incident journal.

## HDFS 451 Nontraditional Families and

 Troubled FamiliesFall. 3 credits. Limited to 30 students. Prerequisites: HDFS 115 and 150. Letter grades only

T R 8:30-9:55. J. Haugaard.
This is an advanced course designed to explore the functioning of families. The first part of the course examines family system theory and how it relates to our understanding of all families. Four types of families are then examined: two nontraditional families (e.g., adoptive families) and two troubled families (e.g., families with a chronically ill child).
[HDFS 456 Families and Social Policy Spring. 3 credits. Prerequisite: one course in the area of the family or in sociology. S-U grades optional. Not offered 1994-95.

Hours to be arranged. P. Moen. An examination of the intended and unintended family consequences of governmental policies, using case studies in areas such as social welfare, day care, and employment. The policy implications of changes in the structure and composition of families are also considered.]
[HDFS 457 Health and Social Behavior
Fall. 3 credits. Prerequisites: HDFS 115 or HDFS 150 or HSS 101 and a course in statistics. Letter grades only. Not offered 1994-95.

M W F 10:10. E. Wethington. This course critically examines theories and empirical research on the relationship between social structure and physical and mental health. The lectures and readings focus on family structure, social support, and social stress, all of which are associated with physical health, mental health, and health behaviors.]
[HDFS 461 The Psychology of Television Spring. 3 credits. Limited to 100 students. Preference given to juniors and seniors. Prerequisite: a developmental or psychology course; HDFS 115 or Psychology 101 preferred. Not offered 1994-95.

M W F 12:20. Staff
This course offers a historical and topical survey of the research literature regarding the influence of television. Topics include (1) the introduction of television from 1950 to 1960 and its direct effects, (2) the audience for television, (3) the content of television, (4) behavioral mechanisms of influence: imitation, disinhibition, arousal/desensitization, (5) the psychological research of the 1960s and 1970s; cognitive mechanisms of influence; mainstreaming and resonance; formal features, comprehension, and perceived reality; current issues in research from 1980 on; the role of advertisements; government policies and advertisements; and television over the life span.]

## HDFS 464 Sexual Minorities and Human Development

Fall. 3 credits. Limited to 15 students.
Permission of instructor required.
T 2-4:25. R. Savin-Williams.

The first half of the course will cover topics of a fairly general nature regarding theoretical, research, and applied issues on sexual minorities. In the second half of the course, students will determine the content through their selection of particular topics that interest them. The success of the course depends on students feeling personally engaged and committed to the course content. Because of the multidisciplinary nature of the course, it is hoped that students from a variety of backgrounds in disciplines, gender, sexual orientation, ethnicity, race, class, and religious affiliation will feel comfortable in the course.

## HDFS 466 Neurobiology of Personality and Psychopathology <br> Fall. 3 credits. Limited to 30 students

 Prerequisites: HDFS 115 or Psychology 101, Psychology of Psychopathology (HDFS 370 or Psychology 325), a semester of biology OR biological psychology. Letter grades only. W 2:00-4:25. R. Depue.For juniors and seniors who have an interest in the neurobiology of behavior. Course material is presented within an evolutionary biology perspective, where the development of neurobehavioral systems as a means of adapting to critical internal and external stimuli is explored. Focus is on the general role played by the biogenic amines (dopamine, norepinephrine, and serotonin) and opiates in personality and psychopathology Specifically, the relation of dopamine and positive emotionality, norepinephrine and negative emotionality, serotonin and behavioral stability, and opiates and social reward-attachment is explored in the area of personality. The manner in which these neurotransmitters may also be involved in disorders of affect, anxiety, personality, obsessive compulsion, and autism, respectively, is covered. The manner in which environmental influences across the lifespan may be coded in the brain and influence the development of personality and psychopathology is explored. Approximately 24-30 papers and chapters will be read and discussed.

## HDFS 470 Advanced Psychopathology: Classification, Causes, and Development

Fall. 3 credits. Limited to 20 juniors or seniors; not open to graduate students. Prerequisites: HDFS 370, statistics (Psychology 350 preferred), introductory biology or neurobiology. Permission of instructor required. Letter grades only.

T R 10:10-11:40. M. Lenzenweger. This course is intended to be an opportunity for advanced undergraduate students (i.e., juniors and seniors) to explore rigorously and in depth the empirical research literature concerning several specific forms of severe psychopathology. The course will focus on schizophrenia, affective illness, and personality disorders, particularly borderline personality disorder. Each syndrome will be discussed in terms of phenomenological and classification issues, etiological factors, and developmental trajectory within the context of the diathesis-stress model of psychopathological development.

## [HDFS 471 Child Development and Psychopathology

Fall. 3 credits. Limited to 60 advanced-level students. Prerequisites: a basic course in psychopathology or instructor's permission. Letter grades only. Not offered 1994-95. T R 2:30-3:55. J. Haugaard.

This class will explore the development and process of mental, emotional, and behavioral disorders in children. Topics will include (1) the classification of mental disorders; (2) biolngical, psychological, and sociological theories regarding the development and maintenance of mental disorders;
(3) prevalence and etiology of childhood mental disorders, and (4) therapeutic and preventive interventions. Lectures will be the primary mode of teaching, although class discussion is encouraged. An optional discussion section will be available to those students who would like an opportunity to discuss readings and lecture material in greater depth.I

## [MDFS 472 Typical and Atypical

 Intellectual Development Spring. 3 credits. Prerequisites: HDFS 115, a course in statistics, and a course in biology. Not offered 1994-95.T R 10:10-11:30. S. Ceci.
This course provides an intensive historical examination of both normal and abnormal intelligence, focusing on the antecedents of contemporary views of the heritability of intelligence, brain-behavior linkages, expertise, generality, and cognitive modifiability. It concludes with an examination of current theories, with an emphasis on the instructor's own bioecological theory.]

## HDFS 498 Senior Honors Seminar

Fall and spring. 1 credit. Required for, and limited to, seniors in the HDFS honors program.

Hours to be arranged. R. Canfield. This seminar is devoted to discussion and presentation of honors theses being completed by the senior students.

## HDFS 499 Senior Honors Thesis

Fall or spring. Credit to be arranged
Prerequisite: permission of thesis adviser and coordinator of honors program. S-U grades optional.

> Department faculty.

## Topics Courses

Fall or spring. 2-4 credits. Prerequisites and enrollment limits vary with topic being considered in any particular term. Permission of instructor required.

Hours to be arranged. Department faculty. This series of courses provides an opportunity for undergraduates to explore an issue, a theme, or research in the areas of departmental concentration. Topics vary each time the course is offered. Descriptions are available at the time of course registration. Although the courses are usually taught as seminars, a subject may occasionally lend itself to lecture, practicum, or other format.

## HDFS 215, 315, 415 Topics in Adalescent and Adult Development

HDFS 235, 335, 435 Topics in Cognitive Development

HDFS 245, 345, 445 Topics in EarlyChildhood Development and Education

HDFS 255, 355, 455 Topics in Family Studies and the Llfe Course

HDFS 265, 365, 465 Topics in Social and Personality Development
HDFS 275, 375, 475 Topics in Developmental Psychopathology

HDFS 285, 385, 485 Topics in the Ecology of Human Development

## The Graduate Program

HDFS graduate courses are only open to undergraduates with instructor's permission.

## General Courses

HDFS 610 Processes in Human Development
Spring. 3 credits. Limited to 20 students. Open to graduate students and juniors and seniors in HDFS and related fields with recommendation from a faculty member and instructor's permission. Prerequisite: a minimum of one course in statistics. Letter grades only.

W 2:00-4:25. U. Bronfenbrenner.
This course focuses on research that illuminates processes of human development as a function of organism-environment interaction through the life course. Topics to be examined will be drawn from the following: the ecology of cognitive development, developmentally instigative characteristics of persons and environments; developmental processes in males and females; activity and work as developmental processes; intimate relationships as contexts of development; developmental processes in adulthood. The final selection will be responsive to student interests.

## [HDFS 617 Adolescence

Spring. 3 credits. Not offered 1994-95.
Hours to be arranged. Staff.
Critical examination of seminal theoretical and empirical writings on adolescent development. Empirical research on specific questions chosen by students is considered in the light of these approaches.]
【HDFS 631 Cognitive Development
Fall. 3 credits. Letter grades only. Offered alternate years. Not offered 1994-95.

TBA. Staff.
Faculty members involved in the course will present their area of specialization in cognitive development. These areas will include perception, attention, memory, language, thinking and reasoning, learning, creativity, and intelligence.]

## HDFS 640 Infancy

Fall. 3 credits.
TBA. S. Robertson
Development in infancy will be examined through a critical review of key research and theory in selected aspects of neurobehavior, perception, cognition, language, emotion, and social relationships. Theoretical issues to be considered include the role of experience in early development, sensitive periods, continuity and discontinuity in development, and the functional significance of early behavior. Some of the conditions that put infants at risk for poor development will also be considered, such as premature birth, perinatal medical complications, and exposure to environmental toxins. The course will combine perspectives from developmental psychology and psychobiology.
[HDFS 641 Early-Childhood Development and Education
Fall. 3 credits. Not offered 1994-95.
TBA. M. Potts.
Survey of major issues in the theoretical and research literature of early-childhood education.]

## HUMAN ECOLOGY-1994-1995

## [HDFS 650 Contemporary Family Theory

 and ResearchFall. 3 credits. Not offered 1994-95.
T 10:10-12:35. E. Wethington.
Sociological and social psychological theories and research in the area of the family are examined with reference to the relationship between the family and society, the processes of socialization and social control, the reproduction of gender and social class, and social group rates of deviance and psychological disorder.]

HDFS 660 Socioemotional Development Spring. 3 credits. S-U grades optional.

T 2:00-4:25. C. Hazan.
This course is designed to provide both broad and in-depth training in the areas of social and emotional development during infancy and childhood. It will cover most of the major topic areas and theoretical orientations. Consideration will be given to basic influences on socioemotional development-biological, social, and cultural. Coverage will include normative development as well as the origins and nature of individual differences. We will explore such fundamental issues and questions as: What are emotions? What role do they play in the development and organization of personality? What are the effects of early social relationships on emotional regulation? When and how does the self-system emerge? Emphasis will be on the processes both internal and externalthat help determine the course and outcome of development.

## HDFS 670 Developmental

Psychopathology
Spring. 3 credits. Prerequisite: an undergraduate course in abnormal psychology or psychopathology; a course in multivariate statistics; and substantive course work in neurobiology or related biological science.

Hours to be arranged. M. Lenzenweger. Overview of current theories and empirical research on functional and organically based psychological disorders. Topic areas to be covered include autism, schizophrenia, anxiety disorders, affective disorders, and personality disorders. Focus is on the developmental and etiology of psychopathology.

## Topical Seminars

Seminars offered irregularly, with changing topics and instructors. Content, hours, credit, and instructors to be announced. Seminars offer concentrated study of specific theoretical and research issues.

## HDFS 618 Seminar in Adolescence and Adult Development

Topics include peer relations, parent-teen relationships, self-esteem, youth and history, work, and moral development.

## HDFS 633 Seminar on Language Dovelopment

Topics include acquisition of meaning in infancy, precursors of language in early infancy, and atypical language development.

## HDFS 635 Seminar In Cognitive Development

Topics include early attention, perception, memory, and communication. Assessment and intervention in relation to these processes will be considered when possible.

HDFS 645 Seminar on Infancy
Topics covered in depth include the role of emotions in early development, infant stimulation and early experience, and the assessment of infant developmental competencies.

## HDFS 646 Seminar in Early-Childhood Development and Education

Topics include analysis of models and settings, design of assessment techniques, program evaluation, and early childhood in a cross-cultural context.

## HDFS 655 Seminar in Family Studies and

 the Life CourseTopics include the sociology of marital status, the single-parent family, work-family linkages, women and work, and families and social change.

HDFS 665 Seminar in Personality and Social Development
Focuses on selected issues related to personality and social development. The issues selected vary each year according to current importance in the field and student interests.

## HDFS 675 Seminar in Developmental Psychopathology

Topics include learning disabilities, therapeutic interventions in atypical development, child abuse and maltreatment, family factors in the etiology of functional disorders, and cognitive characteristics of atypical groups.

## HDFs 685 Seminar in Human

 Development and Family StudiesTopics include development of self-concept, sex-role identity, observational methods, and interviews in developmental research.
HDFS 690 Seminar on Ecology of Human Development
Topics include the institutional setting as a determinant of behavior, the poor family, and the identification and measurement of ecological variables.

## Individualized Special Instruction

HDFS 700-706 Special Studies for Graduate Students
Fall or spring. Credits and hours to be arranged. S-U grades at discretion of instructor.

Department faculty.
Independent advanced work by graduate students recommended by their Special Committee chair with approval of the instructor.

## HDFS 700 Directed Readings

For study that predominantly involves library research and independent study.

## HDFS 701 Empirical Research

For study that predominantly involves
collection and analysis of research data.

## HDFS 702 Practicum

For study that predominantly involves field experience in community settings.
HDFS 703 Teaching Assistantship
For students assisting faculty with instruction. Does not apply to work for which students receive financial compensation.

## HDFS 704 Research Assistantship

For students assisting faculty with research. Does not apply to work for which students receive financial compensation.

HDFS 705 Extonsion Assistantship
For students assisting faculty with extension activities. Does not apply to work for which students receive financial compensation.

HDFS 706 Supervised Teaching
For advanced students who assume major responsibility for teaching a course. Supervision by a faculty member is required.

HDFS 899 Master's Thesis and Research Fall or spring. Credit to be arranged. S-U grades only. Prerequisite: permission of thesis adviser.

Department graduate faculty.

## HDFS 999 Doctoral Thesis and Research

 Fall or spring. Credit to be arranged. S-U grades only. Prerequisite: permission of thesis adviser.Department graduate faculty.

## HUMAN SERVCC STUDIES counses

C. Shapiro, chair; B. L. Yerka, graduate facultyo representative; D. Tobias, undergraduate advising coordinator; J. Allen, D. Barr, R. Battistella, R. Bounous, J. Ford, K. Grazier, J. Greene, A. Hahn, R House; J. Kuder,
C. McClintock, M. Minot, B. J. Mueller,
A. Parrot, K. Pryor, E. Rodriguez, L. Street, D-Totias, W. Trochim, R. J. Babcock, Emeritus, L. A. Noble, Emeritus, J. Ziegler, Emeritus
HSS 100 Skills for Learning in the Field Fall and spring. 3 credits. Instructor's permission required. Open to all levels, undergraduate and graduate. Limited to 30 students.

T R 2:30-4:25. R. Bounous.
Students learn to be self-directed learners and to integrate theory and experience. Topics include experiential learning, participant observation, interpersonal communication, critical analysis, and empowerment. These ideas and skills are learned through participation in CLASP, an adult literacy program.

## HSS 101 Human Services in Contemporary Society

Fall. 3 credits. Recommended for freshmen and first-year transfer students.

T R 10:10-12:05. D. Barr.
A lecture and discussion course designed as an introduction to the community base of services. Current and historical human services are examined. Emphasis is placed on social services, education, health, and criminal justice. Barriers to service delivery are discussed, such as racism, sexism, classism, sexual preference, physical disability, and age. Contemporary issues that impact on service delivery will also be discussed with attention to the relationship between direct service and public policy.
HSS 203 Groups and Organizations Spring. 3 credits. Enrollment limited to 125 students.

M W F 10:10-11. L. Street.
A basic course in the social psychology of groups and human service organizations. Study of the human service organization focuses on individual, group, and organization interface in terms of such issues as the perception of roles, norms, communication, power, leadership, and other issues. Students are expected to learn about the basic concepts
and propositions that provide insight into organizational issues that confront members of organizations. Exercises are used to heighten understanding of group and organizational behavior.

HSS 210 The Elements of Helping Spring. 3 credits. Limited to 50 students. S-U optional. Prerequisite: Attendance at first class meeting mandatog

TBA.D. Barn $H$ OH:
An introduction to the theoretical and practical aspects of human service processes. Included is an overview of the helping relationship covering roles, characteristics, relationships, dilemmas, and career issues of helpers. The course focuses on understanding and development of helping skills. Through role playing and exercises, students deal with basics such as attending, listening, responding, empathy, respect, genuineness, and confronting. Other topics include self-awareness, leaming, communication, and conflict management.

## HSS 225 Education as a Human Service

 Fall. 3 credits.M W F 11:15-12:05. M. Minot.
An introductory course concerned with the role of the educator as a professional provider of preventive and remedial intervention through knowledge that results in intentional changes in cognitive, affective, or psychomotor skills of individuals. Educators, in collaboration with other human service professionals, facilitate human growth and development. The course includes an overview of educational programs that use human ecology content in schools and other selected human service delivery systems and settings. Emphasis is placed upon the competencies and responsibilities of professionals assuming the educative role.
HSS 246 Determinants of Behavior Fall. 3 credits. Prerequisites: introductory sociology and introductory psychology and one eevufe in-humart developmont. -

M W F 2:30-3:20. J. Mueller.
Provides an interdisciplinary knowledge base for human service professionals. Examines social behavior in the human environment from ecological, ethological, historical, cultural, and social system perspectives. Applications are made to professional practice at the micro level (counseling with individuals and families or other small groups) and at the macro level (social planning for vulnerable groups in our society).

## HSS 280 Racism in American Society (also ASRC 280)

## Fall. 3 credits.

> W 7:30-10 p.m. D. Barr, J. Turner.

The purpose of this course is to explore the historical, political, and sociological dimensions of racism in American society. A major goal will be to understand the presence and persistence of racial inequality and the relationship of human services to the problems of racism.
Hss 292 Research Methods Shoud fru Spring. 3 credits. HSS mayors shoud tron M W F 3:35. W. Trochim. Ag thut Juivo Students will learn the logic and methods of $y^{?}$ social science research and develop skill in transforming issues of interest to them into researchable questions. Readings, written assignments, and in-class exercises focus on stating hypotheses, designing studies and
samples to test hypotheses, measuring variables, and simple statistical analysis.

## HSS 300 Special Studies for Undergraduates

Fall or spring. Credit to be arranged Hours to be arranged. Department faculty. Special arrangement for course work to establish equivalency for training in a previous major or institution. Students prepare a multicopy description of the study they want to undertake on a form available from the Student Services Office. This form, signed by both the instructor directing the study and the head of the department, should be filed at course registration during the change-ofregistration period.

## HSS 315 Human Sexuality

Spring. 3 credits. Limited to 500 students. Prerequisite: an introductory course in human development and family studies, psychology, or sociology (or equivalent social science course). Recommended: one course in biology.

## T R 2:30-3:45; seg to be arranged к. пе

The aim of this course is to provide students with an understanding of the interactions and interrelationships of human behavior that influence sexual development and behavior. The course will focus on the evolutioncrosscultural र्ण sexual norms, customs, legislation within changing sociopolitical systems, and delivery of services related to sexual issues, needs, and/or problems. Future trends in sexuality will be addressed. Biological $\operatorname{Qin} A$ developmental components of human sexuality will also be addressed. An underlying issue is the influence of our social and cultural system on the development of sexual needs, standards, and values. Research and theory in human sexuality will be explored in an interclisciplinary approach drawing on human and organizational behavior, biology, history, communication arts, education, research theory, law, sociology, and psychology

## HSS 325 Health-care Services and the

 ConsumerSpring. 3 credits. Prerequisite: an introductory course in human services or health. S-U grades optional. Nir offered 95.96 .

T R 12:20-1:45. R.Heuse Stakh Developments in the health field that affect the availability and kinds of health services. Emphasis is placed on interrelationships between institutions and agencies and the part each can play in prevention, diagnosis, and treatment of disease and disability. Focus will include historical and current trends, quality health care, consumer issues, ethical issues, politics and policies, and the problems of health care.
Hss 330 Ecology and Epidemiology of Health
Spring. 3 credits. S-U grades optional
Offered atternate-years. Vinele
T R 10:10-11:25. E. Rodriguez.
Ecological and epidemiological approaches to the problems of achieving human health within the physical, social, and mental environment. The course introduces epidemiological methods to the students and surveys the epidemiology of specific diseases such as AIDS, hepatitis, Legionnaires' disease, plague, cancer, herpes, and chlamydia Application of epidemiology to health care will be discussed.

## [HSS 340 The Politics of Public Budgeting

Spring. 3 credits. Limited to 50 students: juniors, seniors, or permission of instructor Not offered 1994-95.95-96

T R 10:10-12:05. Staff.
The course examines the theory and practice that have developed to plan and control raising and spending public funds. The study of public budgeting includes the examination of techniques for controlling spending and methods for raising revenues. Because these fiscal decisions are made in a political environment, the course will take a multidisciplinary approach, synthesizing both the political and economic aspects of budgeting. Students will assume the roles of the different actors in the budgetary process to learn both the institutional dynamics of the process and the political constraints involved.]

## HSS 360 Introduction to Program Planning and Development

Fall and spring. 3 credits.
M W F 9:05-9:55. M. Minot.
The course provides an introduction to program planning and development in the delivery of human services. Models of program planning, development, and delivery will be analyzed in relation to practice. The processes of conceptualizing a program and the context of planning and development (political, organizational, economic, and social) will be examined. Basic tools and techniques available to planners will be identified and selected skills developed. Issues related to ethics, power/authority, confidentiality, and accountability will be included. Professional roles and competencies needed will be highlighted throughout the course. Students will apply the planning and development process to individual projects.

## HSS 370 Social Welfare as a Social Institution

Fall. 3 credits.
M W F 9:05-9:55. J. Allen
A philosophical and historical introduction to social welfare services. The course reviews the social contexts from which programs and the profession of social work have evolved. It discusses the political and ideological processes through which public policy is formed and how policies are translated into social welfare programs. Basic issues in welfare are discussed in the context of present program designs, public concerns, and the interrelationships and support of services in the community.

## MSS 400-401-403 Special Studies for Undergraduates

Fall or spring. Credits to be arranged. S-U grades optional.

Hours to be arranged. Department faculty For independent study by an individual student in advanced work in a field of HSS not otherwise provided in the department or elsewhere at the university, or for study on an experimental basis with a group of students in advanced work not otherwise provided in the department or at the university. Students prepare a multicopy description of the study they want to undertakesg a form available from the etunsiminnmed. This form must be signed by the instructor directing the study and the department chair and filed at course registration or within the change-of-registration period after registration. To ensure review before the close of the course registration or change-of-registration period,
early submission of the special-studies form to the chair is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study.

## HSS 400 Directed Readings

For study that predominantly involves library research and independent readings. Dr: Cacu May uncorpaate expeuintal lionn HSS 401 Empirical Research
For study that predominantly involves data collection and analysis or laboratory or studio projects.

## HSS 403 Teaching Apprenticeship

Prerequisite: Students must have taken the course (or equivalent) in which they will be assisting and have demonstrated a high level of performance. For study that includes assisting faculty with instruction.

## HSS 414 Professional Internship in Human Service Studies

Fall, spring, or summer. 47 credits. Limited to juniors and seniors majoring in human service studies or permission of instructor Prerequisite: HSS 100. Precourse enrollment required.

T 1:30-4:25. Placement hours to be
arranged. D. Tobias.
Students intern for a minimum of 10 hours a week in human service organization and attend a weekly seminar or office hours with a focus on integrating classroom and field-based learning. The course is structured as an opportunity for students to learn experientially and, at the same time, provide meaningful services to human service organizations Interns are expected to take active roles in structuring, monitoring, and assessing their learning under the guidance of a faculty instructor.

RHES 417 Power and Empowerment in Human Services
Spring. 3 credits. Offered alternate years. Antifered 1996-05-C

Hours to be arranged. D. Barr.
The course will take a theoretical world view of power and the historically colonial relationship between the American ruling class and other people. The three dimensions of power will be used as the framework for analysis. The relationship between a social class, race, sex, and power will be under study. In addition, the class will explore the nature of empowerment and new theories of power and empowerment.]

## HSS 426 Crime and Crime Policy

Fall. 3 credits. S-U grades optional. Limited to 20 juniors and seniors

T R 10:10-12:05. L. Street
This course is for students who are interested in understanding crime and crime-control policies. The purpose of the course is to learn how to think about crime problems in terms of their social, political, and human service contexts. The following topics are among those addressed in order to realize the objectives of the course: American culture and crime policy; criminal justice agency and system operations; criminal offending and victimization; race and crime; and community crime-control programs. These topics are examined from the vantage point of criminal justice, social justice, and public health perspectives.
HSS 465 Community Decision Making
Fall. 3 credits. S-U grades optional
I R 8:30-9:55. A. Hahn.

This course provides an introduction to the local political environment of human service agencies and programs. Special attention is given to how community issues are raised, debated, and resolved. Topics include the roles of service providers, local government officials, social movement organizations, federal and state governments, the courts, and the news media. Previous or concurrent perticipation in community activities is desirable but not required.

## HSS 471-472 Social Work Practice I

 and IIIntroduction to concepts and methods used in a generalist model of social work practice Examination of the values and ethics of professional practice. Students learn knowledge and skills appropriate for working with individuals, groups, families, organizations, and communities. Class content is integrated with concurrent supervised fieldwork. Placements are made in social agencies in Tompkins and surrounding counties. Students are expected to arrange and to pay for their own transportation. Atam fee fro flelueslarederpernas may be charged to stadents int the coorse. $\mathrm{HKNOO8}$ h
HSS 471 Social WorkPractice I
Fall. 9 credits. Limited to 25 social work students. Prerequisites: introductory psychology, introductory sociology, one course in human development, grades of $\mathrm{C}^{+}$ or better in HSS 246 and 370, and permission of instructor.

Lecs, M W 10:10-12:05; fieldwork, T R for 8 hours each day. R. Bounous $\sim C^{\circ}$

## HSS 472 Social Workfractice II

Spring. 9 credits. Limited to 25 social work students. Prerequisites: grade of B - or better in HSS 471 and satisfactory performance in fieldwork.

Lecs, M W 10:10-12:05; fieldwork, T R for 8 hours each day. R. Bounous.

## HSS 473 Senior Seminar

Spring. 3 credits. Prerequisite: HSS 414 or 471-472 (472 may be taken concurrently) and permission of instructor.

## M W F 2:30. C. Shapiro

This course integrates and expands on learning from HSS courses on environments, programs, and processes. Topics will include professional ethics, crisis intervention, human responses to loss, and lifestyle diversity. Each student will select a social problem or policy issue and demonstrate the application of skills in data collection, data assessment, development of an action plan, and proposing methods for evaluating the action plan. Through this process, students will emphasize the integration of theory with issues in professional practice.

## HSS 475 Social Policy

Spring. 3 credits. Prerequisite: HSS 370 or Government 111 or Sociology 141. S-U grades optional.

M W F 9:05-9:55. J. Allen.
An examination of the policy-making process and the significance of national policies as they affect the distribution of social services. Frameworks for analyzing social policy are used to evaluate existing social programs and service-delivery systems. Implications for change in policies at the national, state, and local levels are discussed.

HSS 476 Housing and Feeding the Homeless (also Hotel Administration S490) VA
zoredits.
Falif z-credtes. Limited to juniors, seniors, and

This course explores public- and privatesector partnerships in addressing the crisis of homelessness. Through lectures, class discussions, research, and community volunteerism, students will explore the economic, social, and political issues of our country's growing concem with housing and feeding homeless people. Students will study the history of homelessness and the strategies to prevent and alleviate the problem. The components of successful housing programs and food assistance programs will be analyzed. Students will volunteer with a service agency 14 hours during the semester, a portion of which is recommended to be done during spring break.

## HSS 499 Honors Program

Fall, spring. S-U optional. 1-6 credits (maximum of 6 credits over 2 semesters) Prerequisites: open only to students in HSS who have been admitted to the College of Human Ecology Honors Program. So Soly
TBA. Faculty.
An independent literature or field investigation. Students should spread the work over two semesters. Human Ecology Honors Program guidelines are to be followed.

## Topics Courses

Fall or spring. 2-4 credits. Prerequisites and enrollment limits vary with topic being considered in any particular term. Permission of instructor required.

Hours to be arranged. Department faculty. This series of courses provides an opportunity for advanced undergraduates to explore an issue, a theme, or research in the areas of departmental concentration. Topics vary each time the course is offered. Descriptions are available at the time of course registration. Although the courses are usually taught as seminars, a subject may occasionally lend itself to lecture, practicum, or other format.

## HSS 490 Human Servicerin the

 EnvironmentsHSS 491 Human Service Programs
HSS 492 Human Service Processes

## The Graduate Program

Human service studies graduate courses are open to undergraduates only with the instructor's permission.
The courses listed below will be taught regularly (annually or in alternate years).

## HSS 600 Special Problems for Graduate

 StudentsFall or spring. Credits to be arranged. For students recommended by their chair and approved by the instructor in charge for independent advanced work. S-U grades optional. Department faculty
HSS 613 Seminar in Mental Health Services
Fall. 3 credits. Open to undergraduates with instructor's approval.

T 4:00-6:30. J. Mueller
Using lectures, case examples, and class discussions, we will look from both administrative and clinical perspectives at the
organization and delivery of mental health services for persons who are mentally ill, mentally infirm, or seriously emotionally and/ or developmentally disabled. We will examine model programs for long-term community care and for services designed to meet the special needs of ethnic/racial minorities, women, and homeless persons who are mentally impaired. State/federal partnerships will be discussed in terms of their impact on fiscal and human resources for both public and for-profit agencies. Other topics include an examination of the major successes and failures of the community mental health movement and the ethical concerns and policy issues that must be addressed in any comprehensive effort to reform the mental health care systems.

## HSS 625 Health Care Services: Consumer and Ethical Perspectives

 Fall. 3-4 credits. Limited to 30 students undergraduates with permission of instructor. Offered alternate years.T R 12:20-1:35. A Parrot.
The course will focus on consumer and ethical issues faced by the health care field today. Broad topics to be discussed include ethical standards and guidelines, health care costs and accessibility of services, government role in health care delivery, health care as a right or privilege, private industry role in health care, services for the medically indigent and elderly, practitioner burnout and training, ethics of transplant surgery and funding, reproductive technology, AIDS research and funding, animals in medical research, right to die, and baby and granny Doe cases. 4-credit option. May be used as Biology and Society Senior Seminar option.

## HSS 627 Legal Aspects of Health-

 Services DeliverySpring. 3 credits. Prerequisites: HSS 634 or permission of instructor

T 4-6:30. Staff.
This course introduces principles of the law that are specifically applicable to healthservices delivery. Topics considered include the liability of hospitals and their staff and personnel for injuries to patients; medical records and disclosure of information; consent to medical and surgical procedures; responsibility for patients' personal property; collection of bills; medical staff privileges; and confidential communications

## [HSS 628 Medical-Service Issues in Health Administration (also Biology and Society 428)

Spring. 3 credits. Limited to 50 students. Not offered 1994-95.

TBA. Staff.
A survey of the issues that offect interactions between the health-oare/consumer and the medical team, including disease processes (how disease occys and progresses), the health-care teath and illness, third-party payment and illness, and resource allocation.)

## [HSS 630 Comparative Health-Care Systems: Canada, the United States, and Third World Countries

Fall. 3 credits. Open to graduate students and seniors. Not offered 1994-95. M 7:30-10 pm. Staff.]

HSS 631 Managed Health Delivery Systems: Primary-Ambulatory Care Spring. 3 credits. T R 2:30-3:45. R. Battistella.

The concept of primary care is used to enhance understanding of the direction and purpose of ongoing changes in health services organization and financing. Pressures on traditional indemnity insurance and solo fee-for-service medicine are examined in the context of the transition from unmanaged to managed delivery systems. The course is divided into two parts: Part 1 examines the development of health maintenance organizations and related forms of managed care against the backdrop of larger public policy concerns. Part 2 centers on administrativefinancial topics associated with the design, marketing, and operation of managed delivery systems in highly competitive markets. Considerable attention is given to the relationship between physicians and management with respect to such subjects as medical practice styles, productivity, quality assurance, and outcome measurement. The consumer health care behavior literature is reviewed in the light of marketing strategies and utilization control objectives. Many of the managerial topics are amplified by field trips and a select group of visiting speakers.

HSS 634 Health Care Organization Fall. 3 credits. Limited to 30 students. Prerequisite: graduate standing or permission of the instructor.

T R 12:20-1:35. J. Kuder.
The course will provide an introduction at the graduate level to the organization of health providers in the United States, the interrelationships of health services, and major sources and methods of paying for care. The course will describe how health services are structured in the United States and how these different services interrelate along the continuum of care. The course will describe and analyze organization, delivery, and financing issues from a variety of perspectives using specific performance criteria (e.g., equity, quality, efficiency). Innovations by the public and private sectors in the delivery and reimbursement of health care will also be presented.

## HSS 635 Field Studies in Health Administration and Planning

Fall or spring. $1-4$ credits
Hours to be arranged. Health faculty. Students interested in developing administrative and program-planning research skills are given an opportunity to evaluate an ongoing phase of health care agency activity in the light of sound administrative practice and principles of good medical care. In planning and carrying out the research, students work closely with a skilled practicing administrator and with members of the school's faculty.

## HSS 640 Economics of Health and

 Medical CareFall. 3 credits.
T R 8:30-9:55. J. Kuder.
The course is designed for graduate students who seek an understanding of the tools, vocabulary, and way of thinking of economics as it is applied to decision making in health services delivery, administration, and policy. The philosophy of the course approach is based upon the often-quoted credo of John M Keynes: "The theory of economics does not furnish a body of settled conclusions immediately applicable to policy. It is a method rather than a doctrine an apparatus of the mind, a technique of thinking which helps its possessor to draw correct conclusions." The basic methods of micro-economics will be
emphasized as tools to help individuals and organizations make better decisions about health services delivery, administration, financing and policy issues.

## HSS 641 Health Care Financial Management I

Spring, 3 credits.
T R 10:10-11:50. J. Kuder.
The course is designed to give graduate students an intensive introduction to the issues and techniques in the financial management of health service organizations. Class lectures, readings, guest speakers, problems, case studies, and research for term paper/projects will all be used to get across the important points and reinforce them with examples and applications. The course emphasizes the internal financial management knowledge and skills necessary for financial success in complex health organizations, especially hospitals

## HSS 642 Health Care Financial

 Management Il: Payment Systems Spring. 3 credits. If Feq HSS Luti W 3:35-6:05. K. Grazier.The purpose of this course is to develop an understanding of the theories on which health care payment and reimbursement systems are based and the techniques through which they operate.

HSS 645 Information Resources Management in Health and Human Service Organizations
Spring. 3 credits.
W 12:20-2:50. K. Grazier.
The course focuses on the nature of decision making and decision support systems, sources of information, and the strategic management of information resources in organizations.

## HSS 648 Managing Health and Human Services Organizations I

## Fall. 4 credits.

T R 12:20-2:00. K. Pryor.
This is the first segment of an 8-credit sequence addressing the management and leadership of health and human services organizations, with a perspective that ranges from that involved in first-line supervision to that of strategy setting at the CEO level. This course begins with a study of basics of management-communications, motivation, change management, leadership, human resources, organizational design issues, and labor relations. It then turns to the development of technical skills in the areas of problem solving, decision making, productivity measurement, resource allocation and performance measurement. The course is taught with an applied focus and utilizes a case study approach.
HSS 649 Managing Health and Human Services Organlzations $\mu_{\mathrm{S}}$ Spring. 4 credit

T R 12:20-2:00. K. Pryot. perminsion This is the second segment of an 8 -credit sequence in the management and leadership of health and human services organizations. This course concentrates on strategy issues, marketing, organizational culture issues, development of mission, the management of professionals, and studies the importance of roles, structure, and inter- and intra-institutional relationships in these organizations.
The course is taught via a case study approach.

HSS 655 Leadership in Human Services Spring. 3 credits. Limited to 20 students. S-U grades optional.

W 7:30-10 p.m. J. Mueller.
Using lectures, relevant literature, case histories, and class discussion, the special features of human service organizations will be examined in terms of their changing economic and political environments and the leadership behaviors of administrators who are making successful adoptive responses. Strategies for effective decision making, organizing for and maintaining innovation, creating the conditions for a high level of employee involvement, and overcoming barriers to effective teamwork will be presented. The introduction of new organizational forms will be discussed from an administrative leadership perspective, including how to structure resource systems around skill levels, and the use of managerial reams distributed staffs, virtual networks, and telecommuting. Additional topics include leadership requirements for effecting cultural change and managing diversity in human service agencies, tools for self-assessment in nonprofit organizations.

## HSS 658 Professional Ethics and Public Policy rot offered 1995.94 Spring. 3 credits. N D O $3: 35-5: 30$. J. Ziegler.

This course will explore current issues of ethics and public policy against a background of theories of ethical behavior. Questions of how public officials and managers of public and non-profit agencies and private enterprises act will be examined. How do standards of ethical behavior in the professions get established? How are public policy issues with ethical implications resolved? Readings will be drawn from political philosophy, contemporary social science, and imaginative writing. Class participation is essential. Open to seniors and graduate students.

## HSS 660 Social Policy and Program

 Planning in Human ServicesSpring. 3 credits. S-U grades optional. M W 11:15-12:30. J. Allen.
A review of the public policy process in education, health, and social welfare services as it pertains to program developinent. The course includes the history, definitions, and boundaries of the policy process; the relationships of the policy process to political economy, social structure, intergovernmental relations, and cultural values and beliefs; theories of policy analysis and program developinent in human services; the role of evaluation in the planning and implementation of policies and programs, with special emphasis on the monitoring and feedback of effects into the policy and planning process; selected current issues in policy and planning processes, such as regulatory and legislative constraints; the respective roles of consumers and professional planners and providers; and problems and opportunities in the coordination of the various human service agencies.
[HSS 661 Designing and Funding Health and Human Service Programs
Spring. 3 credits. Not offered 1994-95.
M 4:00-7:00. J. Mueller.
This seminar focuses on the processes of proposal writing, which include documentation of need and significance of the project in light of the values in health and human services professions; plan for proposed intervention (if applicable); review of relevant
literature; design of a staffing plan and issues related to choices for staffing different types of programs (if applicable); work flow chart: affirmative action plan; appropriate budget to support the scope of the proposed work; documentation of support from relevant community agencies; and design for an evaluation of the project (if applicable) or dissemination of fundings (if policy analysis). Special attention will be given to the
identification of public and private sector resources for funding health and human services projects.]

## HSS 664 The Intergovernmental System

Fall. 3 credits. Open to seniors who have had a course in American government and to graduate students Not offered $1995-94,4 u 91$

T R 2:30-4:00. A. Hahn. Next offeredig,
This course provides a general introduction to the art and science of public administration with special reference to the intergovernmental system, critical issues of public policy and human service administration. Particular attention is given to national and state policy objectives, the national and state budgetary process, and local roles in implementing and influencing national and state programs. Issues of health, education, social welfare, the environment, housing and the like are? discussed.

## [HSS 670 Management in Public and Nonprofit Organizations

Spring. 3 credits. Next offered 1995-96 Offered alternate years.

W 6:30-9 p.m. R. House. Permission of instructor required.
This course presents an overview of organization and management theory, i.e., contributions of public and nonprofit management theorists and implications for managing human service organizations. The focus of the course will be managing a systemsdesigned simulation of a nonprofit human service organization, including defining goals, serving multiple constituencies, relating to governing boaf solving financial problems, and evaluating $\alpha$ gganizitional effectiveness. Students will read uneroretical and case study literature to leodme familiar with conceptual and mangageriel 1 ssues that confront managers of human sefve fonprofit organizations. A course in organizational behavior is strongly recommended but is not required as a prerequisite. Students enrolled for the class will decide whether to use scheduled class time each week for the simulation or set aside a three-day weekend for a concentrated simulated experience.]

## HSS 685 Health and Welfare Policy

 Fall. 3 credits.T R 10:10-11:25. R. Battistella Health and welfare issues are seen as reflecting alternate solutions to the broader institutional problems of allocation (economics), control (politics), and normative behavior (morality). A basic tenet is that health and welfare policy is deeply rooted in social values and the availability of economic resources. Health policy is interpreted from a multidisciplinary perspective in which change emanates from structural dynamics accompanying socioeconomic development such as the evaluation of the economy from the entrepreneurial to the managerial to the post-industrial stages, rogether with shifts in social and political ideology-libertarianism, welfare statism, and secular humanism.

HSS 688 Long-Term Care and the Aged: Alternative Health and Social Service Delivery Systems

## Spring. 3 credits.

T R 9-10:15. R. Battistella.
Alternatives for the organization and delivery of long-term care services are examined within the context of public-financing constraints. Progressive long-term care is viewed as a continuum encompassing medical and social services positioned to optimize independent living. Relevant experience from other highly developed countries is presented. Visiting speakers from the government and the private sector are featured. Field trips provide additional insights into the many challenges and opportunities in long-term care policy and management.

## HSS 689 Introduction to Program Evaluation

Fall. 1 credit.
M 9:05-9:55. J. Greene
This course provides a conceptual introduction to the theory and practice of social program evaluation. It is designed particularly but not exclusively for students planning a major or minor in HSS program evaluation and planning. The course emphasizes two major dimensions of evaluation: 1) its practical, real-world, political dimension and 2) its theoretical, methodological dimension. At the intersection of these two dimensions lie issues of evaluation's purpose and role, which are also addressed in the course.

## HSS 690 Measurement for Program

 Evaluation and Research
## Fall. 3 credits.

M W 10:10-11:25. E. Rodriguez. The course reviews measurement theory and its application to the evaluation of human service programs. Topics include validity; reliability; scaling methods; basic principles of instrument design; and varied methods of data collection with an emphasis on structured questionnaires and interviews. Student work is focused around an applied course project. Attention is also given to ethical and managerial issues that arise in applied measurement settings.

## HSS 691 Program Evaluation and Research Design

Spring. 3 credits.
M W 10:10-11:25. W. Trochim. This course reviews research design and its application to the evaluation of human service programs. Major topics include experimental, quasi-experimental, and nonexperimental research designs; basic sampling and measurement theory; and the theory of validity in research. Attention is given to issues that arise in the application of research designs to the evaluation of programs, including problems of randomization, causal inference. replication, and utilization of results. The central role of the general linear model in the statistical analysis of outcome evaluation is presented through case examples and computer simulation. Students will encounter examples of outcome evaluations from a wide range of disciplines including health, mental health, social welfare, criminal justice, social policy, and education.

## [HSS 692-693 Program Evaluation in Theory and Practice

692, fall; 693, spring. 4 credits each semester Prerequisites for HSS 692: 690 and 691 or 696, or permission of instructor. Prerequisite for HSS 693: 692. Students must register for both semesters. Not offered wo4-i5.

M W 2:30-3:45. Staff.
This course constitutes a one- or two-semester practicum in which the class designs and conducts a program evaluation in the human services. Students are involved in all phases of the evaluation from design through the production and dissemination of a final report. Emphasis is on research methods in the social sciences. Application of knowledge developed in prerequisite courses is stressed (for example, planning and managing an evaluation, ethics, methods of clata collection, data processing, and strategies for analysis and feedback of results).J

## HSS 695 Strategies for Policy and Program Evaluation

Fall. 3 credits. Prerequisites: HSS 690 and 691 or 696, or equivalent. Offered alternate years.

T R 10:10-11:25. J. Greene.
This course examines a wide range of approaches to the evaluation of policies and programs in the human services. The approaches are examined with respect to their purposes, key audiences, and methodologies, as well as their philosophical, political, and value frameworks. Analysis of commonalities and differences across evaluation approaches is used to judge the appropriateness of a given strategy for a particular context.

## HSS 696 Qualitative Methods for

 Program EvaluationSpring. 3 credits. Prerequisites: HSS 690 and 691 or equivalent.

I' R 10:10-11:25. J. Greene
This course presents a qualitative approach to applied research and the evaluation of human service programs. Topics include the epistemological assumptions underlying this approach, questions of entry into setting, methods for data collection and data analysis, reporting, confidentiality of participants, and the ethics of qualitative inquiry. The course aims to help students understand how, when, and why a qualitative approach to social inquiry can be used appropriately, effectively, and defensibly

## HSS 704-705 Internship in Human Service Studies

Fall, spring, or summer. 1-15 credits. S-U grades optional.

Hours to be arranged. Graduate faculty Internship placement in human services is determined by availability and students' academic and professional goals. Opportunities are available in public and private, human service organizations at the national, state, and local levels in positions consistent with students' needs and desires. The duration of an internship is negotiated between the student and the agency, while course credit and residence units are arranged between the student and the Special Committee.

## HSS 790 Advanced Seminar in Program Evaluation

Fall, spring. 1-3 credits. S-U grades optional Prerequisite: permission of instructor.

T R 2:30-3:45. J. Greene.
This course is intended for students with at least three courses in evaluation (HSS 690 series or equivalent) and statistics through multiple regression. The seminar focuses on analysis and appraisal of current literature on program evaluation and evaluative research, with emphasis on the links between program evaluation and program planning and administration. The seminar is topical
addressing current issues of importance in the field.

HSS 799 MPS Problem Solving Project
Fall or spring. Credits to be arranged. For students recommended by their chair and approved by the instructor in charge for independent advanced work. S-U grades optional.

Field faculty
HSS 899 Master's Thesis and Research Fall and spring. Credit to be arranged. Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional

Hours to be arranged. Department graduate faculty

HSS 999 Doctoral Thesis and Research Fall and spring. Credit to be arranged Prerequisite: permission of the chair of the graduate committee and the instructor, S-U grades optional.

Hours to be arranged. Department graduate faculty.

## Topics Courses

Fall or spring. 2-4 credits. Prerequisites and enrollment timits vary with topic being considered in any particular term. Permission of instructor required.
Hours to be arranged. Department faculty This series of courses provides an opportunity for graduates to explore an issue, a theme, or research in the areas of departmental concentration. Topics vary each time the course is offered. Descriptions are available at the time of course registration. Although the courses are usually taught as seminars, a subject may occasionally lend itself to lecture, practicum, or other format
HSS 610 Human Service Administration
HSS 611 Program Evaluation and Planning

## HSS 612 Health Administration

## Topical Seminars and Practica

Seminars and practica, offered periodically and reflecting faculty and student interest, with changing topics and instructors. Content, time, credits, and instructors to be announced. Seminars and practica offer concentrated study in a specific human service area or in the education, planning, or evaluation processes within human services.

## HSS 669 Seminar in Program Planning

 and DevelopmentFall, spring. Variable credit.
TBA 1:00-3:00 p.m. Staff.
Topics include microlevel program planning, third-sector organizations, and intergovernmental influences on program planning, policy formation, program implementation, and mainstreaming. Two or more human services are examined

## HSS 697 Seminar in Program Evaluation

 and Evaluative ResearchFall and spring, 1 credit.
W 12:20-1:10. J. Greene, fall.
W. Trochim, spring.

The seminar is topically organized according to student and faculty projects. Focuses on professional issues in evaluation practice, including consulting, ethics and standarels, preparation of conference and publication materials, and various methodological issues.

TEXTILES AND APPAREL COURSES
S. K. Obendorf, chair, A. Netravali, graduate faculty representative; P. Schwartz; undergraduate advising coordinator; S. Ashdown, C. C. Chu, C. Coffman, M. Govindaraj, C. Jirousek, A. Lemley, A. Racine, N. Saltford, S. Watkins

## TXA 114 Introduction to Computer-aided Design

Fall and spring. 3 credits. Limit 20, with 10 per lab section. Priority given to TXA and DEA students. S-U grades optional.

Fall: Lec T 12:20-2:15 and T 3:35-4:25 or
R 12:20-2:15 and R 3:35-4:25. Spring:
T 10:10-12:05 and 1 hr TBA. A. Racine. A studio course that focuses on using the microcomputer as a design tool. The command-driven AutoCAD software program is the medium of expression for creating, modifying, and plotting visual images. Students will develop two-dimensional surface designs based on historical and cultural artifacts from the Comell Costume Collection. Approximate cost of supplies is $\$ 80.00$.

TXA 125 Art, Design, and Visual Thinking Fall. 3 credits. S-U grades optional. Not open to seniors.

Lecs, M W F 12:20. C. Jirousek.
An introduction to the visual arts and design that explores aesthetic and cross-cultural dimensions of visual experience. Augmented by slide presentations and films, lectures emphasize relationships between visual forms and technology and social, political, and cultural interpretations that distinguish works of art from other man-made objects.

## TXA 145 Apparel Design I

Spring. 4 credits. Limited to 26 students with 13 students per lab section; priority given to TXA majors or students transferring into TXA. Apparel design majors should take course during the first year. Minimum cost of materials, \$125; lab fee, \$10.

Lecs M W 9:05; lab M 2:30-4:25 or
T 2:30-4:25. A. Racine.
Intensive study of principles and processes of flat-pattern design with emphasis on creative expression in children's apparel. Students develop a thorough understanding of principles and techniques needed to produce apparel.

## TXA 217 Drawing the Clothed Figure

Spring. 3 credits. Enrollment limited to 18 students. A basic drawing course is highly recommended. Priority given to TXA Option I students. S-U grades optional. Approximate cost of textbook $\$ 30.00$; minimum cost of supplies $\$ 40.00$

T R 9:05-12:05. C. Jirousek.
To improve the student's ability to illustrate two-dimensionally the interaction of draped fabric and the human form and to develop awareness of clothing as a design medium. Emphasis is on development of techniques and skills in selected media necessary for the communication of design ideas.
TXA 235 Fibers, Fabrics, and Finishes Fall. 3 credits. S-U grades optional.

M W F 9:05. P. Schwartz.
An introduction to fibers, fibrous materials, and dyes and finishes. Special emphasis is given to the use of fibrous materials in apparel, residential and contract interiors, and industrial applications. Topics covered include fiber properties, fabric structure, coloration of fibrous materials, dimensional

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stability, flammability, product specifications, and performance standards.

TXA 245 Dress: A Reflection of American Women's Roles
Fall. 3 credits. S-U grades optional. M W 2:30-4:00. A. Racine
Historical survey of changing patterns of American women's dress from the colonial period to the present day and of cultural, economic, and political forces that affected changes and women's development. Slides, film clips, and the Comell Costume Collection will be used for lectures and discussion.

## TXA 246 Clothing: The Portable Environment

Spring. 3 credits. Average cost of materials, \$30; lab fee, \$10

Lec, T R 10:10-11:40. S. Watkins An introduction to the design of clothing for a variety of occupations and climates for individuals of varying ages, for sports and recreation, and for hazardous environments such as under water or outer space.

## TXA 264 Apparel Design II

Fall. 4 credits. Limited to 15 students. Prerequisite: TXA 145. Recommended: one art or drawing course. Apparel design majors should take TXA 264 and 367 in the same academic year, preferably during the sophomore year. Minimum cost of materials, \$125; lab fee, \$10.

M W 1:25-4:25. S. Ashdown This studio course examines the process of creating a three-dimensional garment from the rwo-dimensional fabric. Through exercises, principles and processes of draping, advanced flat pattern making, and fitting are studied. Assigned problems require the students to make judgments regarding the design process, the nature of materials, body structure,
function, and fashion

## TXA 300 Special Studies for

 UndergraduatesFall or spring. Credit to be arranged.
Hours to be arranged. Department faculty. Special arrangement for course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they want to undertake on a form available from the Student Services Office. The form, signed by both the instructor directing the study and the department chair, is filed at course registration or during the change-of-registration period.

## [TXA 301 Investigative Research on the

 Social Impact of Science (also Biology and Society 300 and Science and Technology Studies 402)Spring. 4 credits. Letter grade only. Prerequisite: one year of science and permission of instructor. Limited to 20 students. Not offered 1994-95.

M W 2:30-4:25. P. Schwartz, P. Taylor. Students choose a current issue regarding the social impact of science and work through the steps of investigation: issue definition, background bibliographic and comparative research, making contacts and interviewing, making and revising written and spoken presentations, proposals for action. In a workshop setting, students comment on and learn from each other's projects. Guest speakers, films, discussion of articles, and case studies illustrate themes of explanation, argument, modes of research, expertise, ways of knowledge, possibilities of research, action, and public participation.]

## 【TXA 331 Apparel Production

 TechnologyFall. 3 credits. Prerequisites: Economics 101 and 102 or CEH 110 and 111 and an upperdivision course in either apparel or textiles. Not offered 1994-95.

Lecs, T R 8:30-9:55. Staff.
Introduction to technical and economic aspects of textile and apparel production. Emphasis is on design and functioning of apparel manufacturing systems and their components. Analysis of efficient manufacturing methods such as Quick Response (QR), Just-in-Time (JIT) as applicable to apparel production, and use of computer technology in production and quality control will be included.]

## TXA 336 Fundamentals of Color and Dyeing

Fall. 4 credits. Prerequisite: College Natural Science Requirements. Lab fee, $\$ 15$.

Lecs, M W F 10:10-11; lab, M 1:25-4:25. C. C. Chu.

Color is an extremely important and useful factor in everybody's daily life, e.g., the clothes we wear, the food we eat, the house we live in. This course will emphasize theories and scientific principles of color, providing a framework for the use of colors in design, marketing, or research. How colorants are used to dye fabrics will be addressed. Although fabrics are chiefly used to illustrate color in the class, much of the information and knowledge will be useful to non-textile majors. Guest lecturers from industry will provide the practical aspects of color in business.

## TXA 337 Formation and Structure of Textile Fabrics <br> Spring. 3 credits. Prerequisite: TXA 235.

 Recommended: college algebra.Lecs, M W F 9:05. P. Schwartz.
This course covers the elements of technical fabric design with an emphasis on woven and knitted fabrics. Topics include structure of woven and knitted fabrics, openness, manufacturability, equivalence, and color effects.

## TXA 367 Apparel Design III

Spring. 3 credits. Prerequisite: TXA 114 and TXA 264. Recommended: two art or drawing courses. Apparel design majors should take TXA 264 and 367 in the same academic year. preferably during the sophomore year
Minimum cost of materials, $\$ 175$; lab fee, $\$ 10$.
M W 10:10-12:05 and 1 hr TBA. A. Racine. Advanced apparel students prepared to challenge and refine their design skills will be presented with a variety of complex studio problems including computer-aided apparel design. The Cornell Costume Collection is used for illustration and inspiration.

## TXA 375 Color and Surface Design of

 TextilesFall. 3 credits. Minimum cost of other materials, $\$ 100$; lab fee, $\$ 50$. Limited to 18 students.

T R 1:25-4:25. C. Jirousek.
Studio experience in the surface design of textiles combined with exercises in color theory. Textile projects will utilize techniques such as block printing, shibori, batik, silk painting, silk screen, and stitchery to produce a portfolio of textile designs. Studio work will be augmented by lectures on pattern and color theory illustrated by slides and textile examples.

## TXA 400-401-402-403 Special

 Independent Studies for UndergraduatesFall or spring. Credits to be arranged. S-U grades optional.

Hours to be arranged. Department faculty. For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of TXA not otherwise provided through course work in the department or elsewhere at the university. Students prepare a multicopy description of the study they want to undertake on a form available from the Student Services office. This form must be signed by the instructor directing the study and the department chair and filed at course registration or within the change-of-registration period after registration. To ensure review before the close of the course registration or change-of-registration period, early submission of the special-studies form to the department chair is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study.

## TXA 400 Directed Readings

For study that predominantly involves library research and independent reading.

TXA 401 Empirical Research
For study that predominantly involves data collection and analysis, or laboratory or studio projects.

## TXA 402 Supervised Fieldwork

For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice.

## TXA 403 Teaching Apprenticeships

Fall or spring. 2-4 credits. Prerequisites:
student must have upperclass standing, have demonstrated a high level of performance in the subject to be taught and in the overall academic program, and have permission of the instructor and the department chair. S-U grades only.
Apprenticeship includes both a study of teaching methods in the field and assisting the faculty with instruction.

## TXA 405 Organizations and Policies in the Federal System

Spring. 3 credits. S-U grades optional Prerequisite: upperclass standing

T R 10:10-11:25. N. Saltford.
Course examines how Congress and the federal agencies function within the context of salient political, legal, and social influences, including private organizations and associations. Using computers to track congressional action, students analyze and critique policy issues relevant to their own area of subject matter.

TXA 406 Field Trip to Washington D.C.
Spring. 1 credit. S-U optional. Prerequisites: Open to students previously or simultaneously enrolled in TXA 405, on a first-come basis. The field trip will be offered if minimum registration $=10$. Maximum enrollment $=20$.

Field trip, spring break. N. Saltford. Spring break trip to Washington D.C. to meet with Congressional, federal agency, and private sector players in the development and implementation of federal policy.

TXA 432 Product Quality Assessment
Fall. 3 credits. Prerequisites: TXA 235 and Statistics. Lab fee, \$15

Lecs, M W 1:25-2:15; lab, M or W
2:30-4:25. A. Netravali
This course covers evaluation of fibers, yarns, fabrics, and garments, with emphases on the meaning of standards, testing philosophy, quality control, and statistical analysis. Day-to-day tests done in textile and apparel industry will be discussed. Laboratory sections will introduce students to various test methods, data generation for analysis, and evaluation.

## TXA 439 Biomedical Materials and

 Devices for Human Body Repair Spring. 3 credits. S-U grades optional Prerequisites: College Natural Science Requirement. Juniors and seniors preferred. (Chem. 103-104, or Biol. 101-103).Lecs,T 1:25-4:25. C. C. Chu Survey of materials and devices for repair of injured, diseased, or aged human tissues/ organs. It includes properties of synthetic and biological materials, wound healing processes, medical devices for repair of wounds, blood vessels, hearts, joints, bones, nerves, male impotence, vision/hearing/voice, and drug control/release.

## TXA 446 Apparel Design: Intermediate Functional Clothing Design

Fall. 3 credits. Prerequisites: TXA 246 (146) and TXA 264 or permission of instructor. Minimum cost of materials, $\$ 125$; lab fee, $\$ 10$. Lecs,T R 9:05-12:05. S. Watkins Complex problems in functional apparel design will be studied with an emphasis on totally encapsulating clothing. Students will work in groups and individually to set design criteria and develop innovative solutions for current problems in protective apparel.

## TXA 465 Apparel Design: Product

 Development and PresentationSpring. 3 credits. Prerequisites: minimum of three drawing or art courses and TXA 367 or permission of instructor. Minimum cost, $\$ 125$; lab fee, \$10.

T R 2:30-4:25. S. Ashdown.
Through studio problems in apparel design, students examine the influence of manufacturing technology and cost on apparel products. Garments are developed to various stages from sketches to finished samples. Some portfolio development included

## TXA 600 Special Problems for Graduate

 StudentsFall or spring. Credit to be arranged. S-U grades optional

Hours to be arranged. Department faculty Independent advanced work by graduate students recommended by their chair and approved by the department chair and instructor.

## [TXA 620 Physical Properties of Fiber.

 Forming Polymers and FibersSpring. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95.

Lecs, T R 2:30-3:45. A. Netravali. Formation and properties of fiber-forming polymers, rubbery, glassy, and crystalline states and their interconnection. Fiber structure, relationship between chemical structure and physical properties of manufactured and natural fibers. Mechanical, thermal, and viscoelastic properties of fibers and testing methods will be discussed.]
[TXA 621 Characterization of Fibrous Materials
Fall. 3 credits. Prerequisite: permission of instructor. S-U grades optional. Not offered 1994-95.

M W F 11:15. P. Schwartz.
A study of the principles of the major analytical characterization methods and the application of these methods to the study of fiber properties and structure. Topics include microscopy, x-ray diffraction, spectroscopy, and magnetic resonance.]

## TXA 626 The Chemistry of Textile

 Finishes and DyeingSpring. 3 credits. S-U optional. Prerequisites: TXA 336 or equivalent and organic chemistry, or permission of instructor. Offered alternate years

Lecs, M 10:10-11:00, W 10:10-12:05.
C. C. Chu.

Chemical aspects of textiles with emphasis on finishes and dyeing are discussed. Industrially important textile chemicals used for dyeing and enhancing fiber and fabric properties, such as durable press, anti-soiling, water repeilency will be studied. The emphasis is on the correlation of the observed effect with chemical structure, end-use influences, interaction with fabric and fibers, sources and synthetic routes. The environmental impact of these textile chemicals and current federal regulation will be briefly discussed.

## TXA 635 Special Topics in Textiles and Apparel

Spring. 1-3 credits. Prerequisite: permission of instructor.

M W 2:30-4:25. Staff

## TXA 639 Mechanics of Fibrous

 AssembliesFall. 3 credits. Prerequisite: permission of instructor. Offered alternate years.

M W F 10:10. P. Schwartz.
A study of the mechanics of fiber assemblies idealized yarn and fabric models; statistical bundle theories; deformation of yarns and fabrics in tensile, shear, and compression stress; bending and buckling; and the mechanical behavior of nonwoven textile materials

## TXA 664 Human Factors:

## Anthropometrics and Apparel

Spring. 3 credits. S-U grade optional. Limit 15. Prerequisite: permission of instructor. Open to advanced undergraduates. Offered alternate years.

T R 8:30-9:55. S. Ashdown
Seminar course focusing on the human form and its relationship to clothing. Includes discussion of quantification of body sizes and human variation; historical, cultural, and aesthetic concepts of fit; apparel fitting techniques; national and international sizing systems and standards; impact of sizing systems on various populations (elderly, handicapped, etc.).

TXA 899 Master's Thesis and Research
Fall or spring. Credits to be arranged.
Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.

Hours to be arranged. Field graduate faculty.

TXA 999 Doctoral Thesis and Research
Fall or spring. Credit to be arranged.
Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.

Hours to be arranged. Field graduate faculty

## FACULTY ROSTER

Allen, Josephine A., Ph.D., U. of Michigan Assoc. Prof., Human Service Studies
Anderson, Carol L., Ph.D., Iowa State U Assoc. Prof., Human Development and Family Studies
Ashdown, Susan, Ph.D., U. of Minnesota. Asst. Prof., Textiles and Apparel
Avery, Robert B., Ph.D., U. of Wisconsin. Prof., Consumer Economics and Housing Avery, Rosemary J., Ph.D., Ohio State U. Asst. Prof., Consumer Economics and Housing
Barr, Donald J., Ph.D., Indiana U. Prof., Human Service Studies
Battistella, Roger M., Ph.D., U. of Michigan. Prof., Human Service Studies
Becker, Franklin D., Ph.D., U. of California at Davis. Prof., Design and Environmental Analysis
Boyd, D. Michael, B.A., U. of North Iowa. Prof., Design and Environmental Analysis
Brumberg, Joan J., Ph.D., U. of Virginia. Prof., Human Development and Family Studies
Bryant, W. Keith, Ph.D., Michigan State U. Prof., Consumer Economics and Housing
Canfield, Rick, Ph.D., U. of Denver. Prof., Human Development and Family Studies
Ceci, Stephen J., Ph.D., U. of Exeter (England). Prof., Human Development and Family Studies
Chi, Peter S., Ph.D., Brown U. Prof., Consumer Economics and Housing
Chu, Chih-Chang, Ph.D., Florida State U. Assoc. Prof., Textiles and Apparel
Cochran, Moncrieff, Ph.D., U. of Michigan Prof., Human Development and Family Studies
Comelius, Steven W., Ph.D., Pennsylvania State U. Assoc. Prof., Human Development and Family Studies
Danko, Sheila, M.I.D., Rhode Island School of Design. Assoc. Prof., Design and Environmental Analysis
Depue, Richard, Ph.D., U. of Oklahoma. Prof., Human Development and Family Studies
Eckenrode, John J., Ph.D., Tufts U. Assoc. Prof., Human Development and Family Studies
Eshelman, Paul E., M.F.A., U. of Illinois. Assoc. Prof., Design and Environmental Analysis
Evans, Gary, Ph.D., U. of Massachusetts at Amherst. Prof., Design and Environmental Analysis
Firebaugh, Francille M., Ph.D., Cornell U. Prof., Consumer Economics and Housing
Ford, John L., Ph.D., U. of Michigan. Prof., Human Service Studies
Garner, Clark E., M.F.A., U. of Kansas. Prof. Emer., Design and Environmental Analysis
Gemer, Jennifer L., Ph.D., U. of Wisconsin. Assoc. Prof., Consumer Economics and Housing
Gibson, Kathleen J., M.A., Ohio State U. Asst. Prof., Design and Environmental Analysis
Govindaraj, Muthu, C.Sc., C. of Mechanical and Textile Engineering (Czechoslovakia). Asst. Prof., Textiles and Apparel

Grazier, Kyle, Ph.D., U. of California at Berkeley. Assoc. Prof., Human Service Studies
Greene, Jennifer C., Ph.D., Stanford U. Assoc. Prof., Human Service Studies
Hahn, Alan J., Ph.D., Indiana U. Prof., Human Service Studies
Hamilton, Stephen F., Ed.D., Harvard U. Prof., Human Development and Family Studies
Haugaard, Jeffrey, Ph.D., U. of Virginia. Asst. Prof., Human Development and Family Studies
Hazan, Cindy, Ph D., U. of Denver. Asst. Prof., Human Development and Family Studies
Heck, Ramona K.Z., Ph.D., Purdue U. Assoc. Prof., Consumer Economics and Housing
Hedge, Alan, Ph.D., U. of Sheffield (England). Assoc. Prof., Design and Environmental Analysis
Hogarth, Jeanne M., Ph.D., Ohio State U. Assoc. Prof., Consumer Economics and Housing
Jennings, Jan, M.S. Oklahoma State U. Assoc. Prof., Design and Environmental Analysis
Jirousek, Charlotte, Ph.D., U. of Minnesota. Asst. Prof., Textiles and Apparel
Koslowski, Barbara, Ed.D., Harvard U. Assoc. Prof., Human Development and Family Studies
Kuder, John, Ph.D., U. of Michigan. Assoc. Prof., Human Service Studies
Kutty, Nandinee K., Ph.D., Syracuse U. Asst. Prof., Consumer Economics and Housing
Laquatra, Joseph Jr., Ph.D., Cornell U. Asst. Prof., Design and Environmental Analysis
Lee, Lee C., Ph.D., The Ohio State U. Prof. Human Development and Family Studies
Lemley, Ann T., Ph.D., Cornell U. Prof., Textiles and Apparel
Lenzenweger, Mark. F., Ph D., Yeshiva U. Asst. Prof., Human Development and Family Studies
Lillard, Dean R., Ph D., U. of Chicago. Asst Prof., Consumer Economics and Housing
Lust, Barbara C., Ph.D., City U. of New York. Prof., Human Development and Family Studies
McClintock, Charles C., Ph.D., SUNY at Buffalo. Prof., Human Service Studies, Associate Dean
Mathios, Alan, Ph.D., U. of Pennsylvania. Assoc. Prof., Consumer Economics and Housing
Maxwell, Lorraine E., Ph.D., City U. of New York. Asst. Prof., Design and Environmental Analysis
Maynes, E. Scott, Ph.D., U. of Michigan. Prof. Emeritus, Consumer Economics and Housing
Minot, Marion E., Ph.D., Cornell U. Prof., Human Service Studies
Moen, Phyllis, Ph.D., U. of Minnesota. Prof., Human Development and Family Studies
Mont, Daniel M., Ph.D., U. of Wisconsin at Madison. Asst. Prof., Consumer Economic and Housing
Mueller, B. Jeanne, Ph_D., U. of Wisconsin. Prof., Human Service Studies
Netravali, Anil, Ph.D., North Carolina State U. Assoc. Prof., Textiles and Apparel
Noble, Lucinda A., Ph D., U. of North Carolina. Prof., Human Service Studies
Obendorf, Sharon K., Ph.D., Cornell U. Prof., Textiles and Apparel
Parrot, Andrea, Ph.D., Cornell U. Asst. Prof., Human Service Studies

Pillemer, Karl A., Ph.D., Brandeis U. Assoc Prof., Human Development and Family Studies
Pollak, Patricia B., Ph.D., Syracuse U. Assoc. Prof., Consumer Economics and Housing
Potts, Marion H., Ph.D., Penn State U. Prof., Human Development and Family Studies
Rendall, Michael, Ph.D., Brown U. Asst. Prof., Consumer Economics and Housing
Robertson, Steven S., Ph.D., Comell U. Assoc. Prof., Human Development and Family Studies
Rodriguez, Eunice, Ph.D., U. of California at Berkeley. Asst. Prof., Human Service Studies
Saltford, Nancy C., Ph.D., Purdue U. Prof., Textiles and Apparel
Savin-Williams, Ritch C., Ph D., U. of Chicago. Prof., Human Development and Family Studies
Schwartz, Peter, Ph.D., North Carolina State U. Assoc. Prof., Textiles and Apparel
Shapiro, Constance H., Ph.D., Cornell U Prof., Human Service Studies
Sims, William R., Ph.D., Massachusetts Inst. of Technology. Prof., Design and Environmental Analysis
Street, Lloyd C., Ph.D., U. of California at Berkeley. Assoc. Prof., Human Service Studies
Suci, George J., Ph.D., U. of Illinois. Prof., Human Development and Family Studies
Trochim, William M. K., Ph.D., Northwestern U. Prof., Human Service Studies

Trzcinski, Eileen, Ph.D., U. of Michigan. Asst Prof., Consumer Economics and Housing
Watkins, Susan M., M.S., Pennsylvania State U. Prof., Textiles and Apparel
Wethington, Elaine, Ph.D., U. of Michigan. Assoc. Prof., Human Development and Family Studies
Yerka, Bettie L., Ph.D., Syracuse U. Prof., Human Service Studies
Zorn, Peter M., Ph.D., U. of California at Davis. Assoc. Prof., Consumer Economics and Housing

## SCHOOL OF INDUSTRIAL AND LABOR RELATIONS

## ADMINISTRATION

David B. Lipsky, dean
Robert Smith, associate dean, academic affairs
Ronald L. Seeber, associate dean, extension and public affairs
Jonathon Levy, assistant dean, administration
James E. McPherson, assistant dean, Office of Student Services
Gordon Law, librarian
Ronald G. Ehrenberg, director, research
Mary Murray, director, school relations
Frances Benson, director, publications
Tom Herson, director of budget
Lawrence K. Williams, graduate faculty representative
Tove Hammer, editor, Industrial and Labor Relations Review

DEGREE PROGRAMS
Industrial and Labor Relations

## Degree

 B. 5
## THE SCHOOL

The School of Industrial and Labor Relations at Comell (ILR) is a small school within a large university. It tries to maintain the smallcollege atmosphere expected of an institution that has about 630 undergraduates and approximately 140 graduate students, even as ILR students participate fully in the activites of the larger Cornell community.
When the construction of the new Ives Hall classroom building is complete, ILR students will return to modern, technologically advanced lecture halls and seminar rooms, as well as to a library enlarged in size and more useable for study. During the construction, ILR classes will meet in buildings near the Ives Hall complex of faculty and administrative offices. Lunches, receptions, parties, and activities will be organized to promote the continuing interaction of ILR students and faculty.
Almost half of the school's typical freshman class comes from the greater New York City area. Another 30 percent live in other parts of New York State. Students from other states and a few from foreign countries make up the rest of the class. Women constitute about 50 percent of recent entering classes, and minority students comprise about 25 percent of new freshmen and transfer students.

Students enrolled in the School of Industrial and Labor Relations at Cornell may take a substantial number of courses in the other six undergraduate colleges and schools of the university, including the College of Arts and Sciences. Comell students have access to all of the libraries and other services of the university.
The school operates in four areas: (1) resident instruction, (2) extension and public service, (3) research, and (4) publications. It provides instruction to undergraduates and graduate students who are preparing for careers in the field, as well as to men and women already engaged in industrial relations activities and the general public through its Extension and Public Service Division.
The school's Conference Center, part of the extension division, initiates and hosts conferences covering the full scope of industrial and labor relations. The center provides continuing education and information to practitioners and scholars.
The Research Division develops materials for resident and extension teaching and originates studies in industrial and labor relations. The Publications Division publishes and distributes the research results.

## GRADUATE DEGREES

More than 140 students on the Cornell campus are enrolled in graduate study in industrial and labor relations, one of the largest graduate fields in the university. Students may work toward the degrees of Master of Industrial and Labor Relations, Master of Professional Studies, Master of Science, and Doctor of Philosophy. For further information on graduate programs, contact the Graduate Office, School of Inclustrial and Labor Relations, Cornell University, 379 Ives Hall, Ithaca, NY 14853-3901.

## DEPARTMENTS OF INSTRUCTION

Courses in the school are organized into six departments:

## Collective Bargaining, Labor Law, and Labor <br> History

In the study of workers, employers, and the government policies affecting them, members of this faculty concentrate on subjects of industrial and labor relations best understood by reliance on the fields of administration, economics, history, and law. Courses explore subjects within the framework of American society, stress fundamental forces of change, and analyze texts and empirical data with methods drawn from the social sciences, the humanities, and the legal professions.

## Economic and Social Statistics

Economic and Social Statistics includes the principles of statistical reasoning, statistical
methods, and the application of statistical tools of analysis.

## International and Comparative Labor Relations

International and Comparative Labor Relations is concerned with industrial and labor relations systems and labor markets in other parts of the world. Countries include those in Western Europe, as well as the newly industrializing countries in Asia and the Third World.

## Labor Economics

Labor Economics deals with labor markets: that is, the institutional arrangements, terms, and conditions under which workers supply their labor and under which firms demand their labor. Faculty members are especially concerned with understanding the workings of labor markets and the effects of various public policies. The topics dealt with in courses and research include the following: analysis of the labor force, employment and unemployment, wages and related terms of employment, income distribution, income security programs, health and safety in industry, retirement, pensions and social security, economic aspects of collective bargaining, and economic demography.

## Organizational Behavior

By studying individuals, groups, single organizations, and associations or organizations, persons in the field of Organizational Behavior understand human behavior within organizations as well as the actions of the organizations themselves. At the individual level of analysis, courses consider motivation, leadership, attitudes, personality, group processes, organizational change, and worker participation. At the organizational level, courses examine occupations, deviance in the work place, conflict, power, organizational design, public policy regarding organizations, and industrial conflict. The department also offers courses on research methods in organizational research and general survey courses in both psychological and sociological research.

## Human Resource Studies

This department offers specialization in human resource studies. Human Resources focuses on employer-employee relationships and deals with such topics as human-resource planning, staffing, computer applications to personnel, personnel information systems, training, management development, performance appraisal, compensation administration, organization development, and the sociological environment of human resource management. The study of human resource policy focuses on government efforts to enhance the population's ability to be employed. Although primarily concerned with governmental measures that influence the supply of labor (for example, training, education, health, mobility, and immigration), the subject area also includes policies in private industry that relate to the demands for labor.

A full list of required and elective courses is available from the Office of Student Services, 101 Ives Hall.

## RESIDENT INSTRUCTION

This division conducts the on-campus programs leading to the degrees of Bachelor of Science, Master of Industrial and Labor Relations, Master of Professional Studies, Master of Science, and Doctor of Philosophy from Cornell.

## Office of Student Services

Staff members from the Office of Student Services, 101 Ives Hall, work closely with faculty and faculty committees to administer degree programs for the school and many of the school's support services. The office's responsibilities include the admitting and orienting of new students, maintaining students' personal and academic records, and counseling students on personal and academic problems. The office also works closely with seniors who are planning graduate study.

## Counseling and Advising

New students will be provided advising on orientation, academic procedures, and course registration by counselors in the Office of Student Services.
Each of the school's academic departments names faculty members to serve as advisers for students who wish to consult with them regarding career possibilities in the field, postgraduate programs, or similar matters. Questions or issues related to graduation requirements, course registration, and related academic procedures should be raised with counselors in the Office of Student Services.

## Minority Programs

Comell University administers a variety of special opportunity programs designed to provide financial assistance and other forms of assistance to (1) minority students and (2) low-income students meeting program guidelines. The purpose of these programs is to open access to a Cornell education for capable students who otherwise might not secure the admissions consideration, financial assistance, or supportive services necessary for their success at the university. The associate director for minority education in the Office of Student Services provides academic and personal counseling to all ILR minority students. ILR offers a variety of support services to enhance academic achievement.

## STUDY OPTIONS

Several study options are open to ILR undergraduates, making it possible to tailor a program to fit special circumstances.
One such option is the five-year ILR master's degree. With early planning, some students may eam the M.S. degree in the fifth year. Using another option, some ILR students arrange for dual registration in the Johnson Graduate School of Management, earning their bachelor's degree in ILR and a master's degree in the Johnson Graduate School of Management after five years of study.

Some students elect to spend a semester in New York City, Albany, or Washington, D.C., with a chance to observe actual labor problem solving as interns in congressional offices, labor organizations, personnel offices, and state and federal agencies. For more information, see "Special Academic Programs," below.
Study abroad options are also available at a number of foreign universities. Qualified students may spend a semester or a full year studying abroad.
A number of ILR courses deal directly with today's problems and involve fieldwork in the Ithaca area and elsewhere in New York State.
The ILR program allows juniors and seniors who want to conduct their own research to receive course credit for individually directed studies if the program is supervised by a faculty member.

## Study in Absentia

Registration in absentia enables a student to seek admission in another American institution for a semester or a year and transfer credit toward completion of the Cornell degree. This study option requires the development of a plan of study, a statement of appropriate reasons for study away from the university (e.g., availability of courses not offered at Cornell), good academic standing, approval of the plan by the director of student services, and payment of a special in absentia registration fee. Course work taken in absentia is usually not evaluated for transfer credit until the work has been completed and the student has returned to the school. Students then submit a course syllabus and other evidence of content to the chairman of the department that might have offered the respective course, or to a counselor in the Office of Student Services if the course is more appropriate as a general elective.

## Leave of Absence or Withdrawal

If a student desires to withdraw or to take a leave of absence from the university, an interview should be scheduled with a counselor in the Office of Student Services. Counselors will assist students in petitioning for approval of a leave of absence and in contacting the appropriate offices or departments of the university.

## REQUIREMENTS FOR GRADUATION

To earn the Comell Bachelor of Science degree in industrial and labor relations, the student needs to successfully complete 120 credits. This requires eight terms for an average of 30 credits a year although some students accelerate their studies.

## Curriculum Changes Effective Fall 1994 for Entering Class

FRESHMAN YEAR

## Fall Semester

Freshman Writing Seminar
Mathematics
History of American Labor: Nineteenth Century (ILRCB 100)
Social and Psychological Foundations of Organizational Behavior I (ILROB 170)*


ILRCB 100, United States Labor History in the Nineteenth Century 3 Fall

ILROB 171 (120), Macro Organizational Behavior and Analysis
ILRST 210, Statistics I 3 Fall

Any two of the following: 4 Spring

ILRCB 101, United States Labor History in the Twentieth Century
ILRLE 140, Development of Economic Institutions
ILROB 170 (121), Micro
Organizational Behavior
and Analysis
Physical education $\quad 0$ Fall and spring

## Sophomore Year

ILRCB 201, Labor Relations
Law and Legislation
ILRLE 240, Economics of
Wages and Employment
ILRST 211, Statistics II
ILRHR 260, Personnel
Management
ILRCB 200, Collective Bargaining
Ag Econ 221, Financial Accounting
ILRCB 101 or ILRLE 140 or ILROB 170 (121)

3 Fall

## Junior Year

ILRLE 340, Economic Security

3 Fall or spring
*College of Arts and Sciences

## Required Courses

( 55 credits)
The curriculum prescribes the courses and subjects listed in the table above, to be taken in the terms indicated. In the senior year, all courses will be electives.

## Elective Courses

( 65 credits)
From the courses offered by the school, students must select a minimum of 27 credits of ILR elective courses. No more than 9 of these credits may be satisfied by ILR 499 , Directed Studies, or ILR 497-498, Internships, or ILR 495, Honors Program.
Undergraduates are required to select one course in the humanities and one intensive writing course (each for a minimum of three credits) from a list of designated courses.
The remaining 33 credits may be selected from the courses of any other college at Cornell, but a student who takes more than 33 credits in the endowed colleges (the College of Architecture, Art, and Planning; the College of Arts and Sciences; the Johnson Graduate School of Management; the College of Engineering; and the School of Hotel Administration) must pay for each credit taken in excess of 33, whether or not the courses are passed. For the precise fee per credit, students should call the Office of the Bursar.

The number of credits that may be taken in the endowed colleges at no additional cost to the student may be changed at any time by official action of the school.

## SCHEDULING AND ATTENDANCE

## Schedule Changes

Occasionally it may be necessary for a student to request changes in his or her course schedule either before a term begins or during the semester. Such requests must be directed to the Office of Student Services to avoid possible loss of academic credit.

## Class Attendance

It is each student's responsibility to attend all scheduled classes unless approved excuses have been given by the faculty. In some courses an instructor may permit a maximum number of class absences without a grade penalty or dismissal from the course. An explanation for absence from class may occasionally be secured from the Office of Student Services in advance of the expected absence. An approved absence may be warranted by:

1) participation in authorized university activities such as athletic events, dramatic productions, or debates;
2) medical problems supported by a record of clinic or infirmary treatment;
3) serious illness or death in the immediate family;
4) other circumstances beyond the student's control.
A request for explanation of an absence should, when possible, be made to the Office of Student Services before the date of expected absence. A reported and explained absence does not relieve a student from fulfillment of academic requirements during the period of absence. The course instructor has the authority to determine what work must be completed. The office can only confirm the explanation for absence. Students should inform the Office of Student Services of any problems they have meeting course requirements.

## ACADEMIC STANDING AND GRADES

## Academic Integrity

In 1987 the faculty of the School of Industrial and Labor Relations approved a revised code of academic integrity. This code, while based on the Cornell University code, varies somewhat.
Absolute integrity is expected of all Cornell students in all academic undertakings. They must in no way misrepresent their work, fraudulently or unfairly advance their academic status, or be a party to another student's failure to maintain academic integrity. The code specifically prohibits:

1) knowingly representing the work of others as one's own;
2) using or obtaining unauthorized assistance in any academic work;
3) fabricating data in laboratory or field work;
4) giving fraudulent assistance to others;
5) fabricating data in support of laboratory or field work.

Full details on the applications of those prohibitions to course work, term papers, examinations, and other situations are listed in the code. Copies are available from the Office of Student Services, 101 Ives Hall.

## Dean's List

A Dean's List is compiled for each of the four undergraduate classes each term on the seventh day following receipt of final grades from the registrar. Eligibility for the Dean's List is determined by applying all of the following criteria:

1) achievement of a term average for freshmen of 3.3 or better; for sophomores of 3.4 or better; and for juniors and seniors of 3.6 or better;
2) a minimum course load for the term of 12 letter-graded credits;
3) completion of all courses registered for at the beginning of the term;
4) satisfaction of all good-standing requirements.

## Academic Standing

Good standing requires that all of the following criteria be met at the end of each term:

1) an average of $C-$ (1.7) for the semester's work, including a minimum of 8 completed and letter-graded credits;
2) no failing grades in any course, including physical education;
3) a cumulative average of $C-(1.7)$ for all completed terms.
If at the end of any term a student fails to maintain good standing or if overall academic performance is so marginal as to endanger the possibility of meeting school and university degree requirements, his or her record is reviewed by the Committee on Academic Standards and Scholarships. The committee may issue a written warning to the student at that time. If a student does not improve after the written warning, he or she may be denied permission to register for the next term.

## Involuntary Separation from the School for Academic Reasons

A student may be denied permission to reregister at the end of any term when he or she has failed:

1) to establish good standing after a semester on warning;
2) to maintain an average of 1.7 in any term after a previous record of warning;
3) to achieve good standing after being on warning any two previous semesters;
4) two or more courses in one term or has a term average of 1.0 or below.
The Academic Standards and Scholarship Committee may decide to permit a student to remain on warning more than one semester if there has been significant improvement even though the cumulative average is still below 1.7.

## INDUSTRIAL AND LABOR RELATIONS - 1994-1995

## S-U Grading Policy

An undergraduate may register to receive a final grade of $S$ (Satisfactory) or U (Unsatisfactory) in courses that offer this option-either in the school or in other divisions of the university-subject to the following conditions:

1) the S-U option may be used in ILR and in out-of-college course electives only, not in directed studies;
2) students are limited to registering in two S-U courses a term;
3) S-U registration is limited to 4 credits for each course;
4) students registering for S-U grades must be in good standing;
5) students must fulfill the graduation requirement of 105 letter-graded credits.
ILR faculty members assign a grade of $\mathbf{U}$ for any grade below C - and a grade of S for any grade of C - or better. A grade of U is considered equal to an $F$ in determining a student's academic standing, although it is not included in the cumulative average.
No change of grading (from letter to S-U or from S-U to letter) may be made after the first three weeks of class. There are no exceptions to this restriction, and appeals will not be accepted.

## Grades of Incomplete

A grade of incomplete is assigned when the course has not been completed for reasons that are acceptable to the instructor. It is understood that the work may be completed later and credit given. Instructors may grant a grade of incomplete for a limited number of clearly valid reasons, but only to students with substantial equity in a course. A firm and definite agreement on the conditions under which it may be made up must be made with the instructor. The school's policy allows a maximum of two full terms of residence for removal of a grade of incomplete. If it is not made up within this time, the grade automatically becomes an F .

## SPECIAL ACADEMIC PROGRAMS

To meet the special academic objectives of some students, the school's faculty has established several special academic programs. For additional information, students should contact a counselor in the Office of Student Services. Counselors will explore the program with students to help them decide if it suits their interests.

## Dual Registration in the Johnson Graduate School of Management

Dual informal registration in the Johnson
Graduate School of Management leads to a Bachelor of Science degree in industrial and labor relations and a master's degree in management after five years of study and is open to students who meet the requirements of the Johnson Graduate School of Management.
Early planning by each student, preferably in the sophomore year, is desirable to ensure that the expectations of the Johnson Graduate School of Management and ILR curriculum requirements are fulfilled. Students interested
in the very limited and selective program of the Johnson Graduate School of Management should contact the Admissions Office, 319 Malott Hall, and a counselor at the Office of Student Services.

## Five-Year Master of Science Degree Program

With early planning it is possible to earn the M.S. degree in a fifth year of study. This program is designed specifically for those who wish concentrated scudy in an area of specialization in the school for a Master of Science degree. Students considering this program should consult a counselor in the Office of Student Services after their freshman year.

## Internships

The Credit Internship Program has provided students with a vivid understanding of problems in labor and industrial relations through observation and participation in "reallife" labor problem solving. A number of selected students spend a term of the junior year in Albany, New York City, or Washington, D.C., in close contact with practitioners. Their activities include independent research under direction of ILR faculty members and seminars drawing on fieldwork experience with employers, labor organizations, and government agencies. More information about this program is available from the Office of Student Services.

## Honors Program

Undergraduates who are ranked in the top 20 percent of their class at the end of the junior year may propose a two-semester research project, an honors thesis, for review by the Committee on Academic Standards and Scholarships. When approved, the candidate for graduation with honors works for two semesters (for 3 credits in each term) to research, write, and then defend the thesis

## Study Abroad

Cornell students with strong academic records and the necessary preparation in required and elective courses are encouraged to consider study abroad. The university currently has agreements with universities in Germany, Israel, England, and the Scandinavian countries that permit undergraduates to register for courses while maintaining Cornell registration and financial aid for a semester or a year. Information about those opportunities may be requested from Cornell Abroad, 474 Uris Hall.

Some study abroad programs require the development of language proficiency and preparation in appropriate courses at Cornell. Students should consult the Office of Student Services and Cornell Abroad in the freshman and sophomore years to be sure that they comply with the academic and procedural requirements for study abroad.

## COLLECTIVE BARGAINING, LABOR LAW, AND LABOR HISTORY

C. Daniel, chair; M. Cook, I. DeVault, M. Gold, L. Gray, J. Gross, R. Hebdon, H. Katz,
S. Kuruvilla, R. Lieberwitz, D. Lipsky, P. Ross, N. Salvatore, K. Stone, L. Tumer,
J. Windmuller

## ILRCB 100 Introduction to U.S. Labor

 History: Nineteenth CenturyFall. 3 credits.
C. Daniel, I. DeVault, N. Salvatore. This first semster of a two-semester sequence covers the major changes in the nature of work, the workforce, and the institutions involved in industrial relations in the United States through the end of the nineteenth century.
ILRCB 101 Introduction to U.S. Labor History: The Twentieth Century Spring. 3 credits. Prerequisite: ILRCB 100.
C. Daniel, I. DeVault, N. Salvatore. This second semester of a two-semester sequence covers the major changes in the nature of work, the workforce, and the institutions involved in industrial relations in the United States from the end of the nineteenth century up to the present.

## ILRCB 200 Collective Bargaining

Fall or spring. 3 credits.
M. Cook, R. Hebdon, H. Katz, S. Kuruvilla, L. Turner.

A comprehensive introduction to industrial relations and collective bargaining in the United States; the negotiation, scope, and day-to-day administration of contracts; the major substantive issues in bargaining, including their implication for public policy; industrial conflict; the major challenges facing unions and employers today; U.S. industrial relations in international and comparative perspective.

## ILRCB 201 Labor and Employment Law

 Fall, spring, or summer. 3 credits.M. Gold, R. Lieberwitz, K. Stone. A survey and analysis of the law governing labor relations and employee rights in the workplace. The first half of the course examines the legal framework within which collective bargaining takes place, including union organizational campaigns, negotiations for and enforcement of collective bargaining agreements, and the use of economic pressure. The second half of the course surveys additional issues of rights in employment, including such topics as employment discrimination, the developing law of "unjust dismissal," and union democracy. Also serves as an introduction to judicial and administrative systems.

## ILRCB 301 Labor Union Administration

Fall. 3 credits. Prerequisites: ILRCB 100, 101, and 201.

Staff.
Study and analysis of the structure and operations of American unions, including the complicated internal life of the organizations: the varied environments in which unions develop and grow or decline; the relationship of national unions, local unions, and members in the many different aspects of internal union government; the ways in which unions are set up to handle organizing, collective bargaining, contract administration, and political activity; and the widespread movement toward merger and consolidation of unions that began in the sixties and continues today. All of these will involve a study of union constitutions and
other primary documents, in addition to secondary readings. Attention will be given to relevant legislation, current problems of unions, and the eternal problems of attaining union democracy.

## ILRCB 305 Labor in Industrializing America: 1865-1920 <br> Fall. 3 credits. Prerequisites: ILRCB 100 and 101. <br> N. Salvatore.

Examines the experience of working people in the years between the Civil War and World War I. It will explore both the workers themselves their organization, diverse cultures, ethnic and racial traditions, and political activities-and the dramatic changes in industry that restructured American life during this period.

ILRCB 384 Women and Unions
Fall or spring. 4 credits.
I. DeVault.

Will explore women's participation in the United States labor movement in the nineteenth and twentieth centuries. Issues covered will include women workers' relations with male-dominated union movements, the role of cross-class alliances of women in organizing women workers, interactions with radical parties and organizations, problems faced by women union leaders and activities, and others.

## ILRCB 385 The African-American Workers, 1865-1910: The Rural and Urban Experience

Spring. 3 credits. Prerequisites: juniors and seniors or permission of instructor. N. Salvatore.

Examines the history of blacks in America from Emancipation through the experience of the first generation born after slavery, with a focus on the work experience. Topics will include the restructuring of work during Reconstruction; the relationship between work and black organizational developments; between black and white workers; and the nature of work in the agricultural south and in cities throughout the nation.

## ILRCB 386 The African-American Workers, 1910-the Present: Race,

 Work and the CityFall. 3 credits. Prerequisites: juniors and seniors.
N. Salvatore.

Examines the history of blacks in America from the start of the Great Migration through the 1970s, with a focus on the work experience. Topics will include the effect of migration and urbanization on black workers; the nature of the relationship between black and white workers as influenced by depression and two world wars; and an examination of the effect of the Civil Rights movement on the economic circumstances of black workers.

## ILRCB 400 Union Organizing

Spring. 3 credits. Prerequisites: Undergraduates, ILRCB 200 and 201; graduate students, ILRCB 500 and 501.
R. Seeber, R. Hurd.

Explores various aspects of unions' attempts to organize workers: why some workers join unions and others do not; strategy and tactics implemented by unions and management during organizing campaigns; present status of labor law as it affects organizing; creative approaches to union organizing; the organizing model of unionism.

## ILRCB 401 My Brother's Keeper: Volunteerism and Philanthropy Spring. 3 credits.

M. Gold.

The philosophy, practice, economics, and law of volunteering labor and donating money. Topics include altruism versus self interest; why individuals volunteer labor and raise and donate money; the structure and practices of charitable organizations; the economic effects of voluntary labor and philanthropic gifts; and the law of raising and distributing money.

ILRCB 404 Contract Administration Fall, weeks $1-7.2$ credits. Prerequisites undergraduates, ILRCB 200 and 201; graduate students, ILRCB 500 and 501.

Staff.
Bridges the gap between ILRCB 200 (500), Collective Bargaining, and ILRCB 602, Arbitration. It focuses on various aspects of dispute settlement process prior to final resolution. The intent of the course is to expand the knowledge of students rather than to develop personal skills. It includes such topics as (1) the historical development of contractual grievance process, (2) the merits of various alternative processes that have been adopted by unions and managements in the United States, (3) the impact of external law on the behavior of the parties in the adjustment process, (4) a comparison of the U. S. system with systems in other industrialized economies, (5) current issues and problems in the systems, (6) nonunion grievance processes, and (7) ongoing experimental alternatives to the standard systems.

## ILRCB 407 Contemporary Trade Union Movement

Fall. 3 credits. Prerequisites: Undergraduates, ILRCB 100, 101, graduate students ILRCB 502.
R. Seeber, R. Hurd.

An examination of contemporary trade union issues, including union power, political action, collective bargaining approaches, and organizing efforts. The course will cover structural, functional and strategic aspects of contemporary unions. Speakers from the union movement will address the class.

## ILRCB 482 Ethics at Work

Fall or spring. 3 credits.
M. Gold.

Major theories of ethics are examined, then applied to issues in the employment relationship such as genetic screening of job applicants, random drug testing of employees, affirmative action, discipline for off-duty conduct, whistle-blowing, worker safety and cost/benefit analysis, comparable worth, strikes by employees providing crucial services, and crossing a picket line.

## ILRCB 484 Employment Discrimination

 and the LawFall. 4 credits. Prerequisite: ILRCB 201/501 or equivalent.
M. Gold.

An examination of legal problems involving employment discrimination based on race, color, religion, sex, national origin, or age, and disability. The impact of developing principles of law on personnel policies, practices, and procedures is cliscussed.
ILRCB 488 Liberty and Justice for All
Fall or spring. 3 credits. Limited to 16 students. Prerequisite: Juniors and seniors. M. Gold.

Major theories of ethics are examined, then applied to contemporary issues such as
affirmative action and reverse discrimination, the right to life (from abortion to capital punishment), comparable worth, and constitutional rights such as freedom of speech.

## ILRCB 495 Honors Program

Fall and spring (yearlong course). 3 credits each term. Admission to the ILR senior honors program may be obtained under the following circumstances: (a) students must be in the upper 20 percent of their class at the end of their junior year; (b) an honors project, entailing research leading to completion of a thesis, must be proposed to an ILR faculty member who agrees to act as thesis supervisor; and (c) the project, endorsed by the proposed faculty sponsor, is submitted to the Committee on Academic Standards and Scholarships.
Accepted students embark on a two-semester sequence. The first semester consists of determining a research design, familiarization with germane scholarly literature, and preliminary data collection. The second semester involves completion of the data collection and preparation of the honors thesis. At the end of the second semester, the candidate is examined orally on the completed thesis by a committee consisting of the thesis supervisor, a second faculty member designated by the appropriate department chair, and a representative of the Academic Standards and Scholarship Committee.

## ILRCB 497-498 Internship

Fall or spring. 497, 3 credits; 498,6 credits. Staff.
All requests for permission to register for an internship must be approved by the faculty member who will supervise the project and the chairman of the faculty member's academic department before submission for approval by the director of Off-Campus Credit Programs. Upon approval of the internship, the Office of Student Services will register each student for 497, for 3 credits graded A+ to F for individual research, and for 498 , for 6 credits graded S-U, for completion of a professionally appropriate learning experience, which is graded by the faculty sponsor.

## ILRCB 499 Directed Studies

Fall or spring. 3 credits.
For individual research, conducted under the direction of a member of the faculty, in a special area of labor relations not covered by regular course offerings. Registration is normally limited to seniors who have demonstrated ability to undertake independent work. Eligible students should consult a counselor in the Office of Student Services at the time of course registration to arrange for formal submission of their projects for approval by the Academic Standards and Scholarship Committee.
ILRCB 500 Collective Bargaining
Fall or spring. 3 credits. Open only to graduate students. Recommended: ILRCB 501 taken previously or concurrently.
M. Cook, R. Hebdon, H. Katz, S. Kuruvilla, L. Tumer.

A comprehensive introduction to the industrial relations system of the United States. The negotiation, scope, and day-to-day administration of contracts; union and employer bargaining structures; implications of industrial relations issues for U.S. competitiveness and public policy; industrial conflict; U.S. industrial relations in international and comparative perspective.

ILRCB 501 Labor and Employment Law
Fall, spring, or summer. 3 credits.
M. Gold, R. Lieberwitz, K. Stone. A survey and analysis of the law governing labor relations and employee rights in the workplace. The first half of the course examines the legal framework within which collective bargaining takes place, including union organizational campaigns, negotiations for and enforcement of collective bargaining agreements, and the use of economic pressure. The second half of the course surveys additional issues of rights in employment, including such topics as employment discrimination, the developing law of "unjust dismissal," and union democracy. Also serves as an introduction to judicial and administrative systems.

## ILRCB 502 History of Industrial Relations

 in the United States since 1865 Spring. 3 credits. Open only to graduate students.C. Daniel, I. DeVault, N. Salvatore. This introductory survey course emphasizes historical developments in the twentieth century. Special studies include labor union struggles over organizational altematives and such other topics as industrial conflicts, working-class life styles, radicalism, welfare capitalism, union democracy, and the expanding authority of the federal government.

## ILRCB 600 Advanced Seminar in Labor Arbitration

Spring. 3 credits. Limited to juniors, seniors. and graduate students. Prerequisites: ILRCB 602 or equivalent and permission of instructor, J. Gross.

An advanced seminar in labor arbitration emphasizing the practical aspects of current labor arbitration techniques and problems. Subjects considered range from laboratory exercises in the presentation of an arbitration case, the preparation of prehearing and posthearing briefs, and the writing of an arbitration opinion and award, to the investigation and evaluation of the experience of labor arbitrators, with selected case problems arising in state and federal employment and public education as well as in the private sector.

## ILRCB 601 Labor-Management Negotiations

Spring or fall. 3 credits.
S. Kuruvilla.

Focus of the course is on the theory and practice of labor-management negotiations. Emphasis is on the theories of bargaining, union and management preparations for bargaining, bargaining strategies and tactics, and preparation for arbitration. Students will be exposed to numerous films about negotiations, and will engage in a major collective bargaining simulation that involves a week of continuous negotiation. Students will also undertake one major arbitration hearing before a professional arbitrator. Grades will be based on performance at bargaining and arbitration.

## ILRCB 602 Arbitration

Fall or spring. 4 credits. Limited to 21 students. Prerequisites: undergraduates, ILRCB 200; graduate students, ILRCB 500; permission of instructor.
J. Gross, R. Lieberwitz. A study of the place and function of arbitration in the field of labor-management relations, including an analysis of principles
and practices, the law of arbitration, the handling of materials in briefs or oral presentation, the conduct of a mock arbitration hearing, and the preparation of arbitration opinions and post-hearing briefs.

## ILRCB 603 Governmental Adjustment of

 Labor DisputesFall or spring. 3 or 4 credits. Prerequisites: undergraduates, ILRCB 200; graduate students, ILRCB 500.

Staff.
An examination of the various governmental techniques for clealing with labor disputes in both the private and public sectors, including mediation, fact-finding arbitration (both voluntary and compulsory), the use of injunctions, and seizure. The course also examines the application of these techniques under the Railway Labor Act, Taft-Hartley Act, and various state acts.
ILRCB 605 Readings in the History of Industrial Relations in the United States
Fall. 3 credits. Limited to seniors and graduate students.
C. Daniel, N. Salvatore.

A seminar covering, intensively, original printed sources and scholarly accounts for different periods in American history.

## ILRCB 606 Theories of Industrial

 Relations SystemsFall or spring. 3 credits. Limited to seniors and graduate students. Prerequisites: seniors, ILRCB 100, 101, 200; graduate students, ILRCB 500.

## H. Katz.

Will trace the evolution of theory and research on industrial relations. Topics include: theories of the labor movement, institutional models and evidence regarding what unions do, the origins of internal labor markets and their relationship with unionization, models of strikes, empirical assessments of arbitration, research on union decline, and empirical evidence of the impacts of new technology.

## ILRCB 607 Values in Law, Economics,

 and Industrial RelationsFall or spring. 3 credits. Limited to 21 . J. Gross.

An examination of the often hidden values and assumptions that underlie the contemporary U.S. systems of employment law, work and business, and industrial relations.
Classroom discussions and student research projects will use novels and short stories (as well as the literature of industrial and labor relations) to focus on issues such as: discrimination; law, economics and the state; work and business; power, conflict and protest; and rights and justice.

## ILRCB 608 Special Topics in Collective Bargaining Labor Law, and Legislation

Fall or spring. 3 credits. Prerequisites: undergraduates, ILRCB 201; graduate students, ILRCB 501.

Staff.
The areas of study are determined each semester by the instructor offering the seminar.

## ILRCB 650 Service Work and Workers in Historical Perspective

Fall or spring. 3 credits.
I. DeVault.

Takes a historical perspective on the
development of a service economy in the United States. Readings will include general
and theoretical works, but the main focus will be recent historical scholarship on specific occupations and situations in the "nonproductive" workforce. Students will explore primary sources for research on the subject and write research papers.

## ILRCB 651 Industrial Relations in Transition

Spring. 3 credits. Limited to seniors and graduate students.
H. Katz.

Considers whether recent developments such as concession bargaining, worker participation programs, and the growth of nonunion firms represent a fundamental transformation in industrial relations practice. Will review recent research and new theories arguing that such a transformation is occurring, including the work of Piore and Sabel, Bluestone and Harrison, and Kochan, McKersie, and Katz. Will also review the counterarguments and evidence put forth by those who believe no such transformation is under way. Course material will focus on industrial relations practice in the private sector in the United States, although some attention will be paid to developments in Western Europe, the United Kingdom, and Japan.

## ILRCB 655 Employment Law

Spring. 3 credits. Prerequisites: ILRCB 201/ 501.
M. Gold.

Examines a number of major federal and state laws designed to protect workers in their employment relationships. The material covered will be selected from the following: the Fair Labor Standards Act, unemployment insurance, workers' compensation, the Occupational Safety and Health Act, the Employee Retirement Income Security Act, the doctrine of employment at will, Social Security, workers' right-to-know, plant closings, and protection of workers' privacy.

## ILRCB 681 Selected Topics in Labor and

 Employment LawFall or spring. 3 credits. Prerequisite: ILRCB 201/501 or equivalent.
M. Gold, R. Lieberwitz.

A survey of the law of employment discrimination, internal union democracy, public sector labor relations, and individual rights in the workplace such as privacy, free speech, and due process. Topics covered may vary with the instructor.

ILRCB 682 Seminar in Labor Relations Law and Legislation
Fall or spring. 3 credits. Limited enrollment. Prerequisite: permission of instructor.
R. Lieberwitz.

Legal problems in public employment and other areas of labor relations affecting the public interest.

## ILRCB 683 Research Seminar in the

 History of Industrial Relations Fall or spring. 3 credits. Prerequisites: undergraduates, ILRCB 100 and 101; graduate students, ILRCB 502.C. Daniel, I. DeVault, N. Salvatore. The areas of study are determined each semester by the instructor offering the seminar.
ILRCB 685 Research Seminar on Trade Unions
Fall or spring. 3 credits. Prerequisite: ILRCB 200 or 500 ; permission of instructor.
S. Kuruvilla.

Designed to provide an analytical survey of research on trade unions in the United States. Major topics include unions in politics, unions as complex organizations, public opinion and attitudes toward unions, determinants of union growth and decline, economic and noneconomic effects of unions, internal union government, and commitment and participation in trade union activity. This is a researchoriented course

## ILRCB 686 Collective Bargaining in the

 Public SectorFall or spring. 3 credits. Prerequisites undergraduates, IlRCB 200 and 201; graduate students, ILRCB 500 and 501.
R. Hebdon.

An examination of the development, practice, and extent of collective bargaining between federal, state, and local governments and their employees. The variety of legislative approaches to such matters as representation rights, unfair practices, scope of bargaining, impasse procedures, and the strike against government are considered along with implications of collective bargaining for public policy and its formulation.

## ILRCB 687 Current Issues in Collective

 BargainingFall or spring. 3 or 4 credits. Limited to 25 students. Prerequisites: ILRCB 200/500, and permission of instructor.

Staff.
An intensive study of the most significant current issues and problems facing employers and unions in their relations with each other, with particular emphasis on the substantive matters in contract negotiations and administration of the provisions of collective bargaining agreements. A major research paper is usually required.
ILRCB 689 Constitutional Aspects of Labor Law
Spring. 3 credits.
R. Lieberwitz

In-depth analysis of the Supreme Court decisions that interpret the United States Constitution as it applies in the workplace. This study will focus on the First Amendment, Fifth Amendment, Fourteenth Amendment, and Commerce Clause, with issues including freedom of speech and association, equal protection, due process, and other issues in the area of political and civil rights. The course entails a high level of student participation in class discussion, and assignments include a research paper.

## ILRCB 703 Theory and Research in Collective Bargaining

Spring. 3 credits. Open to graduate students who have had ILRCB 500 and ILROB 723 or their equivalents. Recommended: a statistics course beyond the level of ILRST 510. Staff.
This is a second-level course in collective bargaining that builds on the institutional research covered in ILRCB 500. The existing literature in the area of collective bargaining is appraised for its theoretical and empirical content. Efforts are made to explore the appropriate role for theory and empirical analysis in moving research in collective bargaining toward a more analytical perspective and to identify and appraise the underlying paradigms used to study collective bargaining-related issues.

## ILRCB 705 The Economics of Collective

 BargainingSpring. 3 credits. Prerequisites: ILRCB 500; ILRLE 540 (or their equivalents) and an understanding of multiple regression analysis; or permission of instructor. Staff.
Focuses on both the economic analysis of unions and collective bargaining in our economy and on the economic forces that affect collective bargaining. The method is to identify and conceptualize the structural determinants of relative bargaining power. On this basis, the course examines both the economic outcomes of collective bargaining and current bargaining trends in a variety of industries. Tentative theoretical analyses of unionism (neoclassical, institutionalist) are compared. The statistical techniques and empirical results of research on the union effect on economic outcomes (wages, prices, inflation, profits, productibility, earnings inequality) are also evaluated. The effect of technology, corporate structures, and public policy on union bargaining power is outlined, and a number of case studies of collective bargaining in the private sector are reviewed. A term paper is required.

## ILRCB 783 Seminar in American Labor

 HistorySpring. 3 credits.
N. Salvatore.

A reading and research seminar for graduate students that focuses on selected topics in nineteenth- and twentieth-century labor history. The topic changes each semester.

## ILRCB 784 Employment Discrimination

 and the LawFall. 4 credits. Prerequisite: ILRCB 501 or equivalent.
M. Gold.

An examination of legal problems involving employment discrimination based on race, color, religion, sex, national origin, age, and disability. The impact of developing principles of law on personnel policies, practices, and procedures is discussed.

## ILRCB 790 ILR M.P.S. Program

Fall and spring, 1-9 credits. Staff.
Supervised research only for those enrolled in the ILR M.P.S. program.

## ILRCB 798 Internship

Fall or spring. $1-3$ credits.
Designed to grant credit for individual research under direction of a faculty member by graduate students who have been selected for an internship. All requests for permission to register for ILRCB 798 must be approved by the faculty member who will supervise the project.

## ILRCB 799 Directed Studies

Fall or spring. Credit to be arranged. For individual research conducted under the direction of a member of the faculty.
ILRCB 980 Workshop in Collective Bargaining, Labor Law, and Labor History
Fall and spring. 2 credits. Limited to M.S. and Ph.D. candidates in the department. S-U grades only.

Staff.
This workshop is designed to provide a forum for the presentation of current research being undertaken by faculty members and graduate students in the Department of Collective

Bargaining, Labor Law, and Labor History, and by invited guests. All M.S. and Ph.D. candidates in the department who are at work on their theses are strongly urged to enroll. Each student in the course will be expected to make at least one presentation during the year, focusing on the formulation, design, execution, and results of that student's thesis research.

## ECONOMIC AND SOCIAL STATISTICS

M. Wells, chair; J. Angellotti, J. Bunge, A. Hadi, P. Velleman

## ILRST 210 Statistical Reasoning I

Fall or spring. 4 credits. Not open to engineering or graduate students. Attendance at the first discussion section of the term is essential.
An introduction to the basic concepts of statistics: measures of location and dispersion, estimation and confidence intervals, hypothesis tests, regression and correlation. Students are taught to use a computer at the beginning of the term and use it for weekly assignments.

## ILRST 211 Statistical Reasoning II

Fall or spring. 3 credits. Prerequisite: ILRST 210 or suitable introductory statistics course. Attendance at the first discussion section of the term is essential.
A continuation of ILRST 210. Application of statistical techniques to the social sciences. Topics include statistical inference, review of simple regression, multiple regression and correlation, applications of regression, elements of time series analysis, and the design of sample surveys. A computer is used throughout the course. (Students who have taken an introductory course in statistics without a computer will be expected to obtain brief instruction during the first few weeks of the semester.)

## ILRST 310 Design of Sample Surveys

Fall. 3 credits. Prerequisite: two terms of statistics.

> Staff

Application of statistical methods to the sampling of human populations. A thorough treatment of the concepts and problems of sample design with respect to cost, procedures of estimation, and measurement of sampling error. Analysis of nonsampling errors and their effects on survey results (for example, interviewer bias and response error). Illustrative materials are drawn from such fields as market research and attitude and opinion research.

## ILRST 312 Applied Regression Methods

 Spring. 3 credits. Prerequisite: ILRST 211 or equivalent.A. Hadi

The course starts with a review of those parts of matrix algebra that provide the vocabulary and skill necessary to construct and manipulate linear regression models. The standard least-squares theory is then developed, and regression analysis techniques are applied to problems arising in economics, industry, government, and the social sciences.
Computer packages are used as an aid to obtain problem solutions. Additional topics are deviation from assumptions,
multicollinearity, variable selection methods, and analysis of variance.
[ILRST 313 Graphical Methods for Data Analysis
Fall. 3 credits. Prerequisite: ILRST 211 or equivalent. Not offered 1994-95.

Staff.
Classical and recently developed graphical methods for analysis and display. Characteristics of effective and honest graphs with comparison of alternative methods for understanding data. Includes study of current computer programs and methods expected to be practical in the near future: graphing of univariate data, bivariate plots, multivariate data, graphical methods of data analysis; the specification, modification, and control of graphs; study of interaction between choice of display and underlying patterns.]

## ILRST 410 Techniques of Multivariate

 AnalysisFall. 3 credits. Prerequisite: two statistics courses or permission of instructor.

Staff.
The techniques of multivariate statistical analysis, the associated assumptions, the rationale for choices among techniques, and illustrative applications. Some matrix algebra and related mathematics are introduced. Includes some regression; correlation; principle components; multivariate tests on means, variances, and covariances; relations between sets of variates; and discriminatory analysis.

## [ILRST 411 Statistical Analysis of Qualitative Data

Spring. 3 credits. Prerequisite; two statistics courses or permission of instructor.

Staff. Not offered 1994-95.
An advanced undergraduate and beginning graduate course. Includes treatment of association between qualitative variates, rank order methods, and other nonparametric statistical techniques, including those related to chi-squared.]

## ILRST 499 Directed Studies

For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILRST 510 Statistical Methods for the Social Sciences I

Fall or spring. 4 credits.
A nonmathematical course for graduate students in the social sciences without previous training in statistical method. Emphasis is on discussion of technical aspects of statistical analysis and on initiative in selecting and applying statistical methods to research problems. The subjects ordinarily covered include analysis of frequency distributions, regression and correlation analysis, and selected topics from the area of statistical inference. Students are taught to use a computer at the beginning of the term and use it for weekly assignments.

## ILRST 511 Statistical Methods for the

 Social Sciences IIFall or spring. 3 credits. Prerequisite: ILRST 510 or an equivalent introductory statistics course.
This is a second course in statistics for graduate students that emphasizes applications in the social sciences. Topics include review of simple linear regression. multiple regression (theory, model building, model violations), and analysis of variance. Statistical computing packages are used extensively. (Students who have taken an introductory course in statistics without a computer course will be expected to obtain brief instruction during the first few weeks of the semester.)

ILRST 610 Seminar in Modern Data Analysis
Fall. 3 credits. Prerequisite: two statistics courses or permission of instructor.
P. Velleman.

An advanced survey of modern data analysis methods. Topics include exploratory data analysis, robust methods, regression methods, and diagnostics. Extensive outside readings cover recent and historical work. Participants should have some knowledge of multiple regression, including the use of matrices (ILRST 312 may be taken concurrently), and some experience using a computer.

## [ILRST 611 Statistical Computing

Spring. 3 credits. Prerequisites: Linear algebra, knowledge of a programming language, and statistics at least through multiple regression. Not offered 1994-95.
P. Velleman.

A survey of new aspects of statistical computing using the recent book on the subject by Ronald Thisted. Includes: basic numerical methods, numerical linear algebra, nonlinear statistical methods, numerical integration and approximation, smoothing and density estimation. Additional special topics may include: Monte Carlo methods, statistical graphics, computing-intensive methods, parallel computation, computing environments. Designed for graduate students in the statistical sciences and related fields interested in new advances. Students may be asked to write programs in a programming language of their choice.]

## ILRST 612 Statistical Classification Methods

Fall. 3 credits. Prerequisite: knowledge of statistics equivalent to the level of ILRST 312 or permission of instructor
J. Bunge.

An introduction to a variety of statistical techniques that assign objects to categories on the basis of observed characteristics of the objects. Course topics include but are not limited to: discriminant analysis and its extensions and variations; Classification and Regression Trees (CART); various clustering techniques; and estimation of error of classification methods.

## ILRST 613 Bayesian and Conditional

 InferenceFall. 3 credits. Prerequisites: Graduate level courses equivalent to OR\&IE 670 and OR\&IE 651 or permission of instructor.

Staff.
This course covers the following topics: loss functions and utility theory, prior information and subjective probability, coherency, basic Bayesian inference, empirical Bayesian inference, robust Bayesian inference, Bayesian computations, ancillarity, conditional properties of statistical procedures, and Barndorff-Nielsen's exact likelihood theory.

## [ILRST 614 Structural Equations with Latent Variables

Spring. 3 credits. Not offered 1994-95.
M. Wells.

Provides a comprehensive introduction to the general structural equation system, commonly known as the "LISREL model." One purpose of the course is to demonstrate the generality of this model. Rather than treating path analysis, recursive and nonrecursive models, classical econometrics, and confirmatory factor analysis as distinct and unique, we will treat them as special cases of a common model.

Another goal of the course is to emphasize the application of these techniques.]

## ILRST 711 Sensitivity Analysis in Linear Regression

Spring. 3 credits. Prerequisite: ILRST 312, OR\&IE 671, or equivalent. A. Hadi. A course on regression for students in statistical sciences and related fields. Attempts to narrow the gap between the theory and practical application of the linear regression model. Classical and recently developed statistical procedures are discussed. Students will be expected to read articles and thoroughly analyze real-life data sets using computer-packaged programs. Topics include role of variables in a regression equation, regression diagnostics (outliers, leverage points, influential observations, generalized linear models, errors-in-variables, and multicollinearity.

## [ILRST 712 Theory of Sampling

Fall. 3 credits. Prerequisite: calculus and at least one semester of mathematical statistics. Staff. Not offered 1994-95.
A companion course to ILRST 310, Design of Sample Surveys, stressing the development of the fundamentals of sampling theory.
Attention is paid to recent progress in the field. Occasional illustrative material is given to indicate the application of the theory.]
[ILRST 713 Empirical Processes with Statistical Applications
Fall. 3 credits. Prerequisite: a course at the technical level of Math 572 and 574 or permission of instructor. Not offered 1994-95. Staff.
The statistical analysis of life history data is playing an increasing role in the social, natural, and physical sciences. We will formulate and solve various practical problems in the statistical analysis of life history data using the modern theory of stochastic processes. We will examine the martingale dynamics for point processes relevant to life history data. Both parametric and nonparametric inference for multiplicative intensity models will be considered. The large sample properties of the proposed procedures will be discussed in detail using recent extensions of functional central limit theorems for martingales.]

## [ILRST 714 Topics in Modern Statistical Distribution Theary

Fall. 3 credits. Prerequisites: OR\&IE 651, 670, MATH 571, STATS 409 or permission of instructor. Not offered 1994-95.

## J. Bunge.

Recent research has revealed vast terrirories of distribution theory that are unfamiliar to most statisticians. Provides an introduction to three topics underlining this "modern" theory: infinite divisibility, decomposability, and stability; characterization of distributions; extensions of univariate distributions to multivariate distributions.]

## ILRST 790 ILR M.P.S. Program

Fall and spring. $1-9$ credits.

## Staff.

Supervised research only for those enrolled in the ILR M.P.S. program.

## ILRST 799 Directed Studies

For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## INTERNATIONAL AND COMPARATIVE LABOR RELATIONS

G. Fields, chair; J. Abowd, J. Bishop, G. Boyer, V. Briggs, M. Cook, I. DeVault, L. Dyer,
H. Katz, S. Kuruvilla, V. Pucik, M. Relsick, L. Turner, J. Windmuller

## [ILRIC 330 Comparative Industrial Relations Systems: Western Europe

Fall. 3 credits ( 1 additional credit may be arranged with the instructor). Open to juniors and seniors. Not offered 1994-95
J. Windmuller.

This course is intended to provide an overview of contemporary industrial relations in several Western European countries, especially Britain, France, West Germany, and Sweden. Particular attention will be given to the role of labor organizations, employers and government, recent developments in labor relations law and collective bargaining, and current issues in labor-management relations. National industrial relations systems will constitute the principal units of analysis but attempts at comparisons will be made throughout the term.]

## [ILRIC 331 Comparative Industrial

 Relations Systems: Non-Western CountriesSpring. 3 credits ( 1 additional credit may be arranged with the instructor). Open to juniors and seniors. Not offered 1994-95

Staff.
A study of the industrial relations systems of less-developed countries and industrialized non-Western countries, including Japan, the Soviet Union, Yugoslavia, India, and several others. Emphasis is on government labor policies, trade unions, and collective bargaining. Also included is a review of international organizations concerned with labor problems.]

## [ILRIC 332 Labor in Developing

## Economies

Spring. 3 credits. Prerequisite: ILRLE 240, Economics 311, or permission of instructor. Not offered 1994-95.
G. Fields

The economic problems of labor in lessdeveloped nations. Among the subjects included are determinants of income and wage structures in less-developed countries; labor demand and unemployment; labor supply and migration; human resource policy; and development strategy and employment growh. 1
ILRIC 333 Western Europe, the United States, and Japan in a Changing World Economy
Fall. 3 credits ( 1 additional credit may be arranged). Open to juniors and seniors.
L. Turner.

Offers an introduction to the contrasting national trajectories and current political economies of Germany, Britain, France, Japan and the U.S. Emphasis will be on (a) crossnational differences and comparisons; and (b) the different capacities that contrasting institutions offer each society as it grapples with intensifying trade competition, domestic political conflict, and the need for production reorganization and "new industrial relations."

ILRIC 336 The Japanese at Work
Spring. 3 credits.
M. Rebick.

Focuses on the development of the Japanese employment system since World War II (with some reference to prewar developments). Topics covered relate to economic security (employment insurance, pensions, health care, etc.) as well as employment contracts, wage payment systems, education and training systems, union activity and the framework of collective bargaining. Special topics such as interfirm transfers of employees, the rapid growth of temporary labor contracts, problems of population aging, labor market distribution and the recent Equal Employment Opportunity Law will be discussed.

ILRIC 337 Special Topics:
Fall or spring. 3 or 4 credits.
Staff.
Devoted to new topics in the field. The specific content and emphasis vary depending upon the interests of the faculty member teaching the course.

## ILRIC 339 The Political Economy of

 MexicoFall. 3 credits.
M. Cook.

This course explores the range of challenges affecting contemporary Mexican politics, society, and economic development-from democratization to immigration to NAFTA. The course provides both an introduction to Mexican political economy for those with no prior background and an opportunity for students with more knowledge of Mexico to explore a research topic in greater depth.

## ILRIC 499 Directed Studies

For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## [ILRIC 531 Comparative Industrial Relations Systems: Non-Western Countries

Spring. 3 credits. For graduate students. Not offered 1994-95.

## Staff.

Students in this course will attend the lectures in ILRIC 331 (see description for ILRIC 331). If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in ILRIC 331 and related topics.]

## [ILRIC 532 Labor in Developing

 EconomiesSpring. 3 credits. For graduate students. Not offered 1994-95.
G. Fields.

Students in this course attend the lectures in ILRIC 332 (see description for ILRIC 332). If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in ILRIC 332 and additional topics.]

## ILRIC 533 Western Europe, the United States, and Japan in a Changing World Economy

Fall. 4 credits. Graduate students.

## L. Turner

See description for ILRIC 333. Graduate students attend class, take the midterm and submit an analytical research paper at the end of the semester.

ILRIC 536 The Japanese at Work
Spring. 3 credits.
M. Rebick.

See description for ILRIC 336. If enrollment warrants, will meet separately at a time to be arranged for discussion of topics in ILRIC 336 and related topics.
[ILRIC 537 Special Topics:
Fall or spring. 3 or 4 credits. Not offered 1994-95.

Staff.
Devoted to new topics in the field. The specific content and emphasis vary depending upon the interests of the faculty member teaching the course.]

## ILRIC 631 Comparative Labor

 Movements in Latin America (also Government 631)Spring. 3 credits.
M. Cook.

Examines the historical development of labor movements in Latin America, their role in national political and economic development, and the impact of economic liberalization, authoritarianism, and redemocratization on contemporary labor organizations in the region. Countries examined will include but are not limited to Mexico, Brazil, Argentina, Chile, Peru, and Venezuela.

## ILRIC 632 European Industrial Relations in Transition

Spring. 4 credits. Graduate seminar open to seniors with permission of instructor only.
I. Turner.

Looks at the contemporary labor movements of France, Britain, Germany, and, the European community. Labor in politics (relations to political parties and to the state) and labor in the workplace (industrial relations, collective bargaining, shopfloor conflict, codetermination, new production organization) are discussed. The emphasis is on cross-national comparisons and on the contrasting capacities of labor movements in the face of the dynamic economic, political, and global challenges of today.
ILRIC 633 Labor, Industry, and Politics in Germany
Fall. 4 credits. Open to seniors with permission and graduate students.
L. Tumer.

Is the successful postwar "social partnership" model of organized capitalism in the Federal Republic of Germany viable in the 1990s? To answer this question, we will study the works councils and codetermination, the rise of a strong postwar labor movement, the contemporary German version of social partnership, with an emphasis on current events and the new challenges for German industry and labor posed by German unification and the single European market.

## ILRIC 636 Comparative History of Women and Work

Spring. 4 credits. Permission of instructor. I. DeVault.

Will explore the similarities and differences between different cultures' assumptions about the work of women as well as women's experiences in varying work circumstances throughout history. Beginning with theoretical pieces and overviews of the history of women and work, most of the course will consist of in-depth examinations of specific work situations or occupations across time and geography. Comparative examples will be taken from the United States, Europe, and the Third World.

ILRIC 637 Labor Relations in Asia and the Pacific Rim
Spring. 3 credits. Permission of instructor required. Seminar format.
S. Kuruvilla.

A comparative survey of the industrial relations systems of selected Asian nations such as Japan, S. Korea, Thailand, Malaysia, Singapore, Hong Kong, China, and several others. The emphasis is on economic development strategies and industrial relations policies in these countries. Industrial relations practices, the extent of union organization, and labor force demographics of these countries will be examined. The primary objective is to provide students with an introduction to industrial relations systems in Asia. The countries chosen are representative, but not exhaustive.

## ILRIC 638 Labor, Free Trade, and Economic Integration in the

 Americas (also Government 630) Fall. 3 credits. Limited. Open to seniors and graduate students with instructor's permission M. Cook.Explores the effects of the contemporary movement toward free trade and regional economic integration on the societies, economies, and political systems of countries in North and South America, with special focus on labor. The course pays special attention to the origins and implications of the North American Free Trade Agreement (NAFTA) but also looks at integration schemes in South America (Andean Pact and Mercosur) and Europe (for comparison) and at hemi-sphere-wide initiatives.

## [ILRIC 730 Research Seminar on Labor Markets and Economic Development

 Fall or spring. 3 credits. Prerequisite: Open to M.S. and Ph.D., students only. Not offered 1994-95.
## G. Fields.

Research seminar for students writing theses or dissertations on aspects of labor markets and economic development. Will address research questions, methodologies, and contributions in the areas of employment and unemployment, income and earnings, educational and human resource development, welfare economics, and economic growth. Numerous presentations and written papers will be required.]

## ILRIC 790 ILR M.P.S. Program

Fall and spring. $1-9$ credits. Spring.
Supervised research only for those enrolled in the ILR M.P.S. program.

## ILRIC 799 Directed Studies

For description, see the section, Collective Bargaining, Labor Law, and Labor History.

## LABOR ECONOMICS

J. Abowd, chair; F. Blau, G. Boyer,
R. Ehrenberg, G. Fields, R. Hutchens,
G. Jakubson, L. Kahn, M. Rebick, R. Smith

## ILRLE 140 Development of Economic Institutions

Fall. 3 credits. Prerequisite for non-ILR students: permission of instructor. G. Boyer. Provides students with an understanding of the historical roots of the economic system currently dominant in Western Europe and the United States. The course will focus on (a)
the process of European economic growth prior to 1914, (b) the effect of industrialization on labor in Great Britain, and (c) the historical evolution of economic thought from Adam Smith to J. M. Keynes.

## ILRLE 240 Economics of Wages and

 Employment (also Economics 341)Fall and spring. 3 credits. Prerequisites: Economics 101-102 or Economics 103.
J. Abowd, R. Hutchens, M. Rebick. Applies the theory and elementary tools of economics to the characteristics and problems of the labor market. Considers both the demand (employer) and supply (employee) sides of the market to gain a deeper understanding of the effects of various government programs and private decisions targeted at the labor market. Topics covered include employment demand, basic compensation determination, education and training, benefits and the structure of compensation, labor-force participation and its relation to household production, occupational choice, migration, labor-market discrimination, and the effects of unions.

## ILRLE 340 Economic Security

Fall or spring. 3 credits. Prerequisites: ILRLE 240 or equivalent.
F. Blau, R. Hutchens, G. Jakubson,
L. Kahn.

Considers the economic and social effects of income security measures. Analyzes programs offering protection against economic loss due to industrial accident, temporary and permanent disability, illness, old age, premature death, and unemployment, as well as private efforts to provide security, and the problems of integrating public and private programs. Proposals for amending or modifying economic security measures are also considered.
ILRLE 341 Postwar Japanese Economy Fall. 4 credits. Open to juniors, seniors, and graduate students. Suggested prerequisite: Introductory economics or an introductory course in Japanese studies.
M. Rebick.

Introduction to the Japanese economy since World War II. Analysis of economic growth, financial markets, industrial structure, labor markets, industrial policy, and international trade. General approach will be institutional, describing the Japanese economy as an integral system. Major focus will be the microeconomics of the Japanese firm.

## [ILRLE 345 Copporate Finance

Spring. 4 credits. Includes a mandatory computer lab. Prerequisites: Economics 101, 102, 103 or equivalent. Not offered 1994-95. J. Abowd.

Covers the basic material in capital budgeting and security pricing at the level of a first-year MBA course. Topics include (1) net present value; (2) the valuation of corporate balance sheets (assets and liabilities); (3) risk, return, and security pricing; (4) capital structure and the cost of capital; and (5) special financial management techniques for human resource managers. The specialized tools include application of net present value to compensation and benefit costs; measuring the effects of tax systems on employment costs; pension systems; mergers, acquisitions and regulation of the financial sector; and the human resource balance sheet.]

## [ILRLE 348 The Economics of Unemployment

Fall. 4 credits. Prerequisite: ILRLE 240/540 or permission of instructor. Not offered

## 1994-95.

## R. Smith.

This course introduces students to several issues fundamental to an understanding of unemployment: the social costs; definitional questions and measurement problems; the patterns of unemployment; and the various types of unemployment, their causes, and the policies that can or have been pursued to alleviate unemployment. The course is designed for undergraduate and graduate students who have taken a survey course in labor economics or its equivalent.]

## ILRLE 440 The Economics of Health

 CareSpring. 4 credits. Prerequisite: ILR 240 or equivalent.
G. Jakubson.

Overview of the basic economic models of the key actors in the U.S. health care system. We will then examine the effectiveness of the U.S. system in its goals, including ensuring equitable access to medical care, controlling health care expenditures, and providing longterm care for the chronically ill.

## ILRLE 441 Income Distribution

Fall. 4 credits. Prerequisite: ILRLE 240 or Economics 341.
R. Hutchens.

Explores income distribution in the United States and the world. Topics to be covered include functional and size distributions of income, wage structure, income-generating functions and theories, discrimination, poverty, public policy and income distribution, and changing income distribution and growth.

## ILRLE 442 The Economics of Employee Benefits

Fall. 4 credits. Prerequisites ILR 240 or equivalent.
J. Abowd.

An in-depth treatment of the economics and financial management and administration of all employee benefits: health care, insurance, retirement income, family-care benefits, executive incentive plans, and other compensation provided as a service or contingent financial package to employees. Detailed international comparisons of health care and retirement systems are included.
ILRLE 445 Women in the Economy Fall. 4 credits. Prerequisite ILRLE 240 or equivalent.

> F. Blau.

Examines the changing economic roles of women and men in the labor market and in the family. Topics include: a historical overview of changing gender roles; the determinants of the gender division of labor in the family; trends in female and male labor force participation; gender differences in occupations and earnings; and the consequences of women's employment for the family.

## ILRLE 448 Topics in Twentieth Century Economic History: The Economics of Depression and the Rise of the Managed Economy

Fall. 4 credits. Prerequisites: ILRLE 240 or Economics 314.
G. Boyer.

Topics covered include: the causes of the Great Depression in the United States; the
economics of the New Deal; the causes of high unemployment in interwar Great Britain; the rise of Keynesian economics and the development of demand management policies in Great Britain and the United States after 1945.

## ILRLE 495 Honors Program

Fall and spring (yearlong course). 3 credits each term.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILRLE 497-498 Internship

Fall or spring. 3 and 6 credits.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILRLE 499 Directed Studies

For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## IRRLE 540 Labor Economics

Fall or summer. 3 credits. Prerequisites: Economics 101-102 or Economics 103 or equivalent. Required of graduate students majoring or minoring in labor economics and M.I.L.R. candidates.
R. Smith.

Applies the theory and elementary tools of economics to the characteristics and problems of the labor market. The course considers both the demand (employer) and supply (employee) sides of the market to gain a deeper understanding of the effects of various government programs and private decisions targeted at the labor market. Topics covered include employment demand, basic compensation determination, education and training, benefits and the structure of compensation, labor-force participation and its relation to household production, occupational choice, migration, labor-market discrimination and the effects of unions.

## ILRLE 541 Social Security and

Protective Labor Legislation
Spring. 3 credits. Prerequisite: ILRLE 540 or equivalent. Required of graduate students majoring in labor economics and M.I.L.R. candidates.
R. Hutchens, L. Kahn.

Considers the economic and social effects of income security measures. Analyzes programs offering protection against economic loss due to industrial accident, temporary and permanent disability, illness, old age, premature death, and unemployment, as well as private efforts to provide security, and the problems of integrating public and private programs. Proposals for amending or modifying economic security measures are also considered.

## [ILRLE 640 Economic History of British

 Labor 1750-1940Fall or spring. 4 credits. Not offered 1994-95. G. Boyer.

Will examine various aspects of British labor history from the beginning of the Industrial Revolution until World War II. Specific topics will include: (1) monetary and non-monetary changes in workers' living standards; (2) internal migration and emigration; (3) the London labor market; (4) the extent of poverty and the evolution of the welfare state; (5) Luddism and Chartism; and (6) the development of trade unions.]

## ILRLE 642 Economic Analysis of the Welfare State

Spring. 4 credits.
R. Hutchens.

Includes economic rationales for government intervention and analysis of the effects of programs on economic welfare. Discusses taxes, in-kind, and cash programs. Includes some discussion of welfare states in other countries.

## [ILRLE 643 Special Topics in Labor

 EconomicsFall or spring. 3 or 4 credits. Not offered 1994-95.

Staff.
Topic varies with the offering. Devoted to new policy issues and to recent developments in labor economics.]

## [ILRLE 644 The Economics of Occupational Safety and Health Spring. 4 credits. Not offered 1994-95.

 R. Smith.Analyzes the problem of occupational injuries and illnesses in the United States. The first section concentrates on legal requirements, judicial interpretations, and legal implications of the Occupational Safety and Health Act, then shifts to such questions as the need for, and appropriate goals of, the act; the stringency of safety standards considered in a benefit-cost framework; the difficulties in enforcing the act; and estimates of the impact of the act.]

## [ILRLE 645 Research Seminar on

 Japanese and Korean Labor Markets Fall or spring. 4 credits. Open to upper-level undergraduates with permission. Not offered 1994-95.
## M. Rebick

Seminar will be concerned with a variety of topics largely determined by the interests of participants. Labor markets and institutions, public policy, demographic issues are among the topics to be covered. Some knowledge of either Korean or Japanese will be helpful.]

## [ILRLE 647 Evaluation of Social Programs

Fall. 4 credits. Not offered 1994-95. R. Ehrenberg.

An introduction to the methodologies used by economists to evaluate the impacts of socialaction programs and legislation. General evaluation methodology, cost-benefit analysis, and econometrics are discussed. Case studies are considered to illustrate the uses of these techniques, to acquaint the student with major current government programs and legislation, and to estimate these programs' economic impacts. Throughout, the primary analytic framework used by the instructor is microeconomics.]

## [ILRLE 648 Economic Analysis of the University

Spring. 4 credits. Not offered 1994-95. R. Ehrenberg.

Seeks to illustrate the complexity of decision making in a nonprofit organization and to show how microeconomic analysis in general, and labor market analysis in particular, can be usefully applied to analyze resource allocation decisions at universities. Among the topics covered are financial aid, tuition, admissions policies, endowment policies, faculty salary determination, the tenure system, mandatory retirement policies, merit pay, affirmative action, comparable worth, collective bargaining, resource allocation across and within departments, undergraduate versus graduate education, research costs, libraries, athletics, and "socially responsible" policies. Lectures and discussions of the extensive readings will
be supplemented by presentations by Cornell administrators and outside speakers who have been engaged in university resource allocation decisions or have done research on the subject.]

## ILRLE 740 The Economics of Health Care

Spring. 4 credits.
G. Jakubson.

Students attend the lectures of ILRLE 440 (see the description of 440 ) but have additional course requirements.
[ILRLE 741 Analysis of Longitudinal Data in the Social Sciences
Fall. 4 credits. Not offered 1994-95.
G. Jakubson.

Considers methods for the analysis of longitudinal data, that is, data in which a set of individual units are followed over time. The focus will be on both estimation and specification testing of these models. Will consider how these statistical models are linked to underlying theories in the social sciences. Course coverage will include panel data methods (including fixed vs. random effects models for both linear and non-linear systems) and, if time permits, duration analysis.]

## ILRLE 742 Economics of Employee Benefits <br> Spring. 3 credits. <br> J. Abowd.

Students in this course attend the lectures in ILRLE 442 (see description for 442) but have additional course requirements. If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in 442 and additional topics.

## [ILRLE 743 Empirical Modeling

Spring. 4 credits. Not offered 1994-95. G. Jakubson.

Covers the implementation of neoclassical models of the demand for commodities (including leisure) by households and the demand for factors of productions by firms. It will cover the use of both the primal and dual formulations of the problem to develop empirically testable models of demands by both firms and households. It will then cover the estimation of these demand systems and testing of the theoretical restrictions. The conventional demand systems (including LES, AIDS, etc.) will be analyzed. Attention will be paid to both exact functional forms as well as approximating functions. Additional topics include non/semi-parametric estimation of derivatives, rationing models, and differences between long- and short-run factor demands. Other topics depending on time and student interest.]

## ILRLE 744 Seminar in Labor Economics I

 (also Economics 641)Fall. 3 credits. ILRLE 744, 745 and 746 constitute the Ph.D.-level sequence in labor economics.
R. Ehrenberg.

Reading and discussion of selected topics in labor economics. Applications of economic theory and econometrics to the labor market and human resource areas.

## ILRLE 745 Seminar in Labor Economics

 II (also Economics 642)Spring. 3 credits. ILRLE 744,745 and 746 constitute the Ph.D.-level sequence in labor economics.
G. Jakubson, L. Kahn.

Reading and discussion of selected topics in labor economics. Applications of economic theory and econometrics to the labor market and human resource areas.

## ILRLE 746 Seminar in Labor Economics III (also Economics 643)

Spring. 4 credits. ILRLE 744, 745 and 746 constitute the Ph.D.-level sequence in labor economics.
F. Blau.

Reading and discussion of selected topics in labor economics. Applications of economic theory and econometrics to the labor market and human resource areas.

## ILRLE 748 Models for Limited Dependent Variables

Fall. 4 credits.
G. Jakubson.

Covers statistical methods for models in which the dependent variable is not continuous. It covers models for dichotomous response (including probit and logit) and polychotomous response (including ordered response and multinomial logit), various types of censoring and truncation (e g., the response variable is only observed when it is greater than a threshold), as well as sample selection issues, etc. Will also include an introduction to duration analysis. Covers not only the statistical issues but also the links between behavioral theories in the social sciences and the specification of the statistical model.

## ILRLE 749 Economics of Development (also Economics 672)

Fall. 4 credits. Prerequisites: First-year graduate economic theory and econometrics. G. Fields.

Analytical approaches to the economic problems of developing nations. Topics to be covered include: some old and new directions in development economics thinking, the welfare economics of poverty and inequality, empirical evidence on who benefits from economic development, labor market models, project analysis with application to the economics of education, and development policy.

## ILRLE 790 ILR M.P.S. Program

Fall and spring. 1-9 credits.
Staff.
Supervised research only for those enrolled in the ILR M.P.S. program.

## ILRLE 798 Internship

For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILRLE 799 Directed Studies

For description, see the section on Collective Bargaining, Labor Law, and Labor History.
ILRLE 940 Workshop in Labor Economics Fall or spring. 3 credits. Intended for Ph.D. students who have started to write their dissertations.
Presentations of completed papers and work in progress by faculty members, advanced graduate students, and speakers from other universities. Focus is on the formulation, design, and execution of dissertations.

## ORGANIZATIONAL BEHAVIOR

P. Tolbert, chair; S. Bacharach, L. Gruenfeld, J. Halpern, T. Hammer, E. Lawler,
W. Sonnenstuhl, R. Stem, L. Williams

## ILROB 170 (121) Introduction to Micro Organizational Behavior and Analysis: The Social Psychology of the Workplace <br> Fall. 3 credits.

Staff.
This introductory (survey) course considers the basic individual and group processes in the workplace. At the individual level, we will study personality, motivation, perception, attitude formation, and decision making. On the group level, we will emphasize group dynamics, leadership, power and influence, and culture.

## ILROB 171 (120) Introduction to Macro Organizational Behavior and Analysis

Spring. 3 credits.
Staff.
The relationship between industry and the economy as a whole and its implications for other social institutions in American society (including stratification, politics, and American values) is discussed. The course moves from classical sociological theory to the analysis of complex organizations. The study of industrial organizations and of complex organizations in general, emphasizing authority relations, goals, the division of labor, bureaucracy, and organizational design.

## ILROB 320 The Psychology of Industrial Engineering

Fall. 4 credits.
T. Hammer

A study of the human factors in the industrial engineering of work, workplaces, tools, and machinery. The course examines the aspects of individual and social psychology that operate in the work setting and that should be taken into account in the design of jobs. These include limitations of the human sensory system; individual difference in skills, abilities, motives, and needs; group dynamics; intrinsic motivation; job satisfaction; conflict.

## ILROB 323 Introduction to the Study of

 AttitudesFall. 4 credits. Open to juniors and seniors. Staff.
Designed to acquaint the student with what is known about (1) origins of human attitudes,
(2) the determinants of attitude change, and (3) the measurement of attitude differences. Studies employing clinical, experimental, and survey techniques are discussed. Each student designs, executes, and analyzes his or her own research study.

## ILROB 324 Work Organizations, Troubled Employees, and Employee Assistance Programs

Spring. 3 credits. Limited to 40 students. Prerequisite: one or more courses in sociology and psychology.
W. Sonnenstuhl.

Focus is on the relationship between organizational life and psychiatric-criminal behaviors. Covers (1) the nature and etiology of psychiatric disorders such as alcoholism, other drug and substance abuse, and the major neuroses; (2) corporate and white-collar criminal behavior; (3) the role of occupational and organizational risk factors in etiology;
(4) various types of organizations that represent societal responses to troubled
employees-mental hospitals, prisons, jails, halfway houses, shelter workshops, and selfhelp groups such as Alcoholics Anonymous. Puts differential emphasis on programs within work organizations that attempt to deal with troubled employees, job-based alcoholism, and employee assistance programs. Field format divides class into small groups for application in local relevant organizations. The development, strategies, and management of employee assistance programs will receive special attention.

## ILROB 325 Organizations and Social Inequality <br> Spring. 3 credits. Limited

P. Tolbert.

Examines the central role that organizations in industrial societies play in allocating income, status, and other resources to individuals. A variety of theoretical explanations of social inequality will be examined, and the social policy implications of each will be considered. Class assignments are designed to develop students' general writing skills, as well as substantive understanding of different theories and approaches to the problem of inequality.

## ILROB 326 Sociology of Occupations

Fall or spring. 3 credits. Limited to 45 students. Prerequisite: one or more courses in sociology.

Staff.
Focuses on (1) the societal characteristics of occupations: division of labor, social stratification, mandate and license, occupational ideologies, stories, and tradition; (2) nature and expression of professionalization of occupations; (3) organizational characteristics of occupations: accommodation to formal organizations, occupational associations, and occupational mix; (4) social psychological characteristics of occupations: temperamental and intellectual role demands, occupational attraction, identity, and commitment, and occupational self-images; (5) relationship between occupational structure and organizational structure.

## ILROB 327 Psychology of Industrial Conflict

## Fall. 4 credits.

> Staff.

An application of frustration theory to the analysis of conflict and stress in organizations and society. Comparisons are made between industrial relations, race relations, international relations, and other settings. Readings include behavioral research findings from a variety of studies in industry. Relevant contributions from experimental, social, and clinical psychology are also considered.
ILROB 328 Cooperation, Competition, and Conflict Resolution
Spring. 4 credits. Prerequisite: one course in social psychology or equivalent. Staff.
An examination of theory and empirical evidence relating to the resolution of interpersonal, intergroup, and international conflict. Specific attention is devoted to studying factors that contribute to the development of cooperative or competitive bonds between parties to a conflict. The following topics are studied: the availability and use of threat; the credibility, intensity, and costs of threat; fractioning and escalating conflict. Personality and situational factors that regulate conflict intensification are stressed.

LROB 329 Organizational Cultures
Fall or spring. 3 credits. Limited to 45
students. Prerequisite: one or more courses in sociology.

Staff.
This course reviews the concept of culture as it has evolved in sociology and anthropology, applying it to formal organizations in workplaces such as corporations and unions. The course first examines the nature of ideologies as sense-making definitions of behavior, concentrating on the cultural forms that carry these cultural messages, rituals, symbols, myths, sagas, legends, and organizational stories. Considerable attention will be given to rites and ceremonials as a cultural form in organizational life that consolidates many of these expressive forms into one. The course will examine types of ceremonial behavior such as rites of passage, rites of enhancement, and rites of degradation, including the role of language gestures, physical settings, and artifacts in ceremonial behavior. The presence of subcultures and countercultures in organizational behavior will also receive attention, especially the part played by occupational subcultures in formal organizations.

## ILROB 370 The Study of Work Motivation

 Fall. 4 credits. Open to juniors and seniors. T. Hammer.Designed to acquaint the student with the basic concepts and theories of human motivation with implications for job design and organizational effectiveness. Focus is on theories of worker motivation and on research approaches and results as these apply to the performance of individuals and groups in formal organizations. Readings are predominantly from the field of organizational psychology, supplemented by relevant contributions from experimental and social psychology. Each student will design, execute, and analyze a research study of his or her own

## ILROB 371 Individual Differences and Organizational Behavior

Fall or summer. 4 credits. Recommended: some acquaintance with the substance and methods of behavioral or social science
L. Gruenfeld.

This course examines personality from a comparative psychodynamic point of view. Social behavior, authority relationships, and work motivation are used to illustrate how various theories could be applied to understand behavior and experience in organizations.

## ILROB 373 Organizational Behavior Simulations

Fall. 3 credits. Prerequisites: ILROB 170 and 171 or equivalent.

> R. Stern.

Basic principles of organizational behavior as studied through readings and participation in four simulation games. Simulations model traditional organizations and cooperatives. One game models executive decision making and another assembly work organization. Organizational design, decision making, conflict, cooperation, and power are the central topics of discussion. The contrasting bases of power in the organizations permits the study of the assumptions underlying organization structure and process.
ILROB 374 Technology and the Worker Fall. 3 credits.

Staff.

Examines theory and research pertaining to the social implications of technology and technological change for the work worlds of blue-collar, white-collar, and professional workers. At issue are alternate conceptions of technology as a social phenomenon, approaches to the study of technology in the workplace, the reactions of individuals and groups to technological change, the construction of a technology's social meaning, and the management of technological change. A broad range of technologies will be considered, but particular emphasis will be given to automation, electronic data processing, and sophisticated microelectronic technologies, including CAD-CAM systems, telecommunication networks, medical imaging technologies, artificial intelligence, and personal computers.

## ILROB 421 Regulating the Corporation Fall or summer. 4 credits.

## R. Stern.

Will examine public and private power from an organizational perspective. The resourcedependence approach to organizationenvironment relations provides a framework for interpreting government attempts at the regulation of corporate behavior. Topics cover the structure and functioning of government regulatory agencies and corporate responses to regulation, including corporate strategy, change, and political influence. Business ethics and corporate social responsibility are considered along with the role of interest groups such as consumer or citizens organizations. Research and case materials focus on the implementation of environmental protection, occupational health and safety, equal opportunity, antitrust, securities, and consumer regulations.

## ILROB 422 Organizations and Deviance Fall. 3 credits.

W. Sonnenstuhl.

Focuses upon the deviant actions of organizations, including such behaviors as price fixing, environmental pollution, illegal campaign contributions, and discrimination in hiring and promotion. Examines the origins of such behaviors within organizations, the processes by which they became institutionalized, and the processes by which they become defined as deviant organizational actions. Within this context, the course will examine such contemporary cases as Exxon's Valdez oil spill, Iran-Contragate, drug testing, and the federal savings and loan scandal. These events raise troubling questions about what it means to live and work within an organizational society, and they cannot be dismissed as instances of a few individuals gone bad.

## ILROB 423 Negotiations

3 credits.

> J. Halpern.

Frequent in-class exercises teach the basic concepts of and methods for effective negotiation in personal and business contexts. We will emphasize how individual-level biases and self-presentation may either facilitate or hinder negotiations. Participation in all exercises in this class is mandatory. Other requirements include written preparation for exercises, journal entries analyzing the exercises, and a final paper.

## ILROB 424 Study of Public Sector

 BureaucracySpring. 3 credits, Prerequisite: permission of instructor.
S. Bacharach.

Field research in public sector organization such as a school bureaucracy or a social welfare bureaucracy. Students conduct a major study into which they integrate themes from organizational theory. Theoretical issues such as decentralization, participation, and communication are discussed in the seminar.

## ILROB 425 Sociology of Industrial

 ConflictSpring. 4 credits
R. Stern.

The focus is on the social, economic, and political causes of industrial conflict. These causes include socialization, class relations, work-non-work effects, as well as the nature of work and employment relations. Social movement, collective organization, and individual actions are examined including such manifestations of conflict, as strikes, labor turnover, absenteeism, and sabotage, and the influence of the environments in which they occur.
ILROB 426 Theories of Industrial Society Fall. 4 credits. Prerequisites: ILROB 171 and permission of instructor.
S. Bacharach.

Concentrates primarily on the works of Weber and Marx and will consist of readings in the original texts.

## ILROB 427 The Professions:

Organization and Control
Fall. 3 credits. Prerequisite: Permission of the instructor.
P. Tolbert.

Focus is on the sources of power and control exercised by professional groups in contemporary society. A number of issues will be examined in this context including the role of professions in society, processes through which an occupational group becomes defined as a profession, sources of control that professional associations have over their members, relations between professionals and nomprofessionals in organizations, and the relationship between unionization and professionalization of occupations.

## ILROB 428 Organizational Change and

 InterventionFall. 3 credits. Limited to 25. Juniors and seniors with permission of instructor. L. Williams.

Seminar will focus on planned and unplanned change in organizations. Topics will include mergers and acquisitions, team building, self management and the role of change agents. Participants will be required to develop and present topics in addition to keeping a weekly journal and participating in exercises.

## ILROB 429 Organizational Politics and Institutional Change

Spring. 2 credits. 7 weeks. Limited to 30 juniors and seniors with permission of the instructor. Please see instructor before the first class.
S. Bacharach.

Will examine the market, cultural, political, and structural forces that change the organizational "rules of the game," how those changes affect individuals and organizations, and the distortions that occur as individuals and organizations attempt to adjust to a new unstable order. Issues to be examined include power, corruption, dealmaking, rationality, uncertainty, and competition. Course requirements include completing a major research paper and leading a class discussion.

## ILROB 470 Group Processes

Fall. 3 credits. Prerequisites: ILROB 170 and 171 or equivalent. Permission of instructor. E. Lawler.

A review of theoretical approaches and selected research on group phenomena, including the formation of groups, the structure of group relations, and group performance. Specific topics include conformity and obedience, status and power relations, tactics of influence, solidarity and commitment, the management of emotion, the emergence and change of microcultures, and the role of groups in networks and organizations.

## ILROB 471 Organizational Analysis of

 Trade UnionsSpring. 4 credits. Prerequisites: ILROB 170 and 171 and one additional course in organizational behavior.

Staff.
Designed to use organizational theory and research in the examination of trade unions. Study of trade unions as organizations including the discussion of the role of unions in contemporary society and the meaning of unions to individual members. Unions will be analyzed in considering them as agents of social change, interorganizational relationships, and political activity. Union members will be the focus in considering why people join unions, their commitment, problems of dual allegiance and leadership. The issue of how effective unions are as a mechanism of worker participation in management decision making is also addressed. Course material focuses on current research on unions and on strategies for further research.
ILROB 472 Applied Organizational Behavior
Fall. 3 credits. Prerequisites: ILROB 170 and 171.
S. Bacharach.

Introduces students to intermediate theory of organizational behavior. It will specifically concentrate on teaching students to use organizational theories for analytical and applied purposes. Among the issues to be addressed are organizational structure, work processes, organizational politics, organizational design, job design, incentive systems, and quality-of-work-life programs.

## ILROB 475 Organizational and Political Behavior in School Districts

Fall. 4 credits. Enrollment limited. Prerequisite: permission of instructor.
S. Bacharach.

This course is intended to provide students with research experience through the study of the administrative and governance processes in school districts. The students will be required to work with school district and union personnel while investigating the following areas: (a) structure and process of decision making in urban and rural school districts, (b) organizational conflict as reflected in school board meetings, (c) the variations in, and effect of, leadership style, as evidenced by different superintendents' advisory techniques, (d) the collective bargaining process as reflected in both contracts and actual negotiations, (e) the effect of the Taylor Law on the structure and process of decision making in school districts, and (f) the effects of administrative law on conflict in school districts. Students will be responsible for the collection of data and the presentation of a final report of their project.

## ILROB 476 Unions and Public Policy in

 School DistrictsSpring. 4 credits. Enrollment limited.
Prerequisite: permission of instructor. S. Bacharach.

A continuation of ILROB 475, but 475 is not a prerequisite. This course is strictly a research field seminar. Students will be required to work with school districts and union personnel while investigating the following areas: (a) labor contracts with school districts, (b) relations between teachers' unions, school boards, and superintendents, (c) teachers' unions' involvement with school district policies.
ILROB 479 Technical Workers and the Social Organization of Research and Development
Spring. 3 credits. Prerequisite: ILROB 170 ,
171 or an introductory course in sociology or anthropology.

Staff.
Examines how industrial R\&D is organized and seeks to impart an appreciation for the practical problems that arise when firms employ a significant number of scientisss, engineers, and other technical workers. It is designed for students who have an interest in high-technology firms or who anticipate working for firms in which R\&D plays an important role. The course brings relevant theoretical perspectives to bear on pragmatic issues surrounding technical innovation and the employment of scientists and engineers. Representative topics include: the organization of scientific and technical communities, the industrialization of research, the nature of scientific and technical work, strategies for fostering innovation, the careers of scientists and engineers, and the managerial problems characteristic of high-technology firms. Requirements include a take-home midterm and a final paper.

## ILROB 495 Honors Program

Fall and spring (yearlong course). 3 credits each term.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILROB 497-498 Internship

Fall or spring. 3 and 6 credits.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILROB 499 Directed Studies

For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILROB 520 Micro Organizational Behavior and Analysis <br> Fall or spring. 3 credits.

## Staff.

Survey of concepts, theories, and research from the fields of organizational and social psychology as these relate to the behavior of individuals and groups in organizations. Job attitudes, motivation, performance, leadership and power, group formation, perception, and organizational climate. A preliminary course for advanced work in organizational behavior.

## ILROB 521 Macro Organizational Behavior and Analysis <br> Spring. 3 credits.

 Staff.Formal organizations are studied from the perspectives of classical organization theory, human relations theory, and comparative and cross-cultural analysis. Contemporary theories and quantitative approaches to organizational structure are also considered in some detail.

Intended to be preliminary to more intensive work in organizational behavior.

## ILROB 620 Theories of Organizational

 Change, Innovation, and Evaluation Spring. 4 credits. Prerequisites: two organizational behavior courses at the 300 level, or advanced courses in sociology or psychology.W. Sonnenstuhl.

This seminar examines the dynamics of individual, structural, and environmental factors operating in organizational change in general, and in the implementation and use of innovations within formal organizations in particular. The role of evaluative research in assessing the effectiveness of the implementation of innovations and in determining organizational effectiveness are analyzed. Several case studies of organizational change in government, unions, and private industry are examined. The emphasis is on conceptual frameworks for analyzing organizational change and mounting evaluative research on innovations. Readings are interdisciplinary and include sociology, psychology, and political science.

## ILROB 621 Organizational Diagnosis Intervention and Development

 Spring. 4 credits. Prerequisites: undergraduates, ILROB 170 and 171; graduate students, ILROB 520 and 521 or equivalent; and permission of instructor.
## L. Gruenfeld.

This applied course considers theories and techniques for the identification and improvement of organizational problems at the behavioral (micro) level. Methods for the implementing of change are evaluated in the light of several normative and descriptive theories of individual and group development and effectiveness. The course emphasizes both quantitative and qualitative data processing procedures.

## ILROB 622 Organizations and Environments <br> Spring. 3 credits. <br> P. Tolbert.

This course will survey the literature on organization-environment relations including work on organizational dependence and power, management of uncertainty, and other aspects of interorganizational cooperation and conflict. The objective of the course is to provide students with a general theoretical understanding of the way in which organizations can shape their environment and in which the environment constrains and shapes organizations.
ILROB 623 Micropolitics in Organizations Spring. 3 credits. Prerequisites: ILROB 170 and 171. Limited, permission of instructor. S. Bacharach.

Will examine micro-political processes in organizations. Neo-Macchiavellain, Marxian, and Weberian approaches to organizational politics will be specifically analyzed. An attempt will be made to understand how the micro-political rules of organizational games are institutionalized in change. Among the ideas to be discussed are the institutionalization of ideology and specification of the relationships among power, tactics, and strategy. Interest groups and coalition politics will be examined in terms of conflict and bargaining. Other issues to be discussed include comption, dealmaking, and competition. Examples will be drawn from both the private and public sectors. Seminar require-
ments will include an in-class presentation and a major paper and/or take-home final exam.

ILROB 624 Groups in Work Organizations
Fall. 4 credits. Enrollment limited. Permission of instructor required.
L. Gruenfeld.

This is an experiential leaming course designed primarily for advanced students who have a comprehensive background in the theory and methods of the behavioral sciences. Work group members study their roles and relationships to each other, the task, other work groups, and especially authorities. Students write a number of self-reflective papers in which they conceptualize their experiences and relate them to theory and method in organizational behavior and experience.

## ILROB 625 Power and Bargaining

 Spring. 2 credits. 7 weeks. Limited to 25 seniors and graduate students with permission.S. Bacharach.

This seminar will attempt to delineate the relationship between power and bargaining, specifically examining the role of tactics, power, coalitions, and bargaining structure.

## ILROB 627 Leadership in Organizations

 Spring. 3 credits. Prerequisites: two organizational behavior courses at the 300 level or advanced courses in sociology or psychology.L. Gruenfeld.

An examination of theories and research findings from the behavioral sciences that are relevant to leadership and the influence process in groups and organizations. Personality, situational factors, intergroup processes, interpersonal perception as well as motivation to lead and to follow will be discussed. The implications for leadership training, organization development, and action research are explored.

## ILROs 628 Cross-Cultural Studies in Organizational Behavior

Spring. 3 credits. Limited. Permission of instructor before registering in course.
L. Gruenfeld.

Designed for students interested in social psychological theory and research in international culture comparisons of behavior and experience in organizations. Variables such as power distance, individualismcollectivism, universalism-particularism and attitudes toward authority as well as work motivation will be examined. Upon completion of the readings and discussion of conceptual materials and consideration of several major international comparison studies, each student will prepare and present a paper on a topic of his/her own choice usually related to his/her country of origin (China, Japan, German, USA, etc.).

## ILROB 629 Personality in Organization

 Fall. 4 credits. Open to undergraduates with permission of instructor.L. Gruenfeld.

This advanced course considers psychodynamic theories of organizational diagnosis at the individual and group levels. Topics include leadership, power, authority, work motivation, intervention, and change. The topics are discussed and applied in small study groups. The professor's role is as a consultant and resource person. Class members study and research their own
behavior and present their qualitative and quantitative findings to the class. Students are expected to have background and interest in both research methods and theory.

ILROB 670 Semester in Manufacturing Spring. 15 credits. Open to master's and Ph.D. students in Industrial and Labor Relations with permission of instructor.
T. Hammer, P. Tolbert.

Intended for students who want to work as professionals or who have a strong interest in the manufacturing industries. It is taught by an interdisciplinary faculty team from the College of Engineering, the Johnson School of Management, and the School of Industrial and Labor Relations. Course material will be based on plant visits and project work with local industry. Student participation will be in interdisciplinary teams with members representing the three colleges. Course content will concentrate on four major issues thought to make a competitive difference in today's economic environment: (1) the changing environment for product design; (2) rapid-response production systems; (3) organization, management, and compensation of the manufacturing team; and (4) performance measurement.

## ILROB 671 Organizations as Social

 NetworksSpring. 3 credits. Prerequisites: one or more courses in organizational behavior, sociology, psychology, anthropology, or political science. A course in statistics or research methods would be helpful.

Staff.
Increasing attention has been devoted to the idea that social structures can be fruitfully investigated as social networks. In particular, organizational and inter-organizational structures may be analyzed as patterned relationships among individuals, groups, and even other organizations. Such networks appear to be strong predictors of a variety of social dynamics including attitude similarity, the diffusion of innovation, turnover, and the allocation of organizational resources. A variety of methods for collecting and analyzing network data including: graph theory, sociometry, clique detection, centrality analysis, blockmodeling, and the quadratic assignment procedures will be used. In addition to reading recent published research, this course will involve work with actual data sets and relevant computer programs.

## ILROB 673 Organizational Implications

 of World Class ManufacturingFall. 4 credits. Limited to seniors with permission.
P. Tolbert.

Examines the organizational dimension of manufacturing. Focus is twofold: 1) process of large-scale organizational change associated with transition to "world class" status and 2) the organizational content of such component elements of world class manufacturing as total quality, cellular manufacturing/team-based organization, just-in-time manufacturing, concurrent engineering, and OEM/supplier relationship.

## ILROB 674 Social Regulation and Control

 of InstitutionsSpring, 7 weeks only. 2 credits. Prerequisites: two organizational behavior courses at the 300 level, or advanced courses in sociology or psychology.
R. Stem.

Interorganizational relations are examined in terms of network control agents and target objects. The dynamics of control relationships based on political bargaining, the distribution of power, economic rewards and costs, and historical circumstances are examined in the context of their evolution through organizational adaptation to the environment. Subject matter includes theories of organizational change and application of a control perspective to the institutions of American business, government regulations, athletics, and education.

## ILROB 675 Cooperative Strategies for Improving Organizational Performance

## Spring. 4 credits.

M. Gaffney, F. Wayno.

Will concentrate on presentation and analysis of a series of case studies involving projects using cooperative strategies to improve organizational performance. Emphasis will be given to cases in which union and management have been working together to enhance productivity and the quality of working life. Cases will be examined against a background of the research literature on improving organizational performance. Students will be responsible for a term paper.

## ILROB 676 Systems of Labor <br> Participation in Management

Fall. 4 credits. Prerequisites: senior standing and permission of instructor.
T. Hammer.

Examines the theory and practice of worker participation in systems ranging from informal shop-level participation to self-management. Special emphasis is placed on socio-technical systems of job design and work restructuring that give workers control over the labor process. Attention is also given to legislated programs of participation (codetermination) and to participation in employee-owned firms.
ILROB 677 Seminar in Field Research I Fall. 4 credits. Enrollment limited. Prerequisite: permission of instructor.

Staff.
Recent research efforts are examined and the dynamic nature of the research process is emphasized. The realities of field research are explored, including problems of gaining and sustaining rapport, the initial development of research interviews and observation data, and their conversion to quantitative instruments. Participants share in the exploration of appropriate theories and concepts, and the possibility of actual field participation in an ongoing research project is explored.
ILROB 678 Seminar in Field Research II Spring. 4 credits. Prerequisites: ILROB 677 and permission of instructor.

Staff.
Continuation of recent research efforts is examined, and the dynamic nature of the research process is emphasized. The realities of field research are explored, including problems of gaining and sustaining rapport, the initial development of research interviews and observation data and their conversion to quantitative instruments. Participants share in the exploration of appropriate theories and concepts, and the possibility of actual field participation in an ongoing research project is explored.

ILROB 720 Issues of Measurement in Research on Organizations (Instrumentation)
Fall. 4 credits.
T. Hammer.

Concerns the study of tests and measures used to assess central variables in organizational behavior and related fields. Students will learn where to find measures suitable for their research purposes and will examine the theories that define the constructs being measured: the empirical information available about different measures-construction, reliability, and validity; and the ways in which the instruments have been used in research and practice.

## ILROB 721 Advanced Micro

Organizational Behavior
Spring. 3 credits. Prerequisites: ILROB 520 and 521

Staff.
Examines the historical development of psychological theories of organizations and contemporary issues in micro organizational research. The course will emphasize reading and analysis of primary source material.

## ILROB 722 Advanced Macro

 Organizational BehaviorFall. 3 credits. Prerequisites: ILROB 520 and 521.

## Staff

Examines the historical development of sociological theories of organizations and contemporary issues in macro organizational research. The course will emphasize reading and analysis of primary source material.

## ILROB 723 Behavioral Research Theory, Strategy, and Methods I

Fall. 4 credits. Designed to meet the needs of M.S. and Ph.D. candidates majoring in organizational behavior, but other graduate students may enroll.
l. Williams.

Materials studied in ILROB 723 and 724 include (1) theoretical, conceptual, and ethical questions; (2) survey research and attitudescaling procedures; (3) laboratory research methods; (4) participant observation and interview methods; (5) use of documents and qualitative data analysis. Provides students with important philosophical background for doing research and exposes them to a wellbalanced, interdisciplinary set of quantitative and qualitative research tools.

## ILROB 724 Behavioral Research Theory, Strategy, and Methods II

Spring. 3 credits. Designed to meet the needs of M.S. and Ph.D. candidates majoring in organizational behavior, but other graduate students may enroll.

Staff.
Course will cover (a) analysis and interpretation of quantitative data, (b) traditional problems encountered in the assessment of human and organizational characteristics, (c) the use of different methods of data analysis, and (d) an examination of the limitations imposed on data analysis and interpretation by traditional measures. Examples of topics covered in the course: the use of Chi-square, $t$-tests, ANOVA, simple and multiple correlation and regression, reliability and validity analyses, causal models, factor analysis, scale construction.

ILROB 725 Analysis of Published Research in Organizational Behavior Fall. 3 credits. Prerequisites: ILROB 520 and 521 and one year of statistics.

Staff.
An advanced research methods course that critically examines published research papers in the field of organizational behavior in terms of research design and method as well as theory.

## ILROB 726 Selected Topics in Organizational Behavior

Fall. 3 credits. Prerequisites: 1LROB 520 and 521 and permission of instructor. Staff.
An advanced proseminar that seeks to develop an interdisciplinary perspective on selected topics in organizational behavior. The topics themselves will change from year to year depending on participants' interests. Course is designed to allow students and the instructor to jointly pursue significant scholarly inquiry into one or more arenas of organizational theory. Emphasis will be placed on exploring the relevance of tradition in related disciplines (anthropology, linguistics, philosophy, sociology, etc.) that may enrich our understanding of organizational life.
ILROB 727 Work and Industrial Conflict
Spring, weeks 7-14. 2 credits.
R. Stern.

A concentrated examination of the sociology of industrial conflict. The seminar focuses on classic formulations of conflict theory in sociology, then the social, political, economic causes of industrial conflict. Both individual and collective forms of conflict expression are examined. Some discussion of the implications of various types of worker management of firms for industrial conflict will be included.

## ILROB 728 Theories of Motivation and Leadership <br> Spring. 2 or 4 credits. Prerequisites: ILROB

 520 and 521.T. Hammer.

Two independent but sequence-connected minicourses.
(1) Theories of Work Motivation. 7 weeks. 2 credits.
Course will provide an introduction to basic concepts of human motivation in general, with particular emphasis on the theories that explain and predict work motivation. Students will examine the empirical research that tests the validity of the theories and shows how and under what conditions different motivation models can be used in practice in work organizations.
(2) Theories of Leadership and Power. 7 weeks. 2 credits.
Several current microtheories of leadership and power and related research are examined. The disciplinary perspective employed is social organizational psychology and the level of analysis emphasized is action and experience of inclividuals in groups.

## ILROB 729 Organizational Change and Intervention

Fall. 3 credits. Graduate students only; no exceptions.

## L. Williams.

This seminar is concerned with planned and unplanned change in organizations. It is designed to analyze theory in practice. Particular attention will be paid to the role of internal and external change agents. Class members will be encouraged to analyze
contemporary changes such as mergers and acquisitions and work force reductions. Participants will submit weekly work force journals.

## ILROB 770 The Cultures of Work Organizations

Fall. 3 credits. Open only to graduate students.

Staff.
Considers both administrative and occupational cultures in the workplace. It takes an anthropology perspective, focusing on ideologies as the main ingredient of cultures but emphasizing the role of cultural forms, eg., myths, stories, sagas, language, rites and ceremonials, and physical settings of meaning. It pays special attention to the place of subcultures and countercultures in the makeup of administrative culture and to occupations as a major source of subcultures. The role of the environment in which organizations are embedded, and its influence on workplace cultures, is also included. Forms of cultural leadership and approaches to reading and changing cultures are also considered.

## ILROB 771 Methods of Observation and

 Analysis of Behavior Attitudes and Values in Work Groups and Organizations
## 4 credits.

L. Gruenfeld.

This graduate-level course considers qualitative and psychometrically precise and systematic research methods for the study of behavior in groups and organizations. Will also include a workshop that is designed to improve teamwork with the use of on-line data generated by group members. Personality, leadership culture, and group dynamics are the major focus of interest. Students will observe, record, and videotape group and individual behavior, which will be analyzed with the help of microcomputer programs, especially SYMLOG (a system for the multiplelevel observation of groups) developed by Bales (1970, 1979). In addition to lectures and discussion of research papers this course will also include a research project designed and executed by the students.

## ILROB 772 Interpretative and

 Anthropological Approaches for Studying OrganizationsFall. 3 credits. Prerequisites: two graduatelevel courses in organizational behavior, sociology, anthropology, or psychology.

Staff.
Focuses on a variety of interpretative and anthropological methods for studying and analyzing organizational life. By reading and discussing examples of published research and by conducting their own field research, students will become familiar with the following research traditions as they have been used in organization studies: participant observation, ethnography, ethnomethodology, ethnosemantics, textual analysis, graphic analysis, and critical theory. The constraints and benefits of each approach will be emphasized as will be the actual research procedures used by those who employ the approach.

## ILROB 773 Advanced Seminar in CrossCultural Studies of Organizational Behavior

Fall. 3 credits. Permission of the instructor
L. Gruenfeld.

Considers theory and method for the study of cross-cultural and cognitive style variables. Members participate in the conceptualization and conduct of a comparative research project.

## ILROB 774 Negotiations

Fall. 3 credits.
J. Halpern.

Frequent in-class exercises teach the basic concepts of and methods for effective negotiation in personal and business contexts. We will consider how individual-level biases and self-presentation may either facilitate or hinder negotiations. Applications of techniques discussed in class to behavior in business and law will be emphasized. Participation in all exercises in this class is mandatory. Other requirements include journal entries analyzing the exercises, a final paper, and an oral presentation.

## ILROB 775 Advanced Topics in the

 Soclal Psychology of the Workplace Spring. 3 credits. Permission of instructor. J. Halpern.Challenges student to question what's hot and what's not in current research into the social psychology of the workplace. We will consider contemporary classics (1970's) as well as readings in social psychology that are at the forefront of conceptual research in the field currently. We will examine how the momentum for each topic developed and consider whether the current excitement is likely to last. Topics are likely to include, but are not limited to, decision making and negotiation, affect, organizational justice, power, leadership and authority, punishment, innovation, and macropsychology.

## ILROB 779 Engineering, Science, and

 InnovationSpring. 4 credits. Prerequisites: ILROB 520, 521, and advanced course in sociology, anthropology, or management or permission of instructor.

Staff,
Focuses on the organization of research and development in industry and the problems of the technical labor force. It is designed for two groups of graduate students: (a) those who anticipate working in firms that employ significant numbers of engineers, scientists, and other technical workers and (b) those who have an interest in doing research in applied scientific and technical settings or in high-technology firms. The course brings relevant theoretical perspectives from sociology, anthropology, and management theory to bear on the social and pragmatic issues that surround technical innovation and the employment of scientists and engineers. Representative topics include: the organization of scientific and technical communities, the industrialization of research, the nature of scientific and technical work, strategies for fostering innovation, the careers of scientists and engineers, and the managerial problems characteristic of high-technology firms.
Students will conduct field research on a topic relevant to the course.

## ILROB 790 ILR M.P.S. Program

Fall and spring. 1-9 credits.
Staff.
Supervised research only for those enrolled in the ILR M.P.S. program.

## ILROB 798 Internship

For description, see the section on Collective Bargaining, Labor Law, and Labor History

ILROB 799 Directed Studies
For description, see the section on Collective Bargaining, Labor Law, and Labor History

## ILROB 920 Organizational Behavior

 WorkshopFall. 2 credits. Limited to M.S. and Ph.D. candidates in the department. S-U grades only.

## Staff

This workshop is designed to provide a forum for the presentation of current research undertaken by faculty members and graduate students in the Department of Organizational Behavior and by invited guests. All M.S. and Ph.D. candidates in the department who are at work on their theses are strongly urged to enroll. Each student in the course will be expected to make at least one presentation during the year, focusing on the formulation, design, execution, and results of that student's thesis research.

## HUMAN RESOURCE STUDIES

B. Gerhart, chair; J. Bishop, J. Boudreau, V. Briggs, L. Dyer, T. Judge, G. Milkovich, V. Pucik, W. Wasmuth, T. Welboume.

## ILRMR 260 Human Resource Management

Fall, spring, and summer. 3 credits. Open only to ILR students.

Staff.
An introductory overview of the management of human resources in organizations. Topics include human resource decisions dealing with staffing, employee development, worksystem rewards, and employee relations. Emphasis is on (a) problem-solving and decision-making approaches; (b) operational methods, technologies, and practices; (c) application of relevant behavioral science theory and research; and (d) legislation and other environmental constraints having an important bearing on the effective utilization of human resources by an enterprise.

ILRHR 266 Personal Computer Basics Fall, spring, and summer. 2 credits. Limited to 20 students.
P. Teeter.

Provides basic skills in the use of IBM personal computers (PCs). It covers basic hardware, terminology, fundamentals of the Disk Operating System, LOTUS $1-2-3$, and dBASE III Plus. Emphasis is placed on handson experience using examples demonstrating human resource issues and PC-based solutions. This course is a prerequisite to several advanced Human Resource Management electives.

## ILRAR 360 Human Resource Economics

 and Public PolicyFall or spring. 3 credits. Open to sophomores, juniors, and seniors.
V. Briggs, J. Bishop.

A review of labor-market trends, data collection systems, and theories pertaining to public efforts to develop the employment potential of the nation's human resources and to combat unemployment. The major segments of the nation's educational training enterprise-public education, higher education, employer-provided training, apprenticeship, and special training programs for the disadvantaged-are examined. Special policy and programmatic issues pertaining to youth, rural workers, welfare reform, direct
job creation, worker relocation, economic development, targeted tax credits, industrial policy, and "enterprise zone" proposals are examined. Comparisons are made with other industrialized nations.

## ILRHR 361 Effective Supervision

Fall or summer. 3 credits. Limited to juniors and seniors. Prerequisite: ILRHR 260 or equivalent.

Staff.
This course covers twenty-five major topics that make a critical difference in the life of a newly appointed or experienced supervisor. Theoretical and real-life case examples are provided from office, factory, union, nonunion, large, and small organizations and cover technical, psychological, social, and political issues at the supervisory level.

## ILRHR 362 Career Development: Theory and Practice

Fall or spring. 2 credits. 7 weeks. Prerequisites: ILRHR 260 or permission of instructor. Limited to 30. S-U only.
J. McPherson.

The components of career management: individual factors and organizational realities in the development of both careers and organized programs for career management. Two complementary learning tasks required: information-gathering for career decision making based on self-assessment activities, and comprehension of organizational circumstances and practices encountered as careers develop. Grade based on short writing assignments and research paper.

## ILRHR 365 New York State Human

 Resource and Employee Relations Issues and PoliciesFall or spring. 3 credits. Open to I $\& L R$ students participating in an Albany internship. Staff.
This seminar will consider functions, current issues, and policy development in New York State human resource development and employee relations. The role of the state in protective labor law administration; human resource programs; its function as a neutral party in labor disputes in the public and private sector; and legislation affecting employee-employer relations and economic development will be reviewed. Students will be assigned individual research topics that will be discussed in the seminar and developed into a term paper.

## ILRHR 366 Women at Work

Fall or spring. 3 or 4 credits. Prerequisite: ILRHR 260 or equivalent.
J. Farley.

Various aspects of female occupational roles in twentieth-century United States. Historical, social, and legal factors that influence women's choice of careers, work socialization and training, and subsequent labor-market experience are considered. Working women's entry-level jobs, opportunities for advancement, and income are compared to men's.

## ILRHR 460 Human Resource

Management for Small Business
Fall. 4 credits. Open to juniors and seniors. T. Welbourne.

Will be taught using a series of case studies developed from small firms. After an initial introductory section exploring the human resource management issues most critical to the growth and development of small businesses, the balance of the course will focus on selected human resource manage-
ment issues raised by the various case studies Students will analyze the problems of each case and prepare a report setting forth their recommendations for resolving the human resource problems and achieving the desired business objectives. Every second week the class will meet for a two-hour session to present and discuss the student reports concerning each case. Owners and managers of the small business firms studied will be present to discuss each case with the students

ILRHR 461 Human Resource
Management in Organization Fall and spring. 4 credits. Open to juniors and seniors out-of-college ONLY.

Staff.
An introductory level survey course that is designed to introduce the student to the methods and processes of human resource management in work organizations. It is primarily intended to acquaint non-industrial relations majors with the human resource management function so that they may better understand the rationale behind human resource decisions. Factors external to the organization are discussed in regard to their impact on human resource decision making. The course includes the integration of topics such as analyzing and designing jobs; the causes and consequences of employee satisfaction, attendance, and turnover; motivating and evaluating employee performance; recruiting and selecting employees; compensating the work force; and dealing with organized labor unions. Throughout the course, emphasis is placed on the importance of the supervisor or manager in the implementation of personnel policy.

## ILRHR 468 Organization and Human

 Resources Management Simulation 3 credits. Limited to juniors and seniors. Prerequisite: ILRHR 260 or equivalent. 7 weeks.W. Wasmuth.

Uses a simulation model and an open-systems approach as means to enhance students' skills in strategic planning and managerial decision making. Attention will be given to the implications and efforts of strategic human resources managerial and supervisory decisions as measured by ten organizational performance indicators, including quality of work life, employee productivity, customer satisfaction, employee retention, internal control, and the bottom line. Each student will be assigned to a group (team) of five members and must be committed to the work of that group. An individual research paper is also required. Regular attendance is required.

## ILRHR 469 Immigration and the <br> American Labor Force

Fall. 3 credits.

> V. Briggs.

Assesses the role that immigration plays as a source of human resource development in the United States. Immigration policy will be placed in an evolutionary context but primary attention will be given to the post- 1965 revival of mass immigration. In addition to legal immigration, policies pertaining to border commuters, illegal immigration, "maquiladoras," refugees, asylees, and nonimmigrant workers are also examined. Comparisons are also made with immigration systems of other nations.

## ILRHR 495 Honors Program

Fall and spring (yearlong course). 3 credits each term.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILRHR 497-498 Internship

Fall or spring. 3 and 6 credits
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILRHR 499 Directed Studies

For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILRHR 560 Human Resource

## Management

Fall or spring. 3 credits. Open only to graduate students.

Staff.
A survey course covering the major areas of the management of human behavior in work organizations. Consideration is given to such aspects of strategic and human resource planning, design and management of workteams, staffing, training and management development, organization development, compensation, and employee and labor relations. Emphasis is on the application of theory and research to the solution of personnel problems.

## ILRHR 653 Transforming Human

Resource Management
Fall. 4 credits. Limited to 25 students, seniors and graduate students only. Prerequisites: ILRHR 260/560, two human resource management electives. Permission of instructor.
G. Milkovich.

In this class we examine change in HRM; as a field of study, a function with organizations, and as a career choice. Theories and research related to changes in HRM will be the primary focus. Trends in the field reflect responses to a wide variety of pressures. Trends represent choices the various stakeholders make, and in turn these choices shape the future of IIRM. HRM's historical evolution, its role in the changing employment relationship, and its function in new organization forms such as decentralization, federal, networks, joint ventures, and semi-autonomous teams will be studied.

## ILRHR 656 International Human Resource Management

Fall or spring. 3 credits. Prerequisite: ILRHR $260 / 560$. Limited. Seniors or graduate students only or permission of the instructor. V. Pucik.

The focus of the course is on international human resource strategies in multinational firms. It has two major objectives: to enhance the understanding of key functional and strategic issues related to HRM activities in international firms, and to review practical applications of concepts learned from the course in leading U.S. corporations. In the first part of the course, the emphasis is on the theory of international HRM; the second part is focused on field analysis. During the semester, students will conduct TEAM research on state-of-the-art IHRM practices in leading U.S. multinationals. In addition, each student will prepare a review paper on one specific area of IHRM of his or her choice.

[^2]Examines the training and learning that occurs on jobs from both an economic and comparative international perspective. Will investigate the scale of the training enterprise, how it is accomplished, why some companies and nations train much more than others and what impact training has on organizational performance and national competitiveness. Training will also be examined from the worker's perspective. The distinction between training and learning, how individuals influence the amount of training they receive and what determines the amount and kind of training they desire. The training institutions and customs of countries like Japan, Sweden, Germany, France, and the United Kingdom will be compared to their American counterparts and an effort will be made to understand why investments in employer training are so much more substantial in Japan and Germany than in the United States and whether there is any role for public policy in the stimulation or improvement of employer training.
ILRHR 658 Training and Development:
Theory and Practice [also Education
685, Communication 685, and
International Agriculture 685)
Spring and summer. 4 credits.
F 9:05-12:05. D. Deshler, R. Colle
Analysis, design, conduct, administration, and evaluation of training programs for the development of human resources in smallfarm agriculture, rural health and nutrition, literacy and nonformal education, and general community development. Designed for scientists, administrators, educator-trainers, and social organizers in rural and agricultural development programs in the United States and abroad.

## ILRHR 659 Internal Staffing: Managing Careers in Organizations

Fall. 4 credits. Limited to 25 students. Prerequisites: ILRHR 260/560 or equivalent and one course in statistics.
T. Judge

Analysis of the movements of people within organizations and the management of career development processes. Selected topics include determinants of career success, career planning methods and techniques, career and life stages, mentorships, glass ceilings, midlife career changes, career and family integration, criteria for internal promotions, politics, stress, and the role of assessment centers in placement decisions.

## ILRHR 660 Seminar in Human Resource Studies

Fall or spring. 3 credits.

## Staff.

A "floating" seminar designed to give faculty and students an opportunity to pursue specific topics in detail, with an emphasis on theory and research. Topics vary from semester to semester. Interested students should consult current course announcements for details.

## ILRHR 661 Organizational Development

 Methods
## Spring. 3 credits.

G. Thomas.

An experiential course that deals with OD and its role in the organizational change process. Combines the opportunity for hands-on practice in a workshop setting. Students will have responsibility for researching and writing a paper that examines a specific method, technique, or critical issue; an in-class demonstration/presentation illustrating applications of a chosen subject; and a final
project requiring a comprehensive proposal that describes an appropriate and logically supported intervention strategy

## ILRHR 662 Managing an Organization through Simulation Training

Spring or summer. 3 credits. Limited to a total of 40 ILR and hotel administration students, seniors and graduate students only Prerequisite: ILRHR 260/560 or equivalent and permission of instructor.
W. Wasmuth.

Techniques of simulation are applied to a hotel banquet facility to enable students working in a small group (task force) to accomplish the following objectives: (1) plan and develop strategies to solve a variety of realistic problems in a supportive low-risk simulated setting; (2) provide direct feedback to the participants as to the effects of their decisions on ten organizational performance indicators, including morale, turnover, productivity, customer satisfaction, and profit/ loss; (3) understand the interrelationships of the indicators and of various parts of an organization through an open systems approach; (4) develop an awareness of how group interaction affects the quality and timeliness of team decision making;
(5) demonstrate communication skills in organizing and reporting significant results of team accomplishments. Also, each student will prepare an individual research project that focuses on some aspect of the simulation experience.

## ILRHR 663 Performance Appraisal and

 Organizational Effectiveness Fall. 4 credits. Limited to 30. Prerequisites: ILRHR 260/560 and one course in statistics. StaffCovers the measurement and evaluation of both individual and organizational performance. It is based on the concept that organizational effectiveness and performance are largely a function of the effectiveness and performance of individuals within the organization. Improving organizational effectiveness and productivity involves improving the effectiveness and performance of individuals and work groups that make up the organization. The course begins by exploring the concept of organizational effectiveness, proceeds with a treatment of the measurement of work performance at the individual and group levels, and concludes with an emphasis on planning, measuring, and controlling organizational performance through the integration of performance from the organization to the individual levels. Different methods of appraising performance are considered and evaluated in terms of their impact on the individual, the appraiser, and the organization.

## ILRHR 664 Seminar in Organizational

 CommunicationSpring. 3 credits. Prerequisite: permission of instructor.

Staff.
Seminar centers on selected issues and relevant research involved in the study of communication with formal organizations. Organizational structure and design, patterns of information flow, and individual and group determinants of communication effectiveness will be important concerns.

## ILRHR 665 Case Studies in Human

 Resource Management PolicySpring. 4 credits. Limited. Prerequisite: ILRHR 260/560 plus two other courses in human resource studies and permission of instructor.

Staff.
An analysis of HR management strategies and policies and their impact on organizational objectives and fair treatment of employees. Cases, incidents, and field data derived from a variety of organization settings provide a framework for examining and understanding the various effects of human resource management decisions. Students with a special interest in HRM are encouraged to use this course as a "capstone" to their studies.

## ILRHR 666 Cost-Benefit Analysis for Human Resource Management

Spring. 4 credits. Prerequisites: ILRHR 260/ 560 or equivalent, one course in statistics, one elective in human resource studies, and permission of instructor.
J. Boudreau.

Explores how to account for the contribution of human resource management programs and decisions to achieving organizational goals. It emphasizes a systematic decisionmaking system that organizes the discipline of human resource management and can assist in planning and evaluating programs. Topics include the role of financial-accounting statements in managing human resources, cost-benefit analysis for programs, managing human resources as a profit center, and identifying human resource management constituents to address their goals.

ILRHR 667 Employee Relations
Fall. 4 credits. Prerequisites: ILRHR 260/560 or equivalent and permission of instructor. L. Dyer.

Explores the policies, programs, and practices used by employers to promote the just and humane treatment of employees, especially managerial, professional, and other employees not covered by collective bargaining contracts. Includes such policies as the protection of employee rights and the nature of processes used to allocate organizational opportunities and rewards; such programs as employee assistance plans and due process procedures; and elements of such practices as employee communication and supervision. Treats these as a "package" to be considered in totality and developed strategically. Considers variations in employee relations strategies, the motives of employers in establishing such strategies, and the effects of these strategies on relevant individual and organizational outcomes.

## ILRHR 668 Staffing: Employee Selection

 and UtilizationFall or spring. 4 credits. Limited to 25 students. Prerequisites: ILRHR 260/560 or equivalent, one course in statistics. ILRHR 266 recommended.
T. Judge.

An analysis of the staffing process as applied to employing organizations. Topics include recruitment, selection processes and techniques, legal issues in selection, international issues, and evaluating the effectiveness of staffing decisions.

## ILRHR 669 Managing Compensation

Fall or spring. 4 credits. Limited to 30 students. Prerequisites: ILRHR 260/560 or equivalent, ILRHR 266 and basic statistics or permission of instructor.
B. Gerhart, G. Milkovich, T. Welbourne.

Major emphasis is on the decisions and issues involved in the design and administration of pay systems. Topics include behavioral and economic theories and research related to compensation, administration, and factors influencing decisions about pay levels, hierarchies, forms, and administration of pay Also focuses on the effects of various pay systems on employee behaviors and firm performance

## ILRHR 690 Comparative Human

 Resource ManagementSpring or fall. 4 credits. Prerequisites: ILRHR 260/560, or permission of instructor. V. Pucik.

The course surveys human resource practices in key countries and regions of the world: Germany, U.K., France, Eastern Europe, Japan, and ASEAN. The focus is on issues related to management of professional and managerial work force, such as selection and staffing, development, and appraisal and reward systems. Special attention is given to current changes and trends in the human resource management area (e.g., Europe 92, transformation in Eastern Europe, globalization of Japanese firms). Implications for multinationals operating in these countries will also be discussed.

## ILRHR 691 Human Resource Planning and Strategy

Spring. 4 credits. Limited. Prerequisites: ILRHR 560 or equivalent, one course in statistics, and permission of instructor.
L. Dyer, G. Milkovich, T. Welbourne Covers the content of human resource strategies and the process of human resource planning. The emphasis is on developing human resource strategies that are integrated with firm business strategies. Covered are methods and techniques used to forecast and plan for organization structures and processes, work force population, employee contribution, and employee morale. Much of the course is organized around a computer simulation game in which students make policy and program decisions for a fictional organization. Decisions are evaluated on the basis of their contributions to the organization's human resource and profit objectives.

## ILRHR 692 Training the Displaced and Disadvantaged

Fall or spring. 3 credits. Prerequisite: permission of instructor.
J. Bishop.

Examines public and private efforts to lower unemployment and underemployment of displaced and disadvantaged workers. The seminar examines the scope of the problem, its causes, and why specific programs have worked and others have not. Topics covered will include training for displaced workers, rehabilitation of the disabled, job-search training, tax credits for hiring, vocational training, literacy instruction, EEO, public service employment, assisting new business, and industrial policy. The seminar also investigates how the structure of the economy influences the ability of targeted training and job creation to achieve sustained reductions in unemployment and draws lessons from the experience of other societies.
ILRHR 693 Design and Administration of Training Programs
Spring. 3 credits. Prerequisites: ILRHR 260/ 560 or equivalent and permission of instructor. J. Boudreau

The purpose of this course is to acquaint students with various aspects of the training and development function in organizations. systems approach is used. Topics include how to determine that a training problem exists, how to conduct a training needs assessment, issues regarding the design of training programs, a review of current training techniques and management development strategies, financial and evaluation strategies and the role that training plays for U.S. firms and labor unions in trying to become more competitive in the world economy. After completion of this class, students should be familiar with current views of the Human Resource Development function and profession, contemporary conceptual models of HRD and adult learning, and the management of an effective HRD function within the current business environment.

## ILRHR 694 Human Resource Information

 System ApplicationsSpring. 4 credits. Limited to 22 students. Prerequisites: ILRHR 260/560 or equivalent; ILRHR 266; at least one upper-level HRS elective; basic statistics; and permission of instructor.
J. Boudreau, B. Gerhart

Explores the development, implementation and management of computerized personnel information systems and their use in human resource management. Theories and concepts relevant to the design and implementation of such systems are presented and used as the framework for hands-on experience with personal and mainframe computer systems. Students create and use applications of current popular human resource software to design their own applications and present them to the class. Where possible, student applications are based on field work in actual organizations.

## ILRHR 695 Education, Technology, and Productivity

Fall. 3 credits
Bishop.
The seminar investigates the nexus between the education and training occurring in schools and at the workplace and the technological progressiveness, productivity, and competitiveness of firms, individuals, and nations. We will investigate (1) how technological progress is changing the nature of work and what this implies for reform of education and training, (2) why United States productivity has not increased in the past fourteen years, (3) how education and training contribute to the growth and competitiveness, (4) why educational achievement has declined, and (5) how the responsibility for education and training should be apportioned among individuals, firms, private nonprofit organizations, and government.
ILRHR 696 Human Resource Management and Government Regulations
Fall. 4 credits. Limited to 25 students. Prerequisite: ILRHR 260/560 or equivalent.
T. Judge, T. Welboume.

A survey and analysis of government legislation and regulations affecting human resource management in nongovermment organizations, examining the framework within which management must operate. Government agencies' methods of enforcement of such regulations and the firms' responsibilities for failure to comply with these legal requirements are considered.

Emphasis will be on human resource policy development and administration to meet legal requirements. Topics include Title VII, Affirmative Action, FLSA, OSHA, ERISA, Employee Rights, Employment at Will, Worker's Compensation, and recent legislative developments.

## ILRHR 697 Special Topics in Resource

 StudiesFall or spring. 3 credits. Staff.
The areas of study are determined each semester by the instructor offering the seminar.

## ILRHR 698 International Human

 Resource Policies and Institutions
## Fall. 3 credits

J. Bishop.

A comparative study of human resource policies and institutions in Western Europe, North America, Japan, and East Asia (with special emphasis on math and science education) and of the effects of these institutions on productivity, growth, and equality of opportunity. The institutions studied include primary and secondary education, apprenticeship and higher education. Data on the consequences of policies is presented and an effort made to understand how human resource policies and institutions have contributed to the rapid growth and low levels of inequality in Europe, Japan, and the Pacific Rim nations. Another focus of the course is understanding the causes of the low levels of achievement of American high school students relative to their counterparts abroad.

## ILRHR 699 Contemporary European

 Labor MarketsSpring. 3 or 4 credits ( 1 additional credit available for those who elect to prepare a special report).
J. Bishop.

Aggregate unemployment rates in Europe have risen from 3-4 percent in the 1960s to 11 percent in the late 1980 s . The course is an examination of the causes and consequences of this transformation of European labor markets. In the process of addressing these questions, we review the recent history of these economies, their labor market institutions, and government labor market policies in a comparative framework. Some European nations-Sweden, Norway, Switzerland, and Austria-have kept their unemployment rates low and the reasons for their success will be explored. The question of why economies that performed so well in the 1960 s are performing so poorly now can only be addressed in the context of an overall theory of unemployment. The course examines the debate that currently rages over the causes of European unemployment and between the advocates of Keynesian, new classical (rational expectations and real business cycle theorists), and new Keynsian (efficiency wage, implicit contracts, and overlapping contracts) theories of aggregate unemployment.

## ILRHR 760 Seminar in Human Resource

 StudiesFall or spring. 3 credits. Prerequisites: ILRHR 560, ILRST 510/511, and ILRHR 669 and permission of instructor.

## Staff.

A "floating" seminar designed to give faculty and students an opportunity to pursue specific topics in detail, with an emphasis on theory and research. Topics vary from semester to
semester. Interested students should consult current course announcements for details.

## ILRHR 761 Human Resource Economics and Public Policy <br> Spring. 3 credits.

V. Briggs.

A review of labor-market trends, data collection systems, and theories as they relate to public policy efforts to develop the employment potential of the nation's human resources and to combat unemployment. The major segments of the nation's educational training enterprise-public education, higher education, employer-provided training, apprenticeship, and special training programs for the disadvantaged-are examined. Special policy and programmatic issues pertaining to youth, rural workers, welfare reform, job creation, industrial policy, wage subsidies, and worker relocation are examined. The role of research to policy formulation and methods of evaluation of social programs will be reviewed. Comparisons will also be made with other inclustrialized nations.

## ILRHR 762 Research Methods in Human Resource Studies

## Fall or spring. 3 credits.

B. Gerhart.

Designed to build social science research skills, particularly in the area of human resource studies (HRS). Topics include measurement reliability, construct validity, design of studies, external validity, metaanalysis, critiquing/reviewing HRS research, publishing HRS research, and applications of statistical models of HRS issues.

## ILRHR 763 Human Resource Strategy for Competitiveness <br> Spring. 3 credits. Prerequisites: ILRHR 560,

 ILRST 510.T. Welbourne.

Review of empirical and conceptual work in the field of human resource management strategy, which proposes that HRM decisions should be directly linked with business strategy. Will consider HRM as an organizational system and how it can support a variety of business strategies. In addition to reviewing the literature on this topic, time will be devoted to applying what is leamed about the field to a variety of developing issues facing businesses today. Human resource strategies to support total quality management, high technology organizations, mergers and acquisitions, downsizing, and small businesses will be studied.

## ILRHR 764 Theory and Research on

 Staffing and Career Management Spring. 3 credits. Prerequisites: ILRST 510 and 511 and permission of instructor.T. Judge.

Research seminar that considers recent developments in theory and empirical research concerning staffing and career management. Topics covered in this course are the following: recruitment, job choice, evaluation of employee selection procedures (e.g., employment interviews, personality tests, biodata, assessment centers, drug and honesty tests), determinants of career success, politics, the glass ceiling, mentoring, integrating work and family, and stress. Readings will consist of journal articles and research reviews on each topic. Class discussion will emphasize critical analysis of past research and how to publish research in this area. Course requirements consist of class attendance and
participation and completion of a research paper or proposal.
ILRHR 769 Topics in Compensation Theory and Research
Fall. 4 credits. Prerequisite: ILRHR 669. G. Milkovich, B. Gerhart.

Examines recent developments in theory, research, and practice related to compensation. Discussion emphasizes the relevance of theory and research to compensation decision making. Topics include strategic perspectives, variable compensation including gainsharing, bonus, spot awards, etc., risk and leverage in pay, egalitarian and meritorious structures, and the relationship between pay, employee behaviors, and organization.

## ILRHR 790 ILR M.P.S. Program

Fall and spring. 1-9 credits. Staff.
Supervised research only for those enrolled in the ILR M.P.S. program.

## ILRHR 798 Internship

For description, see the section on Collective Bargaining, Labor Law, and Labor History.

ILRNR 799 Directed Studies
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## ILRHR 960 Workshop in Human Resource Studies

Fall or spring. 2 credits. Enrollment limited to M.S. and Ph.D. candidates. S-U grades only. Staff.
The workshop is designed to provide a forum for the presentation and critical discussion of current research being undertaken by graduate students, faculty members, and invited guests in the field of human resource studies. All M.S. and Ph.D. candidates in the Department of Human Resource Studies are urged to enroll; candidates in other departments are cordially invited. Each participant will have an opportunity to benefit from the collective wisdom of the others in the formulation, design, and execution of his or her research, as well as to become current on the latest developments in the field.

## INTERDEPARTMENTAL COURSES

ILRID 451 Science, Technology, and the American Economy
Spring. 4 credits. V. Briggs.

The industrial revolution did not begin in the United States, but the nation became the world's first technological society. Attention will be given to the evolutionary confluence of science, technology, mathematics, and capitalism in the formation of the U.S. economy, its institutions, and its labor force Primary attention will be given to the postWorld War II economic developments. The vantage point will be the linkage with employment, unemployment, income, and productivity considerations. Public policy issues (such as research and development policy, national defense influences, the "agricultural revolution," savings and investment rates, labor force preparedness) will be explored. The industrial and human resource policies of other nations as well as the implications of the globalization of technology in the future will also be discussed.

ILRID 452 Writing in Industrial and Labor Relations
Fall or spring. 3 credits.
J. Farley.

Will require close reading of four books related to the term's theme in the field of industrial and labor relations and careful writing about them. Students will also have an opportunity to practice writing about the world of work for different audiences.

## ILRID 790 ILR M.P.s. Program

Fall and spring. 1-9 credits.
Staff.
Supervised research only for those enrolled in the ILR M.P.S. program.

## ILR EXTENSION

## Metropolitan

The following courses are open only to participants in the Extension Division in New York City. These courses are not open to undergraduate or graduate students matriculated in the Ithaca ILR programs. ILR Credit and Certificate Program courses at the Labor College are offered for four credits. Courses and course credits earned in Extension Division certificate programs are not automatically accepted as transfer credits or as a basis of admission to the resident ILR undergraduate and graduate programs in Ithaca. Student applications for course transfer are evaluated by the ILR school on an individual basis.

## 210 Statistical Reasoning I

Fall or spring. 4 credits.
An introduction to the basic concepts of statistics: measures of location and dispersion, estimation and confidence intervals, hypothesis tests, regression and correlation. Students are taught to use a computer at the beginning of the term and use it for weekly assignments

## 260 Personnel Management

Fall or spring. 3 credits.
Focuses on management of personnel in organizations. Deals with manpower planning, recruiting, selection, wage and salary administration, training, performance appraisal, organizational development, and the administration of personnel department activities. Special attention is paid to government manpower policy and its implication for personnel management.

## 301 Labor Union Administration

Fall or spring. 3 credits.
A review of the operations of American unions, including a general theoretical framework but with major emphasis on practical operating experience. The course will consider the formal government of unions; organizational or institutional purposes and objectives and how these are achieved; underlying structure and relationship among members, locals, and national organizations; the performance of the primary function of organizing; negotiating; contract administration; and the effect of the LandrumGriffin Act

## 326 Sociology of Occupations

Fall or spring. 3 credits.
Focuses on (1) the changing character of American occupations within the context of social change; (2) occupational statusdifferences in income, prestige, and power and the resultant general phenomenon of social stratification; (3) vertical and horizontal
occupational mobility; (4) recruitment and socialization into occupational roles; (5) the process of professionalization; and
(6) comparison of personnel occupations with the career and organizational patterns of other occupations. A major sociological theme is the relationship between occupational structure and workplace structure

## 343 Health in the Workplace

4 credits.
Examines the state and federal laws that affect job safety and health, and the way workers and their unions can use legislation to promote safe and healthy working conditions. Topics include safety and health standards: the enforcement of laws and standards; the responsibilities of management; the rights of employees and their unions, including the rights to information; collective bargaining for safety and health; racial- and gender-based discrimination regarding hazardous work; and drug testing.

## 346 Economics of Collective Bargaining

 Fall or spring. 3 credits.Economic aspects of the negotiation, terms, and effects of union-management agreements at the individual firm, industry regional, and national levels. Topics examined include forces influencing contract demands and terms, employer adaptation to higher wages and benefits; interindustry differences in competitiveness, firm size, and markets; regional location of industry, international competition; government regulations; labor supply; inflation, recession, and unemployment.

350 History of Industrial Relations in the United States

## Fall or spring. 3 credits

This review of the history of industrial relations in the United States emphasizes developments in the twentieth century. The course concentrates on the American worker, both union and nonunion; labor movements; and the environmental forces that have shaped industrial relations in the United States. Readings are selected from scholarly accounts and original sources.

## 351 Collective Bargaining

Fall or spring. 3 credits.
A comprehensive study of collective bargaining; the negotiation and scope of contracts; the day-to-day administration of contracts; the major substantive issues in bargaining, including their implication for public policy; and the problem of dealing with industrial conflict.

352 Labor Relations Law and Legislation Fall or spring. 3 credits.
A survey of the law governing labor relations The legal framework in which the collective bargaining relationship is established and hargaining takes place is analyzed. Problems of the administration and enforcement of collective agreements are considered, as are problems of protecting individual employee rights in the collective labor relations context. Also serves as an introduction to the legal system and method and to legal and constitutional problems of governmental regulation of industrial and labor relations.

## 367 Safety and Mealth in the Workplace

Fall or spring. 3 credits.
To provide basic education and training in workplace safety and health. The course will focus on applicable federal and state laws, standards for safety and health, industrial
hygiene, and such health concerns as asbestos, radon, and AIDS. Practical experience will be provided through workplace walk-through safery and health inspections and in use of industrial hygiene equipment that measure noise, temperature, humidity, airflow, and airborne toxics.

## 400 Union Organizing

This course explores various aspects of unions' attempts to organize workers; why some workers join unions and others do not; the techniques used by both unions and employers during organizing campaigns; and the present law of organizing and proposed amendments to the law

## 440 Health, Welfare, and Pension Plans

 Fall or spring. 3 credits.An analysis and appraisal of private health, welfare, and pension plans. A consideration of the origin and development of employer, union, and joint programs and a critical examination of the financing, administration, and general effectiveness of the plans.

## 602 Arbitration

Fall or spring. 3 credits.
A study of the place and function of arbitration in the field of labor-management relations, including an analysis of principles and practices, the law of arbitration, the handling of materials in briefs or oral presentation, the conduct of an arbitration hearing, and the preparation of an arbitration opinion.

## 681 Labor Relations Law

Fall or spring. 3 credits.
An advanced course in labor law, covering such topics as emergency labor disputes, legal problems of labor relations in public employment, labor and the antitrust laws, civil rights legislation, rights of individual employees and union members, and legal problems of union administration.

## 684 Employment Discrimination and the Law

Fall or spring. 3 credits.
An examination of legal problems involving employment discrimination based upon race, color, religion, sex, national origin, or age. The impact of developing principles of law on preemployment inquiries and testing, seniority and promotions, and other personnel policies, practices, and procedures will be discussed. The prerequisites of affirmative action under Executive Order No 11246, as amended, will be analyzed. Special attention will be given to the role of state law in resolving employment discrimination claims and the procedural framework for raising and adjudicating such claims before administrative agencies and the courts.

## 687 Current Issues in Collective Bargaining

Fall or spring. 3 or 4 credits
An intensive study of the most significant current issues and problems facing employers and unions in their relations with each other, with particular emphasis on the substantive matters in contract negotiations and administration of the provisions of collective bargaining agreements. A major research paper is usually required.

## Statewide

The following courses are open to participants in the Extension Division's statewide credit programs in labor studies and management studies. Extension offices are based in Buffalo, Albany, Rochester, Ithaca, New York City, and Long Island. These courses are not open to undergraduate or graduate students matriculated in the Ithaca ILR programs.

## 241 Arbitration

3 credits.
A study of the place and function of arbitration in the field of labor-management relations, including an analysis of principles and practices, the law of arbitration, the handling of materials in briefs or oral presentation, the conduct of an arbitration hearing, and the preparation of an arbitration opinion.

## 242 Public Sector Collective Bargaining

 Fall or spring. 3 credits.This course is designed as an introduction to collective bargaining in the public sector. The course examines the historical development of bargaining in public employment, the evolution of state and federal and bargaining theory and practices, as well as impasse resolutions techniques frequently found in this sector. Special emphasis will be given to developing an understanding of the similarities and differences between public and private sector bargaining and how they have affected tactics and strategies employed by the parties.

## 243 Growth of American Business and Management History

Fall or spring. 3 credits.
The growth and cycles of American business enterprise produced significant changes in education, government, work, the family, the ethnic composition of the population, and the landscape. As business and industry expanded, new methods evolved for managing these enterprises. This course will examine the development of managerial practices, the relationship of management to the work force, and the social ramifications of capitalist expansion.

## 245 Public Sector Labor Law

 3 credits.A survey and analysis of the New York State Public Employees Fair Employment Act is made as well as a comparison with other state laws covering public employees. The course will examine the extent to which the law protects and regulates concerted actions by employees in the public sector. The intent is to study and understand the law as written. but more importantly how it has been interpreted by the courts of New York State in its application. Major emphasis will be employee and employer rights, including recognition and certification, improper practices, strikes, grievances, and disciplinary procedures of the New York State Public Employment Relations Board.

## 247 Labor and the American Economy

 3 credits.Will help the student understand how economic theories relate to the economic problems confronting the American citizen in general and the American union member in particular. Emphasis will be placed on contemporary economic theories and how their proponents attempt to solve American economic problems.

248 Employment Practices Law
3 credits.
Considers laws and regulations that impact directly on managers and employers. Students will examine issues and laws such as Equal Employment Opportunity, Employee Retirement Income Security Act, Federal Wage and Hour Laws, Occupational Safety and Health Act, unemployment laws and other topics. Students will focus on the practical application of laws and their impact on the workplace.

## 251 Principles and Practices of Management

Fall or spring. 3 credits
Presents the theory and processes of management with an emphasis on supervision. Management functions of planning, organizing, staffing, and evaluating are included. Concepts and theories are presented, and case studies are analyzed. Motivating people, exercising leadership, and effectively developing employees are emphasized.

## 252 Contract Bargaining

Fall or spring. 3 credits
Examines the principles of contract bargaining, including bargaining environments and structures as well as standards used in bargaining. Students will leam to prepare bargaining demands, cost economic items, draft noneconomic contract language, negotiate economic and noneconomic issues, and resolve a contract bargaining impasse. The course will consider the impact of contract bargaining outcomes on workers, unions, employers, and the public.

## 253 Contract Administration

Fall or spring. 3 credits.
Focuses on the role of the steward in administering the union contract in the workplace. Students will evaluate grievance and arbitration contract clauses, the grievance procedure in practice, the role of the union steward, the role of local and international unions, negotiation of grievances, and preparation for arbitration. Students will analyze the impact of grievance and arbitration procedures on workers, unions, and employers.

## 254 Labor Law

Fall or spring. 3 credits
Examines the principles of labor law by looking at social philosophy and the historical context of federal labor legislation from the 1930s. Students will concentrate on major provisions of the National Labor Relations Act, examining how the National Labor Relations Board and the federal courts have interpreted the national labor laws. Discussion will include new directions in labor legislation and interpretation with consideration given to the impact of labor law on workers, unions, and employers.

## 255 Labor History

## Fall or spring. 3 credits

Reviews American labor history from the prespective of workers' social dimensions of the development of the working class, reform and revolutionary movements, and the emergence of craft, industrial, and public employee unions. Included will be a discussion of the development of trade union institutions and leaders and the evolution of union political activities and collective bargaining. Special attention will be paid to the involvement of women and minority workers with unions.

## 256 Dispute Resolution

Fall or spring. 3 credits.
Examines third-party participation in dispute resolution in private and public sector collective bargaining. Development of dispute resolution methods in American labor relations; issues and practices in neutral, binding arbitration of grievances and mediation; conciliation; and fact finding procedures will be discussed. We will also look at exclusive labor-management mechanisms to settle industry disputes

## 257 Human Resource Administration

Fall or spring. 3 credits.
Designed to provide an overview of personnel practices in the modern organization. It will focus on manpower planning, employment training and development, motivation and compensation, and performance appraisal and communication for students who are currently supervisors or personnel practitioners or for those aspiring to those positions.

## 258 Organizational Behavior

Fall or spring. 3 credits.
Designed to illustrate how behavioral science theory leads to research and how theory and research provide a basis for practical application in business, industry, education, and government.

## 259 Union Administration

Fall or spring. 3 credits.
Focus is on the principles and practices of effective union administration. Students will study the dynamics of democratic organizations and the development of organizational leadership. The course explores alternative methods of decision making and lines of responsibility. The legal obligations of unions and union officials will be discussed and analyzed. The course also examines the structure and evolution of relationships inside the labor movement.

## 263 Trends in Worker Participation

 Fall or spring. 3 credits.This course will examine the existence of worker participation models in the context of our changing global economy. We will examine both the external and internal forces that are giving rise to greater labor-management cooperation on the one hand, and increased management hostility toward unions, on the other. We will examine the historical struggle of workers and management for control over the work process and the impact that decades of Taylorism have had in shaping the labor-management relationship. We will review worker participation structures in Germany, Sweden, and Japan, and discuss their usefulness as a model for the American workplace. Finally, it will examine case studies of joint-decision making approaches in U.S. workplaces, with a special emphasis on the auto industry

## 264 Contemporary Labor Problems

Fall or spring. 3 credits
A survey of the major challenges that confront the American labor movement. Students are briefed on the background of each problem and discuss and analyze a broad range of solutions proposed by the experts
266 Professional Writing: The Power of the Written Word in Business
3 credits.
Focuses on the importance of developing effective writing skills and strategies required to be successful in business communities.

Students will sharpen existing writing skills, correct bad writing habits, and develop new writing habits through "real life" exercises taken from case studies and their own experiences. In addition, they will learn the importance of using rhetorical strategies such as defining situations requiring written responses, writing to a specific audience, attending to a specific purpose, choosing the appropriate language, and varying tone and style as the situation demands. Students, upon completing this course, will have the confidence and the writing skills to successfully address most situations requiring written communication. Genres include memos, proposal letters, and reports.

## 267 Speaking and Listening for Business

 and the Professions3 credits.
The overall objective is to equip participants with the skills and knowledge they need to speak and listen effectively. By the end of the course, students will be able to accurately listen to, and interpret, oral communication; identify major causes of listening misunderstandings such as biases, distractions, emotions, etc.; describe and employ techniques for overcoming those listening barriers; speak effectively in front of an audience; describe ways to build rapport with an audience; persuade an audience; use visual aids effectively; introduce speakers, make presentations, and speak extemporaneously.

## 359 Directed Studies in Labor Education

 Fall or spring. 3 credits.Designed to grant credit for fieldwork under the direction of members of the faculty. Third semester of an intensive training program in labor education for mature students with demonstrated ability to undertake independent work who have been carefully screened and selected for participation in this course. Combines 180 hours of fieldwork in a union education or related program with 3-hour seminars in the classroom. Classroom meetings are devoted to (1) in-depth analysis of union experiences in relation to labor education, theory, method, and techniques, and (2) individual consultations.

## 363 Wages and Salary System Design

 3 credits.An examination of compensation practices and special issues affecting wage and salary systems. Topics to be discussed include: determining pay level and structure, employee equity, incentive plans, and performance evaluation. Will also examine benefits and legislation that are relevant to compensation practices and theories.

## 364 Labor, Government, and Politics

## 3 credits.

A survey of the ways the American political system affects labor and how organized labor affects the system through voting, political parties, and interest groups.

## FACULTY ROSTER

Abowd, John M., Ph D., U. of Chicago. Prof., Labor Economics
Bacharach, Samuel, Ph.D., U. of Wisconsin. Prof., Organizational Behavior
Barley, Stephen R., Ph.D., Mass. Inst. of Technology. Assoc. Prof., Organizational Behavior

Bishop, John H., Ph.D., U. of Michigan. Assoc. Prof., Human Resource Studies
Blau, Francine D., Ph.D., Harvard U. Francis Perkins Prof. of Industrial and Labor Relations, Labor Economics
Boudreau, John W., Ph.D., Purdue U. Assoc. Prof., Human Resource Studies
Boyer, George R., Ph.I., U. of Wisconsin. Assoc. Prof., Labor Economics
Bretz, Robert D. Jr., Ph.D., U. of Kansas. Asst. Prof., Human Resource Studies
Briggs, Vemon M., Jr., Ph.D., Michigan State U. Prof., Human Resource Studies

Brooks, George W., M. A., Brown U. Prof. Emeritus, Collective Bargaining, Labor Law, and Labor History
Bunge, John A., Ph.D., Ohio State U. Asst. Prof., Economic and Social Statistics
Cook, Maria L., Ph.D., Univ. of Calif., Berkeley. Asst. Prof., Collective Bargaining, Labor Law, and Labor History
Daniel, Cletus E., Ph.D., U. of Washington. Prof., Collective Bargaining, Labor Law, and Labor History
DeVault, Ileen A., Ph.D., Yale U. Assoc. Prof. Collective Bargaining, Labor Law, and Labor History
Dyer, Lee D., Ph.D., U. of Wisconsin. Prof., Human Resource Studies
Ehrenberg, Ronald, Ph.D., Northwestern U. Irving M. Ives Professor of Industrial and Labor Relations and Economics, Labor Economics
Farley, Jennie T., Ph.D., Cornell U. Prof., Extension
Fennell, Dorothy E., Ph.D., U. of Pittsburgh. Asst. Prof., Extension and Public Service
Fields, Gary S., Ph.D., U. of Michigan. Prof., Labor Economics
Gerhart, Barry A., Ph.D., U. of Wisconsin. Assoc. Prof., Human Resource Studies
Gold, Michael E., LL.B., Stanford U. Assoc. Prof. Collective Bargaining, Labor Law, and Labor History
Gross, James A., Ph.D., U. of Wisconsin. Prof., Collective Bargaining, Labor Law, and Labor History
Gruenfeld, Leopold W., Ph.D., Purdue U. Prof., Organizational Behavior
Hadi, Ali S., Ph.D., New York U. Assoc. Prof., Economic and Social Statistics
Halpern, Jennifer, Ph.D., UCLA at Berkeley. Asst. Prof., Organizational Behavior
Hammer, Tove H., Ph.D., U. of Maryland. Prof., Organizational Behavior
Hebdon, Robert P., Ph.D., U. of Toronto. Asst. Prof., Collective Bargaining, Labor Law, and Labor History
Hurd, Richard W., Ph D., Vanderbilt U. Prof., Extension and Public Service
Hutchens, Robert M., Ph.D., U. of Wisconsin. Prof., Labor Economics
Jakubson, George H., Ph.D., U. of Wisconsin. Assoc. Prof., Labor Economics
Judge, Timothy A., Ph.D., U. of Illinois. Asst. Prof., Human Resource Studies
Kahn, Lawrence M., Ph.D., U. of Calif. at Berkeley. Prof., Collective Bargaining, Labor Law, and Labor History/Labor Economics
Katz, Harry C., Ph.D., U. of California at Berkeley. Prof., Collective Bargaining, Labor Law, and Labor History
Kuruvilla, Sarosh C., Ph.D., U. of Iowa. Asst. Prof., Collective Bargaining, Labor Law, and Labor History
Lawler, Edward J., Ph.D., U. of Wisconsin at Madison. Prof., Organizational Behavior

Lieberwitz, Risa L., J. D., U. of Florida. Assoc. Prof., Collective Bargaining, Labor Law, and Labor History
Lipsky, David B., Ph.D., Massachusetts Inst. of Technology. Prof., Collective Bargaining, Labor Law, and Labor History
Milkovich, George, Ph.D., U. of Minnesota. Prof., Human Resource Studies
Pucik, Vladimir, Ph.D., Columbia U. Assoc. Prof., Human Resource Studies
Rebick, Marcus E., Ph.D., Harvard U. Asst. Prof., Labor Economics/International and Comparative Labor Relations
Ross, Philip, Ph.D., Brown U. Prof., Collective Bargaining, Labor Law, and Labor History
Salvatore, Nicholas, Ph D., U. of California at Berkeley. Prof, Collective Bargaining, Labor Law, and Labor History
Seeber, Ronald L., Ph.D., U. of Illinois. Assoc. Prof., Extension
Smith, Robert S., Ph.D., Stanford U. Prof., Labor Economics
Sonnenstuhl, William J., Ph.D., New York U Asst. Prof., Extension and Organizational Behavior
Stern, Robert N., Ph.D., Vanderbilt U. Prof., Organizational Behavior
Tolbert, Pamela S., Ph.D., U. of Califomia Assoc. Prof., Organizational Behavior
Turner, Lowell R., Ph.D., U. of Califomia. Asst. Prof., Collective Bargaining, Labor Law and Labor History/International and Comparative Labor Relations
Velleman, Paul F., Ph.D., Princeton U. Assoc. Prof., Economic and Social Statistics
Wasmuth, William J., D.B.A., Indiana U. Prof. Emeritus, Extension/Human Resource Studies
Welbourne, Theresa M., Ph.D., U. of Colorado. Asst. Prof., Human Resource Studies
Wells, Martin T., Ph_D., U. of California at Santa Barbara. Assoc. Prof., Economic and Social Statistics
Williams, Lawrence K., Ph.D., U. of Michigan Prof., Organizational Behavior
Windmuller, John P., Ph.D., Cornell U. Prof. Emeritus, Collective Bargaining, Labor Law, and Labor History/ International and Comparative Labor Relations

## LAW SCHOOL

## ADMINISTRATION

Russell K. Osgood, dean of the law faculty and professor of law

Robert A. Hillman, associate dean for academic affairs and professor of law
Claire M. Germain, law librarian and professor of law
Frances M. Bullis, associate dean for development and public affairs
Anne Lukingbeal, associate dean and dean of students
Charles D. Cramton, assistant dean for alumni/ international affairs

Richard D. Geiger, assistant dean and dean of admissions

## LAW SCHOOL

The primary function of the Law School is to prepare attorneys for both public and private practice who are equipped to render skillful professional service and who are conscious of the important role played by the law as a means of social control. The curriculum is designed to prepare students for admission to the bar in all American states and territories.

Ordinarily, a student who is admitted to the Law School must have a baccalaureate degree from an approved college or university. The course of study leading to the degree of Doctor of Law (J.D.) covers three academic years. Students may be admitted to a program of study leading to the degree of Doctor of Law "with specialization in international legal affairs."
There are combined graduate degree programs with the Johnson Graduate School of Management, the Department of City and Regional Planning of the College of Architecture, Art, and Planning, the School of Industrial and Labor Relations, and the graduate divisions in economics, history, and philosophy of the College of Arts and Sciences, as well as a special opportunity for highly qualified undergraduates in the College of Arts and Sciences to register in the Law School during their senior year.
The graduate program of the Cornell Law School admits a limited number of students, generally all foreigners, each year. The LL.M. degree (Master of Laws, Legum Magister) and the J.S.D. degree (Doctor of the Science of Law, Jurisprudentiae Scientiae Doctor) are conferred. A small number of law graduates may also be admitted as special students, to pursue advanced legal studies without seeking a degree.

For further information, refer to the Law School catalog, which may be obtained from the Office of the Registrar, Myron Taylor Hall.

## FIRST-YEAR COURSES

500 Civil Procedure
502 Constitutional Law
504 Contracts
506 Criminal Law
507 Legal Process
508 Practice Training I
509 Practice Training II
512 Property
515 Torts

## UPPERCLASS COURSES

602 Administrative Law
603 Admiralty
604 Advanced Civil Procedure
605 Advanced Topics in the 14th Amendment
607 American Constitutional History
608 American Indian Law
609 Antitrust Law
612 Banking Law and Regulation
613 Bioethics and Law
614 Civil Rights Legislation
616 Commercial Law
618 Comparative Law
619 Comparative Law of Evidence and Procedure in International Litigation

620 Conflict of Laws
621 Constitutional Law II: The First Amendment
625 Corporations
627 Criminal Procedure
628 Debtor-Creditor Law
629 Directed Reading
630 The Early Development of Anglo-American Common Law

631 Economics for the Lawyer
633 Employment Law
636 Environmental Law
637 Environmental Litigation
638 Estate and Gift Taxation
640 Evidence
641 Family Law
643 Federal Courts
644 Federal Income Taxation
646 Feminist Jurisprudence (also GOVT 618)

## 652 Intellectual Property

653 International Business Transactions
654 International Commercial Arbitration
655 International Human Rights
657 International Taxation
659 Japanese Business Law
660 Labor Law
662 Land-Use Planning
666 Law, Society, and Morality (also PHIL 342)
668 Lawyers and Clients
674 Negotiation
675 Philosophy of Human Rights
676 Political Obligation and Civil Disobedience (aiso PHIL 343)

679 Public International Law
680 Roman Law and Modern Civil Law Systems
682 Securities Regulation
684 Sports Law
685 Statistics for Lawyers
686 Supervised Teaching
687 Supervised Writing
688 Taxation of Corporations and Shareholders
690 Theory of International Law
692 Trial Advocacy
694 Trusts and Estates

## SEMINARS AND PROBLEM COURSES

700 Advanced Estate Planning
701 African Americans and the Supreme Court
702 American Legal Theory
704 Biblical Law
706 Comparative Leases
708 Constitutional Decisionmaking
710 Consitutional Law and Political Theory
711 Corporate Law and Securities Regulation: A Contractual Perspective
713 Death Penalty Litigation
716 Empirical Studies of the Legal System
717 Employment Litigation
725 Family Law Seminar
731 HIV Disease and Law
732 Immigration and Refugee Law
733 Introduction to French Law

736 Introduction to International Dispute Resolution

740 Law and Society
Law, Science, and Technology
756 Legal Aspects of Commercial Real Estate Development

Legal Interpretation
Organized Crime Control
767
Outsider Jurisprudence
770 Selected Topics in International Law: Secession

Seminar on the Psychology of Law
773 Separation of Powers
Sovereignty, Self-Determination, and Secession

775 Supreme Court Seminar
776 Tax Policy Seminar
777
Theories of Property
778 Theories of Social Justice

## CLINICAL COURSES AND EXTERNSHIPS

Basic Estate Planning and Drafting Clinic
Civil Liberties Clinic
Government Benefits Clinic Legal Services Externship

786
Judicial Externship
790
791 Legal Aid
792
Legal Aid 2
793 Legal Aid 3
794 Legislative Externship
Neighborhood Legal Services Externship
Women and the Law

## FACULTY ROSTER

Abrams, Kathryn, J.D., Yale U. Professor of Law and Associate Professor, Program on Ethics and Public Life
Alexander, Gregory S., J.D., Northwestern U Prof.
Barcelō, John J. III, S.J.D., Harvard U. A. Robert Noll Professor of Law

Beresford, H. Richard, M.D., U. of Colorado. Visiting Prof.
Bridge, Stuart N., M.A., Cambridge. Visiting Prof.
Clermont, Kevin M., J.D., Harvard U. James and Mark Flanagan Professor of Law
Clymer, Steven D., J.D., Cornell U. Asst. Prof.
Cramton, Roger C., J.D., U. of Chicago.
Robert S. Stevens Professor of Law
Cripps, Yvonne M., Ph.D., U. of Cambridge. Visiting Prof.
Dolgin, Janet L., Ph.D., Brown U. Visiting Prof.

Eisenberg, Theodore, J.D. U. of Pennsylvania. Prof.
Farina, Cynthia R., J.D., Boston U. Prof.
Garvey, Stephen P., J.D., Yale U. Asst. Prof.
Gerhardt, Michael J., J.D., U. of Chicago. Visiting Prof.
Germain, Claire M., M.L.L., U. of Denver. Edward Cornell Law Librarian and Professor of Law
Green, Robert A., J.D., Georgetown U. Assoc. Prof.
Hausmaninger, Herbert, Dr.jur., Graz. Visiting Prof.
Hay, George A., Ph.D., Northwestern U. Edward Cornell Professor of Law and Professor of Economics in the College of Arts and Sciences
Henderson, James A., Jr., LL.M., Harvard U. Frank B. Ingersoll Professor of Law
Hillman, Robert A., J.D., Cornell U. Prof.
Holden-Smith, Barbara J., J.D., U. of Chicago. Assoc. Prof.
Johnson, Sheri L., J.D., Yale U. Prof.
Kahng, Lily, J.D., Columbia U. Assoc. Prof.
Kent, Robert B., LL.B., Boston U. Prof.
Lyons, David B., Ph.D., Harvard U. Susan Lynn Sage Professor of Philosophy and Professor of Law
Macey, Jonathan R., J.D., Yale U. J. DuPratt White Professor of Law
Martin, Peter W., LL.B., Harvard U. Jane M. G. Foster Professor of Law
Oda, Hiroshi, LL.D., Tokyo U. Visiting Prof.
Orenstein, Aviva, J.D., Cornell U. Visiting Prof.
Osgood, Russell K., J.D., Yale U. Prof.
Palmer, Larry I., LL.B., Yale U. Prof.
Rachlinski, Jeffrey J., J.D., Ph.D., Stanford U. Asst. Prof.
Roberts, Ernest F., LL.B., Boston C. Edwin H. Woodruff Professor of Law
Rossi, Faust F., J.D., Cornell U. Samuel S. Leibowitz Professor of Trial Techniques
Rudden, Bernard, D.C.L., Oxford. Visiting Prof.
Rush, Sharon E., J.D., Cornell U. Visiting Prof. Sadurski, Woiciech, LL.M., U. of Warsaw Visiting Prof.
Schwab, Stewart J., Ph.D., U. of Michigan. Prof
Shapiro, Howard M., J.D., Yale U. Assoc. Prof.
Shiffrin, Steven H., J.D. Loyola U. of Los Angeles, Prof.
Siliciano, John A., J.D., Columbia U. Prof. Simson, Gary J., J.D. Yale U. Prof.
Stone, Katherine V. W., J.D., Harvard U. Prof. Summers, Robert S., LL.B., Harvard U. William G. McRoberts Research Professor in the Administration of the Law
Taruffo, Michele, Dr.jur., Pavia. Visiting Prof.
Taylor, Winnie F., LL.M., U. of Wisconsin Prof.
Teson, Fernando R., S.J.D., Northwestern U. Visiting Prof.
Varady, Tibor, S.J.D., Harvard U. Visiting Prof.
Wippman, David, J.D., Yale U. Assoc. Prof.
Wolfram, Charles W., LL.B., U. of Texas. Charles Frank Reavis Sr. Professor of Law

## Lecturers

Cook, Nancy L., J.D., Georgetown U. Senior Lecturer
Galbreath, Glenn G., J.D., Case Western Reserve U. Senior Lecturer
Miner, JoAnne M., J.D., U. of Connecticut. Senior Lecturer and Director, Cornell Legal Aid Clinic
Seibel, Robert F., J.D., Northeastern U. Senior Lecturer
Strom, Barry, J.D., Cornell U. Senior Lecturer

## Academic Library Staff

Germain, Claire M., M.L.L., U. of Denver. Edward Cornell Law Librarian and Professor of Law
Hasko, John J., M.S.L.S., U. of Illinois. Associate law librarian
Hillmann, Diane I., M.S.L.S., Syracuse U. Associate law librarian and head of technical services
Court, Patrica G., M.L.S., Indiana U. Head of Reference
Pajerek, Jean M., M.L.S., SUNY-Albany. Head of cataloging
Beehler, Sandra A., M.L.S., Indiana U.
Acquisitions librarian
O'Connor, Linda Karr, M.L.S., U. of California, Los Angeles. Reference librarian
Pantaloni, Nazareth A.M. III, J.D., Temple U. Reference librarian

## Members of Other Faculties <br> Associated with the Law School

Carmichael, Calum M., B. Litt., Oxford U. Prof. College of Arts and Sciences
Gross, James A., Ph.D., U. of Wisconsin. Prof. School of Industrial and Labor Relations
Hyams, Paul R., D. Phil., Oxford U. Assoc. Prof. College of Arts of and Sciences

## Adjunct Faculty Members

Blyth, John, Dr.jur., Goethe U. Adjunct Prof. Briggs, W. Buckley, J.D., Georgetown U. Adjunct Prof.
Colapietro, Bruno, J.D., Cornell U. Adjunct Prof.
Goldstock, Ronald G., J.D., Harvard U. Adjunct Prof.
Grumbach, Carol, J.D., Comell U. Adjunct Prof.
Holmes, Clive A., Ph.D., Cambridge U. Adjunct Prof.
Levao, Richard A., J.D., Cornell U. Adjunct Prof.
O'Toole, Martin W., J.D., Cornell U. Adjunct Prof.
Pinnisi, Michael D., J.D., Cornell U. Adjunct Prof.
Yale-Loehr, Stephen W., J.D., Cornell U. Adjunct Prof.

## Practitioners in Residence

Berzon, Marsha S., J.D., U. of California at Berkeley. Pract.
McLaughlin, Joseph T., J.D., Cornell U. Pract.

## JOHNSON GRADUATE SCHOOL OF MANAGEMENT

## ADMINISTRATION

Alan G. Merten, dean
Thomas R. Dyckman, associate dean
Michael J. Hostetler, associate dean for executive education
Richard A. Highfield, assistant dean for students

Steven J. Sharratt, assistant dean for external relations
John A. Elliott, director, doctoral program Anne Coyle, director of admissions
Harriet Peters, director of advising and student activities

Stephen F. Johansson, director of career services
John P. McKeown, director of finance and business operations
L. Joseph Thomas, director of the Executive Development Program
Eugene Ziegler, director of computing services
Donald Schnedeker, director, Eastwick Library
Rhea J. Nickerson, assistant to the dean
Nancy A. Culligan, business manager and director of human resources

Linda Myers, managing editor, Cornell Enterprise, and publications coordinator
Linda Pike, managing editor, Administrative Science Quarterly
Ann W. Richards, registrar and financial aid associate

The Johnson Graduate School of Management prepares men and women for managerial careers in business. The school offers course work in many disciplines to provide potential managers with an understanding of the complexities of the professional world in which they will operate and of the organizations of which they will become a part

A bachelor's degree or its equivalent is required for admission to the two-year program leading to the Master of Business Administration (M.B.A.) degree. Nearly half of the students have a background of undergraduate studies in arts and sciences, and about one-quarter in engineering. Five percent of the students begin their graduate training immediately after receiving their bachelor's degrees and the remaining 95 percent following work experience
Combined degree programs allow highly qualified Cornell students to co-register in the school during their senior year, thereby eaming a master's degree in less than the usual time.

The doctoral program, administered through the Graduate School, provides an advanced level of education in business for those who seek careers in teaching and research at leading universities.

More detailed information about these programs is available from the Office of Admissions and Student Affairs, Johnson Graduate School of Management, Malott Hall.
Students in other graduate programs and undergraduate students registered with the university are welcome in many classes. Since matriculated MBA students require certain courses for graduation, non-Johnson School students are not allowed to pre-enroll. During the first week of classes, registration of nonJohnson School students occurs on a space available basis.

## UNDERGRADUATE ONLY

NBA 300 Entrepreneurship and Enterprise
This course provides a disciplined look at the entrepreneur and small business management. It deals with the formation and the acquisition of enterprises from the viewpoint of individuals who desire to become the principal owners. Reviews include legal and tax aspects, valuation techniques, organization forms, and venture-capital sources, as well as planning techniques necessary to launch a successful venture

## NCC COMMON CORE COURSES

NCC 500 Financial Accounting
NCC 501 Quantitative Methods for Management
NCC 502 Microeconomics for Management
NCC 503 Marketing Management
NCC 504 Behavioral and Organizational Science
NCC 506 Managerial Finance
NCC 508 Production and Operations Management

## NBA MANAGEMENT ELECTIVE COURSES

## Accounting

NBA 500 Intermediate Accounting
NBA 501 Accounting for Mergers and Consolidations
NBA 502 Managerial Cost Accounting
NBA 503 International Accounting
NBA 505 Auditing
NBA 506 Financial Information and Evaluation
NBA 508 Advanced Accounting

## Economics

NBA 520 Pricing and Strategy
[NBA 522 Managerial Economics Not offered 1994-95]
[NBA 523 Business and Economic Forecasting Not offered 1994-95]
NBA 527 Applied Price and Theory

## Finance

NBA 540 Financial Policy Decisions
[NBA 541 Economic Evaluation of Capital Investment Projects Not offered 1994-95]
NBA 542 Investment and Portfolio Analysis
NBA 543 Financial Markets and Institutions
NBA 544 Bank Management
NBA 545 Corporate Financial Policy and Investment Strategies
NBA 546 Introduction to Options and Futures
NBA 550 Advanced Topics in Derivative Securities
NBA 551 Asset Valuation and Management
NBA 552 Case Studies in Finance
NBA 553 Finance and Accounting for Manufacturing
NBA 554 International Finance
NBA 555 Fixed Income Securities
NBA 556 Investment Banking, International Equities and Markets
NBA 557 Case Studies in Venture Investment and Management

## General Management

NBA 560 Business Law I
NBA 561 Business Law II
NBA 562 Estate Planning
NBA 564 Entrepreneurship and Enterprise
NBA 567 Management Writing
NBA 568 Oral Communication
NBA 569 Management Consulting
NBA 571 Cornell Management Simulation
NBA 574 Public Policy Issues
NBA 575 Advanced Consulting
NBA 576 The World Geopolitical Environment of Business
NBA 577 The Political, Legal, and Regulatory Environment of Business
NBA 578 Business Ethics
NBA 579 Cases in Business Strategy

## International Management

NBA 580 Industrial Policy: Lessons for the United States from Japan and Europe
NBA 584 Management of the Multinational Corporation
[NBA 588 International Human Resources Management Not offered 1994-95]
NBA 590 Management in Developing Countries

## Management Information Systems

[NBA 600 Data Base Management Not offered 1994-95]
NBA 605 Expert Systems
NBA 606 Business Data Communications
NBA 609 MIS Policy

## Marketing

NBA 620 Marketing Research
NBA 621 Advertising Management
NBA 622 Marketing Strategy
NBA 623 Models and Methods for New Product Development
NBA 625 International Marketing
NBA 626 Consumer Behavior
NBA 627 Affect and Brand Equity

NBA 630 Policies in Marketing Channels
NBA 635 Marketing Models
[NBA 636 Promotion Management Not offered 1994-95]
NBA 637 Topics in Direct Marketing
NBA 638 Analysis of Competitive Decision Making
Operations Management
NBA 641 Logistics and Manufacturing Strategy
NBA 642 Statistical Methods in Business
[NBA 644 Quality Management
Not offered 1994-95]
NBA 649 International Operations Management
NBA 650 Semester in Manufacturing Management

## Behavorial and Organizational Science

NBA 663 Managerial Decision Making
NBA 666 Negotiations
NBA 669 Decision Making and Negotiation

## NMI AND NRE RESEARCH AND ADVANCED STUDIES

NMI 500-502 Directed Readings and Research
NRE 502 Doctoral Seminar in Marketing
NRE 504 Doctoral Seminar in Accounting
NRE 505 Doctoral Seminar in Managerial Accounting
NRE 507 Doctoral Seminar in the Behavioral Implications of Affect and Cognition
NRE 513 Doctoral Seminar in Finance
NRE 518 Doctoral Seminar in Cognition: Affect and Decision Making

## FACULTY ROSTER

Bailey, Warren B., Ph.D. U. of Califomia at Los Angeles. Asst. Prof., Finance
BenDaniel, David J., Ph.D., Massachusetts Inst. of Technology. Don and Margi Berens Professor of Entrepreneurship
Bierman, Harold, Jr., Ph.D., U. of Michigan. Nicholas H. Noyes Professor of Business Administration
Bloomfield, Robert J., Ph.D.. U. of Michigan. Asst. Prof., Accounting
Carr, Peter P., Ph.D., U. of California at Los Angeles. Asst. Prof., Finance
Chintagunta, Pradeep K., Ph D., Northwestern U. Asst. Prof., Marketing

Conway, Richard W., Ph.D., Cornell U Emerson Electric Co. Professor of Manufacturing Management, Prof., Information Systems
D'Souza, Julia, Ph D., Northwestern U. Acting Asst. Prof., Accounting
Dyckman, Thomas R., Ph.D., U. of Michigan. Ann Whitney Olin Professor of Accounting
Elliott, John A., Ph.D., Cornell U. Assoc. Prof., Accounting
Frank, Robert, Ph.D., U. of California at Berkeley. Goldwin Smith Professor of Economics, Ethics, and Public Policy
Freeman, John, Ph.D., North Carolina at Chapel Hill. Charles H. Dyson Professorship in Management, Prof., Organizational Behavior
Gibbons, Robert S., Ph.D. Stanford U. Assoc. Prof., Economics
Hass, Jerome E., Ph D., Carnegie-Mellon U. Prof., Finance and Business Strategy
Haveman, Heather A., Ph.D., U. of California at Berkeley. Assoc. Prof., Organizational Behavior

Highfield. Richard A., Ph.D., U. of Chicago. Asst. Prof., Economics
Hilton, Ronald W., Ph.D., Ohio State U. Prof., Accounting
Isen, Alice M., Ph.D., Stanford U. S. C Johnson Professor of Marketing, Prof., Organizational Behavior, Prof., Psychology
Jaquier, Eric, Ph.D., U. of Chicago. Asst. Prof., Finance
Jarrow, Robert A., Ph.D., Massachusetts Inst. of Technology. Ronald P. and
Susan E. Lynch Professor of Investment Management, Prof., Finance and Economics
Kadiyali, Vrinda, Ph.D., Northwestern U. Acting Asst. Prof., Marketing and Economics
Kumar, Akhil, Ph.D., U. of Califomia at Berkeley. Asst. Prof., Management Information Systems
Libby, Robert, Ph.D., U. of Illinois David A. Thomas Professor of Management, Prof., Accounting, and Behavioral Science
Lind, Robert C., Ph.D., Stanford U. Prof. Economics, Management, and Public Policy
McAdams, Alan K., Ph.D., Stanford U. Assoc. Prof., Managerial Economics
McClain, John O., Ph.D., Yale U. Prof., Quantitative Analysis
Malik, Kavindra, Ph.D., U. of Pennsylvania. Asst. Prof., Operations Management
Merten, Alan G., Ph.D., U. of Wisconsin. Anne and Elmer Lindseth Dean of the S.C. Johnson Graduate School of Management, Prof., Information Systems
Michaley, Roni, Ph.D., New York U. Asst. Prof., Finance
Nelson, Mark W., Ph.D., Ohio State U. Asst. Prof., Accounting
O'Hara, Maureen, Ph.D., Northwestern U. Robert W. Purcell Professor of Management
Orman, Levent V., Ph.D., Northwestern U. Assoc. Prof., Information Systems
Rao, Vithala R., Ph.D., U. of Pennsylvania. Deane W. Malott Professor of Management. Prof., Marketing and Quantitative Methods
Robinson, Lawrence W., Ph.D., U. of Chicago Asst. Prof., Operations Management
Russo, J. Edward, Ph.D., U. of Michigan. Prof., Marketing and Behavioral Science
Sally, David F., Ph D., U. of Chicago. Acting Asst. Prof., Organizational Behavior
Smidt, Seymour, Ph.D., U. of Chicago. Nicholas H. Noyes Professor of Economics and Finance
Stayman, Douglas M., Ph.D., U. of California at Berkeley. Asst. Prof., Marketing
Swaminathan, Bhaskaran, Ph.D., U. of California at Los Angeles. Asst. Prof., Finance
Thaler, Richard H., Ph.D., U. of Rochester Henrietta Johnson Louis Professor of Management, Prof., Economics and Behavioral Science
Thomas, L. Joseph, Ph.D., Yale U. Nicholas H. Noyes Professor of Manufacturing

Valley, Kathleen L., Ph.D., Northwestern U. Asst. Prof., Organizational Behavior
Waldman, Michael, Ph.D., U. of Pennsylvania. Prof., Economics
Wittink, Dick R., Ph.D., Purdue U. Prof., Marketing and Quantitative Methods

## Lecturers

Curtis, Richard T., MBA, Cornell U. Part-time Lec., Finance
Katz, Jan, Ph.D., Massachusetts Inst. of Technology. Lec., International Business and Marketing
Medvec, Victoria H., Ph.D., Cornell U. Lec., Organizational Behavior

Mink, Barbara E., M.A., Cornell U. Lec., Management Communication
Pike, Alan S., M.A., Comell U. Sr. Lec., Management Communication
Rosen, Charlotte, Ph.D., Cornell U. Sr. Lec., Coordinator, Management Communication

## Adjunct and Visiting Faculty

Abowd, John M., Ph.D., U. of Chicago. Prof., Labor Economics
Grossman, Dale A., J.D., American U. Sr. Lec., Tax and Business Law
Schuler, Richard E., Ph.D., Brown U. Prof Economics, Prof. Civil \& Environmental Engineering
Stark, David, Ph.D., Northwestern U. Assoc. Prof., Sociology

## DIVISION OF NUTRITIONAL SCIENCES

## ADMINISTRATION <br> Cutberto Garza, director

Carole Bisogni, associate director for academic affairs

Kathleen Rasmussen, graduate faculty representative, Field of Nutrition

## THE DIVISION

Nutritional sciences draws upon the chemical, biological, and social sciences to understand the complex relationships among human health, nutritional status, food and lifestyle patterns, and social and institutional environments. Understanding these relationships includes the study of the metabolic regulation and function of nutrients, nutrient requirements through the life span, role of diet in reducing risk of chronic disease, nutritional quality of foods, and interventions and policies designed to promote nutritional health of individuals and populations.
The focus of this broad field of study at Cornell is the Division of Nutritional Sciences, which brings together specialists from many disciplines. The faculty are involved in undergraduate and graduate teaching, research, and extension of research-based knowledge throughout New York State, the nation, and the world.
The division is affiliated with both the College of Human Ecology and the College of Agriculture and Life Sciences. An undergraduate program in nutritional sciences is offered through the College of Human Ecology, and an undergraduate program, Nutrition, Food, and Agriculture, is offered in the College of Agriculture and Life Sciences. Graduate study is administered through the Field of Nutrition, which includes faculty members throughout the university.

## FACILITIES

Most of the faculty members of the division work in Savage Hall and Martha Van Rensselaer Hall. In addition to housing offices, classrooms, and seminar rooms, those buildings contain research facilities, specialized laboratories, a human metabolic research unit, and computer facilities.
The division's Learning Resources Center in Martha Van Rensselaer Hall is used by students for individual study and small group discussions. The Learning Resources Center contains class materials, audiovisual aids, and supplementary books and periodicals for independent study and special projects in nutrition. Savage Hall also has a graduate reading room.

## UNDERGRADUATE PROGRAMS

The B.S. degree programs provide students with strong training in chemistry and biology and a strong foundation in the broad field of nutritional sciences. Through the nutritional sciences major in the College of Human Ecology, students can prepare for a variety of career interests including medicine and other health careers, fitness and sports nutrition, clinical nutrition, dietetics, nutritional biochemistry, and nutrition education. The undergraduate program, Nutrition, Food and Agriculture, in the College of Agriculture and Life Sciences is for students who desire strong training in human nutrition in combination with supportive course work in agriculture and the life sciences. Students in the Nutrition, Food, and Agriculture program supplement the core nutrition curriculum with courses in such areas as food science, animal science, food and agricultural economics, and advanced biology.

Every student majoring in nutrition is assigned a faculty adviser. An effort is made to match interests, and students may change advisers at any time if their goals and interests change. Regular student-adviser conferences are required at least twice a year. The adviser helps students select courses to meet their interests and college graduation requirements and often can suggest opportunities for individual study or experience outside the classroom.

## THE CORE CURRICULUM

The core undergraduate curriculum includes introductory chemistry and biology, organic chemistry, biochemistry, physiology, and math as well as introductory courses in the social sciences. Students complete five core courses in nutritional sciences: Nutrition and Health: Concepts and Controversies, Social Science Perspectives on Food and Nutrition, Nutritional and Physicochemical Aspects of Foods, Physiological and Biochemical Bases of Nutrition, and Methods in Nutritional Sciences Students select a minimum of three advanced courses in nutritional sciences in the area of their interest.

A strong foundation in chemistry and biology is required. New majors, including transfer students, should plan chemistry courses carefully to assure the appropriate sequence of courses. All students who have adequate preparation in high school mathematics and chemistry are encouraged to take Chemistry 207-208. For information about specific course requirements for the nutritional sciences major in the College of Human Ecology or the Nutrition, Food, and Agriculture program in the College of Agriculture and Life Sciences, contact the division's Academic Affairs Office, 309/335 MVR.

## CAREER OPTIONS AND COURSE PLANNING

The core curriculum is viewed as the minimum requirements for a major in nutritional sciences. Students should consult with their advisers to develop course programs that will prepare them for entrylevel jobs or graduate study in the field(s) of their particular interests. Independent study involving research or field study may be chosen to enhance a course program. A summary of suggested areas from which students can choose electives for different career interests follows.
Medicine and Other Health Careers:
Students add physics and calculus to the core curriculum. Nutrition courses of special interest include those focused on the relationship of nutrition to disease, behavior, growth, development, and aging. Other electives may include genetics, advanced biology, sociology, psychology, humanities, public policy, and language.
Fitness and Sports Medicine: Students can complete the Applied Exercise Science Concentration at Ithaca College which includes courses in anatomy, kinesiology, exercise physiology, and biomechanics. Nutrition courses of special interest relate to growth and development, regulation of body weight, and community nutrition and health. For information about the Applied Exercise Science Concentration, contact the DNS Academic Affairs Office, 309 MVR.
Dietetics and Clinical Nutrition: Students can complete the academic requirements for The American Dietetic Association (ADA) by adding courses in foods, nutrition and disease, microbiology, management, statistics, and nutritional care to the core curriculum. For additional information about meeting ADA requirements see Gertrude Armbruster, 366 MVR.
Nutritional Biochemistry: Recommended electives include calculus, physics, genetics, advanced biology and chemistry, toxicology, and nutritional sciences courses related to the physiology, biochemistry, and metabolism of different nutrients and disease states.
Nutrition Communications and Community Nutrition: Suggested electives include courses in communications, education, human development, human service studies, public policy, and nutritional sciences courses related to community nutrition, maternal and child nutrition, geriatric nutrition, nutrition and disease, and food economics.
Consumer Foods: Recommended electives include courses in business, economics, communications, food science, microbiology, and nutritional science courses related to the physicochemical aspects of foods, management, and experimental foods.

Nutrition, Food and Agriculture: Recommended electives include food science, animal science, plant sciences, international agriculture, agricultural economics, biological sciences, and rural sociology.
International Nutrition: Recommended electives include courses in language, anthropology, agricultural economics, policy, economics, rural sociology, international agriculture, and nutritional science courses related to maternal and child health and problems of developing nations.

## FIELD EXPERIENCE

Structured field experience in a community agency, health-care facility, or business can be taken for credit in several ways through the Human Ecology Field and International Study Program or as an independent study course (NS 402).

## INDEPENDENT STUDY ELECTIVES

Independent study courses (NS 400, 401, 402) can be used to obtain credit for more diverse or intensive experience than the classroom can offer, whether this involves laboratory work, library research, or field study. Any student interested in independent study should obtain the sponsorship of a faculty adviser and the approval of Carole Bisogni or consider applying to the honors program

## HONORS PROGRAM

The honors program, leading to a B.S. degree with honors in nutritional sciences, gives official recognition to students who have demonstrated excellence in their academic work and their capacity for independent study.
In addition to fulfilling the requirements for a major, students in the honors program take courses on designing and evaluating research, complete an original piece of research, and prepare an honors thesis. The honors project may be laboratory or field research or deal with policy and program development. Animals may be used in some research studies.
For more information, students should contact Michael Kazarinoff, 230 Savage Hall.

## COURSES RECOMMENDED FOR NONMAJORS

Courses in nutritional sciences can strengthen programs of study in biological sciences, biology and society, agriculture, food science, human development, human services, and other fields.

NS 115 , Nutrition and Health: Concepts and Controversies, is open to all students. After NS 115, nonmajors with limited backgrounds in chemistry and biology may elect NS 222 , Maternal and Child Nutrition; NS 247, Food for Contemporary Living; NS 275, Human Biology and Evolution; NS 306, Nutritional Problems of Developing Nations; NS 315, Obesity and the Regulation of Body Weight; NS 347, Human

Growth and Development: Biological and Behavioral Interactions; NS 349, Geriatric Nutrition; NS 375 Developmental Psychobiology: Motivational Processes; NS 457. National and International Food Economics Nonmajors with strong backgrounds in chemistry and the biological sciences may consider NS 331, Physiological and Biochemical Bases of Human Nutrition, as well as many advanced nutritional sciences courses, such as NS 421 Nutrition and Exercise.

## GRADUATE PROGRAMS

Graduate study is administered by the Field of Nutrition, a group of more than fifty faculty members from throughout the university who have a common interest in nutritional problems. In the M.S. and Ph.D. degree programs, students may specialize in animal nutrition, human nutrition, international nutrition, nutritional biochemistry, foods, or general nutrition. Research is emphasized in all graduate programs. Field experience may be a component of concentrations in community, international and public-health nutrition, and nutrition education.
The specialties and interests represented by faculty in the Field of Nutrition provide almost unlimited opportunity for graduate study. Cornell's extensive laboratory and agricultural facilities ensure that students interested in experimental nutrition have exceptional choice and thorough training. As the largest faculty in the country devoted to the study of human nutrition, the field includes specialists in biochemical, metabolic, epidemiological, and sociocultural research. Opportunities to work with community and federal agencies are available to students interested in applied nutrition and public policy, and students in international nutrition are expected to conduct their thesis research abroad.
For more information about the graduate program, interested persons may write for the brochure Graduate Study in Nutrition, available from the Graduate Faculty Representative, Field of Nutrition, Cornell University, MVR Hall, Ithaca, New York 14853-6301; telephone (607)255-4410.

## COURSES

NS 115 Nutrition and Health: Concepts and Controversies
Fall. 3 credits. S-U grades optional
M W F 1:25. Evening prelims, times to be arranged. D. Levitsky.
Facts and fallacies concerning the role that nutrition, exercise, and other health behaviors play in preventing disease, maintaining good health, and maximizing athletic performance will be discussed. Emphasis is on understand ing the biological mechanisms through which good nutrition and regular exercise affect psychological and physical health

## NS 116 Personalized Health and

 NutritionFall. 1 credit. Corequisite: NS 115. S-U only. Limited 10 per section TBA. D. Levitsky.
This course provides students enrolled in NS 115 individualized assistance in many skills used in NS 115 including using computers to analyze diets, using electronic mail, finding
and using scientific references, and reviewing material presented in NS 115 lectures.

## NS 120 Contemporary Perspectives in

 NutritionSpring. 1 credit. S-U grades only W 12:20. G. Combs.
A series of presentations by experts from various areas of the field of nutrition involving consideration of the many types of activities of nutritionists in contemporary society, including the requisite knowledge areas and skills for those activities

## NS 222 Maternal and Child Nutrition

Spring. 3 credits. Prerequisites: NS 115 and a college biology course or permission of the instructor. S-U grades optional.

M W F 1:25. C. Garza.
Involves the study of nutritional requirements in pregnancy, lactation, infancy, and childhood growth through adolescence. Topics include the relationship between maternal diet and pregnancy outcome; analysis of different methods of infant feeding; and nutritional status of pregnant women. children, and adolescents in the United States and in developing countries.
NS 245 Social Science Perspectives on Food and Nutrition
Fall. 3 credits. Prerequisite: NS 115. Limited to nutrition majors. Letter grade only.

TR 10:10-11:25. J. Sobal, D. Sanjur.
Theories, concepts, and methods from several social science disciplines will be applied to food and nutrition topics and issues Emphasis will be placed on theories on the formation and modification of food habits, dietary methodologies, ethnicity and food habits, and educational programs in nutrition in both national and international contexts.

NS 247 Food for Contemporary Living Fall and spring. 3 credits. Laboratory sections limited to 16 students. Laboratory preregistration during course pre-registration required in 309 Martha Van Rensselaer Hall. Laboratory coat required.

Fall lec, T 9:05; lab, T R 10:10-12:40;
spring lec T 9:05; labs T R 10:10-12:40 or
T R 2:15-4:35. G. Armbruster.
Emphasizes integration of sound nutritional practice in the scientific concepts and techniques of food preparation. Priority will be given to factors that influence meal planning, selection, and preparation of food, such as resources available; ethnic, cultural, and behavioral considerations; food presentation; sensory quality evaluation. Safe food handling practices and storage procedures included.

## NS 262 The Cell and the External World

 Spring. 3 credits. Prerequisites: one semester of biologyM W 9:05. N. Noy
The course will focus on the relationships of the cell with the environment. Examples from three general areas will be considered: 1 . Mechanisms of uptake of nutrients by bacterial and by mammalian cells. 2. Intracellular outcomes of nutritional stimuli: effects on metabolism and gene transcription, toxicity. 3. Pathways of neutralization: detoxification and secretion.

## [NS 275 Human Biology and Evolution (also Biological Sciences 275 and Anthropology 275)

Fall. S-U grades optional, with permission of either instructor. Offered alternate years. Not offered 1994-95.

Lec, W F 10:10; disc M 10:10.
K. A. R. Kennedy, J. D. Haas.

An introduction to the biology of Homo sapiens through an examination of human evolution, biological diversity, and modes of adaptation to past and present environments. Evolutionary theory is reviewed in relation to the current evidence from the fossil record and studies of the evolution of human behavior. A survey of human adaptation covers a complex of biological and behavioral responses to environmental stress. Human diversity is examined as the product of longterm evolutionary forces and short-term adaptive responses. Topics such as creationism, the Piltdown fraud, genetic engineering, and race and racism are presented as examples of current issues in human biology.]

## NS 300 Special Studies for Undergraduates

Fall or spring. Prerequisites: permission of instructor. S-U grades optional.
Special arrangements to establish equivalency for courses not transferred from a previous major or institution. Students prepare a description of the study they want to undertake on a form available from the Student Services Office. The form, signed by both the instructor directing the study and the associate director for academic affairs, is filed at course registration or during the change-ofregistration period.

## NS 306 Nutritional Problems of

 Developing NationsSpring. 3 credits. Prerequisites: NS 115. S-U grades optional.

Lec T R 10:10-11:00. Discussion TBA.
J. D. Haas, M. C. Latham.

The course is designed for undergraduates interested in the nutritional problems of developing countries. Attention is given to the array of nutrition problems encountered, the causes of hunger and malnutrition, the epidemiology of the major nutritional problems afflicting poor nations, the functional consequences of these problems on individuals and societies, and the types of programs that can be implemented to improve health and nutrition.

## [NS 315 Obesity and the Regulation of

 Body Weight (also Psychology 315) Spring. 3 credits. Prerequisites: NS 115 , Psych 101. S-U grades optional. Offered alternate years. Next offered 1995-96T R 1:30-3. D. Levitsky
This course is a multidisciplinary discussion of the causes, effects, and treatments of human obesity. Topics include the biopsychology of eating behavior, genetics of obesity, role of activity and energy metabolism, psychosocial determinants of obesity, anorexia nervosa, therapy and its effectiveness, and social discrimination.]

## N5 331 Physiological and Biochemical

 Bases of Human NutritionSpring. 3 credits. Prerequisites: Biological Sciences 330 or 331 or equivalent. S-U grades optional.

M W F 10:10. M. Stipanuk, C. McCormick. The biochemical and physiological bases for human nutritional requirements, including digestion and absorption, energy metabolism,
food intake regulation, lipids, carbohydrates, protein and amino acids, minerals, vitamins, and relationship of nutrition to major chronic diseases.

NS 332 Methods in Nutritional Sciences
Spring. 3 credits. Each section limited to 18 students. Prerequisites: NS 245, NS 345, NS 331 or concurrent registration. Laboratory preregistration during course preregistration required in room 309 Martha Van Rensselaer Hall. One evening prelim to be scheduled. Lab fee \$25.00.

Lec, M 12:20; labs, M W 1:25-4 or T R
8:15-10:45 or T R 1:25-4. J. T. Brenna, Laboratory introduction to principles and analytical techniques of nutritional research. Emphasis is on analytical concepts and skills required to determine nutrient function and nutritional status of individuals. Topics include methods of nutrient, metabolite, and enzyme analysis in body fluids, and methods for assessing individual food intake and nutritional status.

NS 341 Human Anatomy and Physiology Spring. 4 credits. Letter grade only. Prerequisites: College biology; NS 115 recommended.

M W F 11:15. Labs, R F 9:05-11:00, 1:25-3:30.
Introduction to human anatomy and physiology with particular emphasis on aspects of relevance to nutrition sciences and medicine. All major organ systems will be covered. Laboratories will emphasize location, recognition, and description of anatomical structures and testing of physiological function with an emphasis on tests of nutritional and medical relevance.

## NS 345 Nutritional and Physicochemical Aspects of Food

Spring. 3 credits. Prerequisite: college course in organic chemistry or biochemistry. S-U grades optional.

T R 2:30-3:45. B. Lewis, R. Parker. A study of the nutritional, physical and chemical properties of foods including composition, food structure, enzymic and nonenzymic phenomena, and processing/ preparation aspects. Issues related to food safety, regulation, and food composition data bases will also be discussed.

## NS 347 Human Growth and

 Development: Biological and Behavioral Interactions (also Human Development and Family Studies 347 and Biology and Sociology 347 and Biology and Society 347)Spring. 3 credits. Prerequisites: Biological Sciences 101 or 109 or equivalent; Human Development and Family Studies 115 or Psychology 101 or equivalent. Offered alternate years.

Lec M W 1:25. Disc F 1:25. J. Haas,

> S. Robertson.

This course is concerned with the interrelationships between physical and psychological growth and development in humans, particularly during infancy. Intrinsic and extrinsic causes of variations in growth, including various forms of stimulation, are considered. In addition, the consequences of early growth and its variation for current and subsequent behavioral, psychological, and physical development are examined. The interaction between physical and behavioral or psychological factors is emphasized throughout the course.

## NS 349 Geriatric Nutrition

Fall. 3 credits. Prerequisite: NS 115
T R 2:30-3:45. Division faculty.
Aims of the course are to acquaint students with effects of aging on nutritional needs; to teach them methods of nutritional assessment that are appropriate for use with the elderly; and to give them information on nutritional interventions that have been shown to have positive effects on the nutritional and health status of older individuals.
[NS 361 Biology of Normal and Abnormal Behavior
Fall. 3 credits. Prerequisites: Biological Sciences 101-102, Psychology 101, or permission of the instructor. A fundamental knowledge of biology and psychology is essential. S-U grades optional. Limited to juniors and seniors. Not offered 1994-95.

M W F 10:10. B. Strupp.
A critical evaluation of biological factors thought to influence behavior and/or cognitive functioning. Biological, psychological, and societal influences will be integrated. Topics include nutrition and behavior, psychiatric disorders, developmental exposure to environmental toxins and drugs of abuse, and biopsychology of learning, memory, intelligence, and related cognitive disorders.]
NS 375 Developmental Psychobiology: Motivational Processes (also Psychology 375)
Spring. 3 credits.
T R 10:10. E. Blass
This course examines the principles of behavioral development in mammals. The approach focuses on behavioral ecology by identifying demands that animals must satisfy during development and the resources that are used in so doing. Among these demands are food, water, shelter and warmth

## NS 378 Food, Nutrition, and Service

 ManagementFall. 3 credits. Prerequisites: NS 115, NS 247 or permission of instructor.

T R 8:40-9:55. P. Tennant.
The application of management principles and theory to foodservice operations and nutrition services is discussed. The systems concept of organization is used. Emphasis is placed on leadership development, decision making problem solving as related to procurement, production, distribution, and quality assurance in food and nutrition services. Recipe and menu development projects show the interrelationships of nutrition, labor, equipment, and environmental concerns. Marketing strategies and implementation are discussed.

## NS 380 Integrating Food Systems and Human Nutrition Needs

Spring. 2 credits. Prerequisites: NS 115 or Food 200 or An Sc. 100. Letter grade only. T R 8:40-9:55. G. Combs.
A student-centered course that employs case studies to address concepts linking human nutrition and health issues to those involving systems of food production and distribution. Student teams will investigate new and existing technological options within food systems to address domestic or international human nutrition needs.

## NS 398 Honors in Nutritional Sciences

Fall. 1 credit. Limited to students admitted to the division honors program. S-U grades only

T $2: 30$. M. Kazarinoff and division faculty. Research design. Analysis of research papers on selected topics.

## NS 400-401-402-403 Special Studies for Undergraduates

Fall or spring. Credits to be arranged. S-U grades optional.

Division Faculty.
For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of nutritional sciences not otherwise provided through course work in the division or elsewhere at the university. Students prepare a description of the study they want to undertake on a form to be signed by the instructor directing the study and the associate director for academic affairs. The form, available from the Student Services Office, is filed at course registration or within the change-of-registration period. To ensure review before the close of the course registration or change-of-registration period, students should submit the special-studies form to the associate director for academic affairs as early as possible.

## NS 400 Directed Readings

For study that predominantly involves library research and independent reading.

## NS 401 Empirical Research

For study that predominantly involves data collection and analysis or laboratory or studio projects

## NS 402 Supervised Fieldwork

For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice.

## NS 403 Teaching Apprenticeship

For study that includes assisting faculty with instruction.

NS 421 Nutrition and Exercise Spring. 3 credits. Prerequisites: Bio S 311 or NS 341 and NS 115 or NS 331. S-U grades optional.

M W F 11:15. Division faculty. This course will acquaint students with the interaction between nutrition, exercise, and athletic performance. Topics will cover the biological, psychological, and sociological aspects of nutrition in exercise performance. Students will learn nutritional counseling techniques in educating the recreational and professional athlete, coach, and trainer.
Ns 441 Nutrition and Disease
Fall. 4 credits. Prerequisites: NS 331 and a human physiology course. S-U grades optional.

M W' F 10:10 and F 8. V. Utermohlen. Study of the physiologic and metabolic anomalies in chronic and acute illnesses and the principles of nutritional therapy and prevention. The topics covered include diabetes mellitus, starvation, obesity, nutritional assessment, nutritional pharmacology, severe injury, infection, cancer, gastrointestinal diseases, liver disorders, renal diseases, cardiovascular diseases, and pediatric conditions.
Ns 442 Implementation of Nutrition Care Fall. 3 credits. Limited enrollment. Prerequisites: NS 247, concurrent registration in NS 441 (or equivalent background in either course). Laboratory preregistration during course preregistration required in 309 Martha Van Rensselaer Hall. S-U grades optional.

Lec, M W 9:05; lab 1 T 2:30-4:20, lab 2 R 11:15-1:10. Division faculty.
Development of skills necessary to implement nutrition care plans: interviewing and counseling, theories of nutrition education, dietary assessment, principles of diet therapy and menu planning, and quality assurance are covered.

NS 446 Physiochemical Aspects of Food Fall. 3 credits. S-U grades optional.

M W F 9:05. G. Armbruster.
The relation of food quality to (a) rheological properties of food systems, (b) oxidation and reduction reactions, and (c) enzymatic and nonenzymatic browning. Covers physical and chemical factors accounting for the color, flavor, and texture of natural and processed foods.

## NS 447 Physiochemical Aspects of Food-Laboratory

Fall. 1 credit. Prerequisite: NS 446 or concurrent registration. S-U grades optional.

T 1:25-4:25. G. Armbruster.
Laboratory experiments designed to illustrate the effect of varying ingredients and treatment on the quality of food products. Objective testing methods are used to determine food quality characteristics.

## NS 448 Physiochemical Aspects of

 Food-LaboratoryFall. 1 credit. Prerequisite: NS 446 or concurrent registration. S-U grades optional. R 1:25-4:25. G. Armbruster. Laboratory experiments designed to illustrate (a) the physiochemical behavior of colioidal systems, (b) chemical reactions of some food components, and (c) effects of temperature, pH , moisture, inorganic salts, and enzymes on physiochemical changes in natural foods, food components, and food mixtures.
NS 456 Experimental Foods Methods Spring. 3 credits. Prerequisites: NS 446.

Labs, M W 1:25-4:25. G. Armbruster. Application of the scientific method in the design and performance of experimental food problems and the interpretation and evaluation of results. Evaluation of the use of instruments and chemical and sensory methods in the measurement of food properties. Independent problems.

## NS 457 National and International Food Economics (also Economics 374)

 Spring. 4 credits. Prerequisites: Econ 101 or CEH 110 and junior standing, or permission of instructor. S-U grades optional.M W F 9:05. Discuss section TBA.
E. Thorbecke.

Analysis of the world food economy. Review and analysis of the major economic factors determining the demand for food, the composition of food consumption, and nutritional intake; and the major economic factors affecting food production and supply. Evaluation of effectiveness of various policies and programs in alleviating poverty and malnutrition.

## Ns 488 Applied Dietetics in Foodservice Systems

Spring. 3 credits. Limited to 27 students. Prerequisites: NS 378, Micro 290. Laboratory preregistration during course preregistration is required in room 309 Martha Van Rensselaer Hall. White lab coat is required. Approximately $\$ 25.00$ will be needed for special supplies/activities.
M W 9:05. Labs, M T W 1:30-6:00.
P. Tennant.

Students will gain experience in facility design; equipment selection, use, and care; job analysis and evaluation; human resources planning; management of financial resources; menu planning, recipe development, volume food production; computer-assisted management; employee training; applied safety and sanitation standards and will develop other skills required to operate/manage a foodservice program. The application is stressed. Laboratories will be arranged through Cornell Dining.
NS 498 Honors in Nutritional Sciences
Spring. 1 credit. Limited to students admitted to the division honors program. Students may register in NS NS 499 concurrently.

F 2:30. M. Kazarinoff and division faculty. Informal presentation and discussion of current topics in food and nutrition in which all members participate. Written reports on topics discussed may be requested. Delineation of honors research problems in consultation with faculty adviser.

## NS 499 Honors Problem

Fall and spring. Credits to be arranged. Open only to students in the division honors program.

TBA. Division faculty
An independent literature, laboratory, or field investigation. Students should plan to spread the work over two semesters.

## NS 600 Special Problems for Graduate Students

Fall or spring. Credit to be arranged. Limited to graduate students recommended by their chair and approved by the instructor in charge. S-U grades optional.

Hours to be arranged. Division faculty. Emphasis on independent advanced work
Experience in research laboratories in the division may be arranged.

## [NS 601 Proteins and Amino Acids (also

 Animal Science 601)Spring. 2 credits. Prerequisites: physiology, biochemistry, and nutrition, or permission of instructor. Letter grade only. Offered alternate years. Not offered 1994-95.

W F 12:20. R. E. Austic.
A course in amino acid and protein nutrition, with emphasis on the dynamic aspects of protein digestion, amino acid transport, and amino acid and nitrogen metabolism. Topics also will include nutritional interrelationships of amino acids, amino acid availability and requirements, and the roles of amino acids in selected physiological processes.]

## NS 602 Lipids

## Fall. 2 credits.

T R 11:15. A. Bensadoun. Advanced course on biochemical, metabolic, and nutritional aspects of lipids. Emphasis is on critical analysis of current topics of lipid methodology, lipid absorption, lipoprotein secretion, structure, and catabolism; molecular biology of lipoproteins and their receptors; molecular mechanisms of hormonal regulation of lipolysis and fatty acid synthesis; and cholesterol metabolism and atherosclerosis.

## Ns 604 The Vitamins

Fall. 2 credits.
T R 10:10. G. F. Combs, Jr.
Test-based discussion sessions on nutritional aspects of the vitamins, including recent developments in nutritional and biochemical interrelationships with other nutrients and metabolites.

NS 607 Nutrition as an Integrating Discipline: Concepts and Paradigms Fall. 3 credits. Prerequisite: NS 331 or An Sci 610 and NS 650 , or permission of the instructor.

M W F 10:10. M. Kazarinoff, J-P Habicht, and division faculty.
This course is intended for graduate majors and minors in nutritional sciences who have had prior graduate course work in nutrition. It will cover current nutritional issues from molecular biology to public policy, presenting concepts and paradigms using Vitamin A as an example. Emphasis will be placed on the integration of actual and conceptual information and the use of this information to solve nutritional problems.

## NS 611 Molecular Toxicology (also

 Toxicology 611)Fall and spring. 3 credits. Prerequisite: Toxicology 610 and a full-year 400 -level course in biochemistry or equivalent. S-U grades optional.

Hours to be arranged. Staff. A study of fundamental biochemical mechanisms of absorption, transport, metabolism, and excretion of drugs, carcinogens, and toxicants. Emphasis on oxidative and conjugative pathways of metabolism and of environmental and nutritional factors that influence toxicant metabolism and disposition Methods of evaluating in vivo and in vitro metabolism.

## NS 612 Methods of Assessing Physical

 Growth in ChildrenSpring. 3 credits. Limited to graduate students and students who have permission of the instructor. A previous course in statistics required. S-U grades optional.

Lec, T 1:25; lab, R 1:25-4:25; disc, T 2:15-3:05. J. Haas.
A laboratory course to train students in methods and techniques used to assess the physical growth and development of children. The methods explored are those applicable for field or community studies and cover anthropometry, body composition, skeletal age, maturity indicators, physical fitness, and energy expenditure.

## NS 614 Topics in Maternal and Child

 NutritionFall. 3 credits. Prerequisites: NS 331, and 222 or 347, Biological Sciences 311, and permission of instructor.

T R 8:30-10:00. K. Rasmussen
Advanced course on the role of nutrition during pregnancy and lactation. Feeding and growth of infants and children in health and disease is considered. Critical evaluation of current literature is emphasized.

NS 617 Teaching Seminar
Fall or spring. 0 credit. Limited to division graduate students and students who have permission of the instructor. S-U only.

Hours to be arranged. C. Bisogni, D. Way. Individualized instruction focusing on development of teaching skills for guiding classroom learning in lecture, discussion, and laboratory settings. Preparation of content, presentation, and interaction techniques and evaluative methods are emphasized in relation to the student's specific teaching assignment. Videotape simulations provide opportunity for practice and analysis of teaching behaviors.

## NS 618 Teaching Experience

Fall or spring. 0 credit. Limited to division graduate students and students who have permission of instructor. S-U only.

Hours to be arranged. Division faculty;
C. Bisogni, coordinator.

Designed to provide experience in teaching nutritional sciences by direct involvement in college courses under supervision of a faculty member. The aspects of teaching and the degree of involvement vary, depending on the needs of the course and the experience of the student.

## NS 619 Field of Nutrition Seminar (also

 Animal Science 619)Fall or spring. 0 credit. S-U only.
M 4. Faculty and guest lecturers
Lectures on current research in nutrition.
[NS 620 Food Carbohydrates (also Food Science 620)
Spring. 2 credits. Prerequisites: Biological Sciences 330 or equivalent. Letter grades only. Offered alternate years. Next offered 1995-96.

T R 10:10. J. Brady, B. Lewis. A consideration of the chemistry of carbohydrates, including sugars and complex carbohydrates (starches, pectins, hemicelluloses, gums, cellulose, and glycoconjugates). Emphasis is on intrinsic chemistry, functionality in food systems, and changes occurring during food processing and storage.]

## NS 626 Special Topics in Food

## Spring. 2 credits.

Hours to be arranged. G. Armbruster, B. Lewis.

Current research related to food is reviewed in the context of basic principles and their application to the quality of food.

## [NS 630 Anthropometric Assessment

Spring, weeks 3-5. 1 credit. Prerequisites: NS 331 or equivalent and permission of instructor. Not offered 1994-95.

T 2:30-5:30, S 9-12. J. Haas.
Overview of methods of assessing nutritional and health status, techniques of anthropometry, body composition, energy expenditure and physical performance applicable to children and adults.]

## [NS 631 Dietary Assessment

Fall. 1 credit. 7 weeks only. Prerequisites: statistics and NS 331 or equivalent. Enrollment limited. Not offered 1994-95.

R 2:30-5:30. D. Sanjur.
Study of methods and techniques for assessing dietary intakes at the individual and household levels.]

## [NS 632 Clinical Assessment

Spring. 1 credit. Prerequisites: NS 441, 630, 631, and Biological Sciences 330 or 331; NS 332 or Biological Sciences 430; and permission of instructor. Not offered 1994-95.

T R 2:30-5:30. V. Utermohlen and division faculty.
Study of methods and techniques for clinical assessment of nutritional status and diagnosis of nutritional disorders.]
[NS 633 Human Metabolic Studies
Spring. 1 credit. Prerequisite: NS 331. Limited to 20 students. S-U grades optional Not offered 1994-95.

Hours to be arranged; 6 meetings over a 3 -week period, 2-1/2 hours each. Division faculty.
Lectures cover planning and writing a study protocol; selecting an experimental design;
selecting subjects; designing, preparing, analyzing diets; how to make collections; how to examine data for subject period and treatment effects. Students will participate in a 6-day study.]

## NS 635 Mechanisms of Metabolic

## Regulation (also Biological Sciences

 635)Spring. 2 credits. Prerequisites: Chemistry 358 or 360 and either Biological Sciences 330 or 331 or permission of instructor. Offered alternate years.

T R 9:05. M. N. Kazarinoff. Lectures only. The identification and characterization of regulatory steps in metabolism are considered from both theoretical and practical aspects. The intracellular mechanisms of regulation are stressed, with specific examples examined in detail.

## [NS 636 Integration and Coordination of Energy Metabolism(also Biological Sciences 637)

Fall. 3 credits. Prerequisites: Biological Sciences 330 and 331, or equivalent. Not offered 1994-95.

M W F 9:05. W. J. Arion.
The dynamics of energy metabolism in humans and higher animals are developed through characterizations of how the metabolic components support the structure and function of the individual tissues.
Mechanisms that control and coordinate energy metabolism within and between organs are analyzed in the context of selected physiological and pathological stresses.]

## NS 637 Epidemiology of Nutrition

Spring. 3 credits. Limited to graduate
students. Prerequisites: Statistics and Biometry 602 or 604 or equivalent, NS 331 or equivalent.

Hours to be announced. J.-P. Habicht. Course covers principles of nutritional epidemiology, impact assessment of nutrition intervention programs, and nutritional surveillance. Teaching principles of using nutritional information for decision making, including the levels of evidence about nutrition and health for making decisions. The course shows how the biochemistry and physiology of nutrition can be related to epidemiological assessment and research strategies.

## NS 638 Epidemiology of Nutrition Seminar

Spring. 3 credits. Reserved for graduate students planning field intervention studies; by permission of instructor. Prerequisite: NS 637.

Hours to be announced. J.-P. Habicht. Covers the meta-analysis, design, measurement, and analytic issues involved in developing, implementing, and analyzing studies of field interventions with nutritional impact.

## NS 639 Epidemiology Seminar (also

## Statistics and Biometry 639)

Fall and spring. $0-1$ credit. Limited to graduate students; others by permission of instructor. Contact P. Cassano 255-7551 for permission and credit information. S-U grades only.

M 12:20. P. Cassano.
This course will develop skills in the preparation and interpretation of epidemiological data by discussing current research topics and issues.

## NS 640 Social Science Theories in Nutrition <br> Fall. 3 credits. Limited to 20 graduate

 students.T R 2:30-3:45. J. Sobal.
Social science theories from psychology, sociology, anthropology, economics, political science, geography, and history that contribute to understanding food and nutrition will be examined. Examples of approaches, concepts, and methods from each discipline will be added to understand how to apply social science theories to nutrition topics, issues, and problems.

## NS 641 Applied Regression Methods in

 Nutrition and Human EcologySpring. 3 credits. Prerequisite: Stats 601 or equivalent.

M W F 11:15. E. Frongillo.
Second statistics course intended for graduate students who need to apply regression methodology in nutrition, health, human services, human development, or program intervention. The course covers the conceptual and statistical aspects of regression models for continuous, discrete, and time-toevent response variables with multiple covariates. Interpretation of parameters, confounding and interaction, and assessing fit are emphasized. An introduction to modeling complex observational data with multiple response variables is presented.

## NS 644 Community Nutrition Research

 SeminarFall and spring. Non-credit. S-U only. Fall M 11:15; spring M 12:20. A. Gillespie and Cornell Community Nutrition Program faculty.
This seminar series focuses on research presentations in nutrition education and other areas of community nutrition. Cornell faculty and graduate students and outside invited speakers present research proposals, results from ongoing research, theoretical bases for research, program evaluations, and discuss current programs and issues in community nutrition research. The format varies but always includes discussion by participants.

## NS 645 Nutrition Intervention in

Communlties: A Global Perspective Spring. 3 credits. Limited to 25 graduate students with an interest in human nutrition and health and exceptional senior nutrition majors by permission. Prerequisite: NS 6,40 .

T R 8:40-9:55. C. Olson and nutrition
intervention and policy faculty.
The goal of the course is to help students gain tools and develop conceptual frameworks for thinking critically about nutrition interventions in communities around the world. The course involves extensive reading and active involvement in class discussions.

## NS 646 Seminar in Physicochemical Aspects of Food

Spring. 1-3 credits. Prerequisite: a college course in organic chemistry or biochemistry S-U grades optional.

T R 2:30-3:45; disc to be arranged.
B. Lewis, R. Parker.

An introduction to physicochemical aspects of food, for graduate students who have had limited or no work in this area. The seminar uses the lectures of NS 345 as a basis for supplementary readings and critical review of research on selected topics.

## NS 650 Public Health Nutrition

Spring. 3 credits. For graduate students with a major or minor in nutrition and undergraduate nutrition majors in their senior year. Prerequisite: NS 331 or equivalent.

TBA. Division faculty.
Lectures cover social, environmental, and disease variables that influence the nutrition of infants, children, and adults. Students gain experience in nutritional assessment methods. Endemic nutritional problems (such as obesity, dental caries, and anemias) of public health importance of the United States are discussed.

## NS 659 The Nutrition, Physiology, and

 Biochemistry of Mineral Elements (also Veterinary Medicine 759 and Biological Science 615)Spring (first 7 weeks). 2 credits. Prerequisites: basic physiology, intermediate biochemistry, and general nutrition.

T R 3-4:40. R. H. Wasserman, and
C. C. McCormick.

The objective of this course is to provide students with an insight into the fundamental concepts of mineral nutrition and to highlight the unique aspects of minerals as nutrients. Lectures and discussions focus on absorption, transport, homeostasis, function, essentiality, toxicity, and requirements of key minerals.

## NS 660 Special Topics in Nutrition

Fall or spring. 3 credits maximum each term. Registration by permission of the instructor.

Hours to be arranged. Division faculty. Designed for students who want to become informed in any specific topic related directly or indirectly to nutrition. The course may include individual tutorial study, experience in research laboratories, a lecture series on a special topic selected by a professor or a group of students, and/or selected lectures of another course already offered. Topics may be changed so that the course may be repeated for credit.

## NS 680 International Nutrition Problems, Policy and Programs

Fall. 3 credits. Prerequisite: permission of instructor.

T R 11:15-12:30. M. Latham.
Designed for graduate students who want to learn about the important nutritional problems of developing countries. The major forms of malnutrition related to poverty and their underlying causes are discussed. Emphasis is placed on programs and policies that can assist poor countries and communities to improve their nutritional and health status.

## NS 681 Nutritional and Public Health

 Importance of Human Parasitic InfectionsFall. 2 credits. Prerequisites: graduate student status or permission of instructor. S-U grades optional. Offered alternate years.

M 2:30-4:15. L. Stephenson and staff. Reviews the scientific evidence for relationships between human nutritional status and common human parasitic infections. Concentrates on malnutrition (protein-energy malnutrition, anemia) in developing countries. Parasitic infections emphasized are malaria, hookworm, ascaris, schistosomiasis, and trichuriasis. Format is lecture-discussion.

## NS 683 Field Studies in International/ Community Nutrition

Fall. 1 credit. Graduate student status or permission of instructor required. Strongly recommended for graduate students doing field research. S-U grades only.

Hours to be arranged; 12 class hours on 3 Saturdays. L. Stephenson.
Reviews practical considerations in conducting field research in developing countries,
including (1) seeking fundings, (2) experimental design issues, (3) choice of procedures, and (4) planning for and carrying out data collection. Also includes how to a) construct a C.V., b) write an abstract and prepare a clear 10-minute talk with legible slides (FASEB formation), and c) when, where, and how to publish research results. Extensive handouts. Lecture/demonstration/discussion.
NS 685 Food and Nutrition Policy (also Agricultural Economics 685) Spring. 3 credits. Prerequisites: Consumer Economics and Housing 310 or Consumer Economics and Housing 603 or Economics 311 or 313 or Agricultural Economics 415 or equivalent. Knowledge of multiple regression. S-U grades optional.

M W 1:25-2:35. D. Sahn.
The course will focus on performing economic analysis to examine the role of the state in alleviating malnutrition and poverty in developing countries. The role of macroeconmic and sectoral policies, particularly in agriculture, in affecting prices and incomes of the poor, as well as their nutritional status, will be stressed. In addition, the course will explore the experience of specific intervention programs, such as food subsidies and the role of food aid, in raising incomes and consumption. Methodologies for empirical data analysis and economic modeling will be covered.
[NS 690 Advanced Analytical Chemistry III: Trace Elements and Isotopic Analysis (also Chemistry 628)
Spring. 3 credits. Primarily for graduate students. Prerequisite: Chemistry 288 or 390 , or Chemistry 208 and Physics 102 and Mathematics 112 , or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

T R 10:10. J. T. Brenna.
Modern trace, micro, and surface methods of analysis, including atomic spectroscopy, solids mass spectrometry, high precision isotope ratio techniques, activation analysis, microscopic microprobe, and electron spectroscopy. Applications to biological and solid state problems.]

## NS 698 International Nutrition Seminar

 Fall and spring. No credit. No grades given.R 12:20-1:10. J. Haas, J-P Habicht.
This seminar series consists of presentations by Comell faculty and graduate students, and by outside invited speakers. Speakers cover a range of topics which relate to nutritional problems, policy, and programs in the nonindustrialized countries.

## NS 699 Special Topics in International

 NutritionFall and spring. 3 credits maximum each term. Registration by permission of instructor. Faculty in Program in International Nutrition.
This option is designed for graduate students, mainly those with a concentration in international nutrition, who wish to become familiar with some specific topic related to international nutrition that is not adequately covered in an existing course. It consists usually of tutorial study on an agreed topic. Because the topics change, the course may be repeated for credit.

NS 700 Current Topics in Toxicology (also Toxicology 698)
Fall or spring. $1-3$ credits. S-U' grades optional.

Hours to be arranged. Staff. A discussion of the most current developments in various areas of toxicological research and testing. Faculty and students will participate jointly in evaluating research findings and provide seminars and discussion of such material. For information regarding topic, instructor, and credit, contact the office of the Graduate Field of Environmental Toxicology.

## NS 702 Seminar in Toxicology (also

 Toxicology 702)Fall or spring. 1 credit. S-U grades only F 12:20. Staff
The seminar program covers varied topics in biochemical, genetic, nutritional, veterinary, and regulatory toxicology, ecotoxicology, and environmental chemistry. Included are presentations of basic research studies, fundamental concepts, and research activities involving environmental problems of a toxicological nature. Presentations are given by speakers from Cornell and visitors.

## NS 703 Seminar in Nutritional Science

Fall and spring. 1 credit. S-U grades only. T 12:20 or W 12:20. Division faculty. Presentations of original articles pertinent to the Nutritional Sciences. Students will learn how to make professional presentations and how to critique the presentations by others. In addition, students will leam how to read and interpret original articles published in a wide variety of journals.

## NS 707 Nutrition as an Integrating Discipline: Evaluation, Criticism, Application

Fall. 3 credits. Prerequisites: advanced graduate standing and permission of the instructor. 2-hour class period per week plus discussion and workshop

TBA. M. Kazarinoff, K. Rasmussen. The goal of this course is to provide an integrative capstone learning experience for advanced graduate students with majors or minors in nutrition. Groups of students will focus on a series of special problems in nutrition drawn from those currently faced by nutrition professionals. Special problems may involve assuming the role of consultants, expert committee members or peer-reviewers who are charged with answering questions or formulating recommendations related to research, programs, or policies

## NS 899 Master's Thesis and Research

Fall or spring. Credit to be arranged.
Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.

Hours to be arranged. Division graduate faculty.

## NS 999 Doctoral Thesis and Research

Fall or spring. Credit to be arranged.
Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.

Hours to be arranged. Division graduate faculty.

## FACULTY ROSTER

Arion, William J., Ph.D., U. of N. Dakota. Prof. Armbruster, Gertrude, Ph.D., Washington State U. Assoc. Prof.

Bensadoun, Andre, Ph.D., Cornell U. Prof., Nutritional Sciences/Physiology
Bisogni, Carole, Ph.D., Comell U. Assoc. Prof. and Associate Director for Academic Affairs Brenna, Thomas, Ph D., Cornell U. Asst. Prof.
Brink, Muriel, M.S., Michigan State U. Prof.
Campbell, T. Colin, Ph.D., Cornell U. Jacob Gould Schurman Professor of Nutritional Biochemistry
Chen, Junshi, M.D., Peking Medical College, China. Adjunct Prof
Combs, Gerald F. Jr., Ph.D. Cornell U. Prof.
Crompton, D. W. T., Ph.D., Sc.D., U. of Cambridge (England). Adjunct Prof.
Devine, C., Ph.D., Cornell U. Asst. Prof.
Garza, Cutberto, M.D., Baylor College; Ph.D., MIT. Director and Prof.
Gillespie, Ardyth, Ph.D., Iowa State U. Assoc. Prof.
Haas, Jere D., Ph.D., Pennsylvania State U. Prof.
Habicht, Jean-Pierre, Ph.D., Massachusetts Inst. of Technology. James Jamison Professor of Nutritional Epidemiology
Jonsson, Urban, Ph.D., Chalmers U. Tech. (Sweden). Adjunct Prof.
Kazarinoff, Michael N., Ph.D., Comell U Assoc. Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology
Latham, Michael C., D.T.M.\&H., U. of London (England). Prof.
Levitsky, David A., Ph.D., Rutgers U. Prof.
Lewis, Bertha A., Ph.D., U. of Minnesota. Assoc. Prof.
McCormick, Charles, Ph.D., North Carolina St U. Assoc. Prof.

Nesheim, Malden C., Ph.D., Cornell U. Prof.
Noy, Noa, Ph.D., Tel-Aviv U. (Israel), Assoc Prof.
Olson, Christine M., Ph.D., U. of Wisconsin. Prof.
Parker, Robert S., Ph.D., Oregon State U. Assoc. Prof.
Pearson, Thomas, Ph.D., Johns Hopkins U. Adjunct Prof.
Pelletier, David, Ph.D., The Pennsylvania State U. Assoc. Prof.

Peto, Richard, M.Sc., U. London (England). Adjunct Prof.
Rasmussen, Kathleen M., Sc.D., Harvard U Assoc. Prof.
Rivera, Juan, Ph.D., Cornell U. Adjunct Asst. Prof.
Sahn, D., Ph.D., M.I.T. Assoc. Prof.
Sanjur, Diva M., Ph.D., Cornell U. Prof.
Sobal, Jeffery, Ph.D., U. of Pennsylvania. Assoc. Prof.
Stephenson, Lani, Ph.D., Cornell U. Assoc. Prof.
Stipanuk, Martha H., Ph.D., U. of Wisconsin. Prof.
Stover, Patrick, Ph.D., Med. College of Virginia. Asst. Prof.
Strupp, Barbara, Ph.D., Cornell U. Assoc. Prof.
Thorbecke, Erik, Ph.D., U. of California. H. E. Babcock Professor of Economics and Food Economics
Utermohlen, Virginia, M.D., Columbia U. Assoc. Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology

## Other Teaching Personnel

Frongillo, Edward, Jr., Ph.D., Cornell U. Senior Research Associate
Tennant, Priscilla, M.Sc.Ed., SUNY Cortland, Lecturer

## Joint Appointees

Apgar, B. Jean, Visiting Assoc. Prof., U.S. Plant, Soil, and Nutrition Laboratory/ Nutritional Sciences
Bauman, Dale, Prof., Animal Science/ Nutritional Sciences
Blass, Elliot, Prof., Psychology/Nutritional Sciences
Miller, Dennis, Prof., Food Science/Nutritional Sciences
Van Campen, Darrell R., Assoc. Prof., U.S. Plant, Soil, and Nutrition Laboratory/ Nutritional Sciences
VanSoest, Peter J., Prof., Animal Science/ Nutritional Sciences

Military instruction began at Comell University in 1868 under the provisions of the Morrill Act of 1862. Since that time, officer education has been highlighted by the construction of Batton Hall in 1914, establishment of a formal Reserve Officers Training Corps (ROTC) unit in 1917, and the evolution of a program that, while teaching drill and ceremonies, places greater emphasis on the development of leadership and managerial skills. Throughout the years, Comell's program of officer education has produced many outstanding civilian and military leaders.
The programs of officer education allow the student to prepare for a commission as an officer in either the United States Army, Navy, Air Force, or Marine Corps. Each service program is headed by a senior military officer who also serves as a full professor on the Cornell faculty.

## MILITARY SCIENCE

Lieutenant Colonel Michael Merola, Quartermaster Corps, United States Army, Professor of Military Science and Commanding Officer, U.S. Army ROTC Instructor Group

Captain David G. Johnson, Field Artillery, United States Army
Captain Steven L. Jones, Quartermaster Corps, United States Army
Captain Robert K. Nye, Infantry, United States Army

## United States Army ROTC Program

The primary objective of the Army Officer Education Program at Cornell is to commission the future officer leadership of the United States Army. Intermediate objectives are to provide students with an understanding of the fundamentals of responsibility, integrity, and self-discipline, as well as an appreciation of the citizen's role in national defense. The application of the decision-making process to a variety of situations is given major emphasis as a valuable aid in developing leadership potential.
These objectives are achieved through a program normally covering four years. A twoyear program is available for those who qualify. The program includes specific courses in military science, more general academic subjects that assure a well-rounded education, practical training in leadership through participation in the Cadet Corps (including attendance at one six-week summer camp at an Army installation), and the opportunity to participate in a number of extracurricular activities. The combination prepares the student for commissioning and effective performance in the many branches of the Army. The student's academic major, academic performance, leadership ability, personal desires, and the needs of the Army determine the branch of the Army in which the student is commissioned upon graduation.

## Requirements for Enrolling

Applicants must be citizens of the United States. (Noncitizens may enroll in selected portions of the program.) Students must meet Army medical requirements.
Overall sound mental and physical condition is essential, and students are required to undergo periodic physical fitness tests. Enrollment and continuation in the program is subject to the approval of the professor of military science.
Enrollment in specific courses by students not formally enrolled in the program must be approved by course instructors.
Contracted students must register for lettergrade military science classes and leadership laboratories for the purpose of commissioning assessions into the United States Army.

## Four-Year Program

The Four-Year Program is open to students in their freshman year or, with the approval of military and university authorities, to sophomores in a five-year degree program. Veterans of the Armed Forces of the United States and students entering Cornell with AROTC credit from secondary or military schools (Junior Division AROTC) may receive advanced standing.
Under the Four-Year Program students enroll in the Basic Course (Mil S I and II) during the first two years, and the Advanced Course (Mil S III and IV) during the next two years. A total of twelve credits of military subjects is taken. In addition, academic-enrichment courses are required in such fields as written communications, math logic, computer science, human behavior, military history, and perhaps a foreign language. All cadets attend a six-week camp, with pay, between the junior and senior years. All cadets participate in physical fitness training three days per week.

## Basic Course (Mil S I and Mil S II)

Students in the first year of the Basic Course take one classroom course in military science in the fall and spring semesters, for which they receive academic credit depending upon their college. These courses include study of the U.S. organization for defense and principles and techniques of leadership and management.
Students also participate in leadership modules that include rappelling, orienteering, drill and ceremony, physical training, winter survival, and individual tactical training. These modules are designed to promote personal development and enrichment. While they do not receive academic credit for these activities, students may receive physical education credit. Typical freshman participation in Army officer education is $481 / 2$ program-related hours.
During the fall of the second year, students take a one-credit course in map reading and spend approximately two hours a week in
practical leadership training, land navigation, and military skills. In the spring, students take a one-credit course in the basic principles of small organizations.

## Advanced Course (Mil S III and Mil S IV)

The Advanced Course of the Four-Year Program is open to students who have successfully completed the Basic Course and are accepted by the Professor of Military Science for further enrollment. It is also open to students who have gained appropriate advanced standing through either successful completion of a six-week summer camp or prior military training. Students entering the Advanced Course must have two years of academic work remaining at Cornell or another degree-granting institution. Students must pass required physical and aptitude tests In addition, the past performance and desire of each student is evaluated to determine if he or she has the potential for eventual commissioning.
When students are accepted for the Advanced Course or accept a scholarship, they execute a written contract with the U.S. government. Under terms of the contract, they agree to complete the Advanced Course and to accept a commission if tendered. Concurrently with the signing of the contract, students enlist in the United States Army Reserve for control purposes.
Classroom study in the Advanced Course includes one military science course each semester on such subjects as leadership and management, small-unit tactics, and command and staff organization and functions. The two hours a week of practical leadership training continues, and between the junior and senior years all cadets attend a six-week advanced summer camp currently conducted at Fort Bragg, North Carolina

## Scholarships

Scholarships are awarded on the basis of merit and are available for two, three, or four years. AROTC scholarships are awarded each year to outstanding Basic Camp participants and students in the freshman and sophomore classes. Scholarships pay up to $\$ 8,000$ or 80 percent of tuition and mandatory fees, whichever is greater. Scholarship cadets and Advanced Course cadets also receive $\$ 100$ a month for up to ten months a year. Scholarship cadets receive an additional amount to defray the cost of books.

## Commissioning

All students who successfully complete the Advanced Course, including the advanced summer camp, are commissioned as second lieutenants in the United States Army Reserve or Regular Army upon graduation.

## Service Obligations

ROTC graduates may serve on Active Duty, in the Army Reserve, or in the National Guard, depending upon the needs of the Army and
the desires and leadership abilities of the cadet.

Officers beginning active duty attend the Officer Basic Course (normally ten to sixteen weeks) of their assigned branch. Upon completion of this course, officers are assigned to a unit and location that is determined by the desires of the individual and the requirements of the Army. Those officers selected for reserve duty attend the Officer Basic Course, after which they are released to reserve status.
Nonscholarship cadets accepting a Regular Army commission serve a minimum of three years on active duty followed by five years in reserve status.

Scholarship cadets, whether commissioned in the Regular Army or the Reserve, generally serve four years on active duty and four years in reserve status; however, some may serve eight years on reserve duty

## Choice of Branch

Cadets in the second year of the Advanced Course (normally the senior year) may specify the branch of the Army-such as Infantry, Corps of Engineers, Quartermaster, Medical Science, Field Artillery, Signal Corps, Armor, Chemical, Aviation, Finance, Military Intellience-in which they prefer to serve They are notified in the spring, before commissioning, of the branch to which they are assigned. The likelihood of appointment in a chosen branch depends upon the student's academic and officer education performance, degree area, and the needs of the Army at that time.

## Graduate Study

Active duty deferments, or educational delays, may be granted to individuals who want to attend graduate school at their own expense. Requests will be considered on the basis of needs of the service. Admission to graduate school is the student's responsibility

## Benefits

Each cadet in the Advanced Course (Mil S III and Mil S IV) receives $\$ 100$ a month for up to ten months a year. While attending the advanced summer camp (between the junior and senior years), each cadet receives approximately $\$ 700$ and an allowance for travel to and from camp. A cadet in the TwoYear Program receives the same payments as cadets in the Advanced Course and, in addition, receives approximately $\$ 700$ and travel costs for summer Basic Camp attendance before entering the Advanced Course

## Military Science Courses

All cadets take one course and a leadership laboratory each semester in military science The number of hours a week spent in the classroom varies from semester to semester, as does the credit received for each course.

## Freshman Year (Mil S I)

Mil S 101 United States Organization for Defense
Fall. 1 credit. Required. Staff.
Students examine the U.S. defense structure in terms of organization, mission, personnel, and relationships among military forces and between the military forces and various
branches and departments of the government The United States Army force structure is examined at all levels. The complexities and magnitude of operating the defense organization are studied to provide a framework for subsequent instruction

## Mil S 102 Leadership Theory

Spring. 1 credit. Required. Staff.
This course allows students to develop a basic understanding and appreciation of the theories of social and organizational psychology and behavior as they apply to the military setting. Attention is given to leader types, the source and exercise of authority, and the impact of varying styles of leadership on motivation and organization effectiveness. The student is introduced to the concepts of integrity, ethics, and professionalism.

## Sophomore Year (Mil S II)

Mil S 321 Armed Conflict and Society Fall. 3 credits. Optional. Presentation by Army, Marine Corps, Navy, and Air Force instructors with guest lecturers, primarily from government and history departments. A study of modern warfare that examines the relationship of military strategy to geography, economics, sociology, technology, and national political realities and values; the evolution of warfare, including principles of war, weapons, and associated equipment; and the effects of nuclear weapons and guerrilla warfare on traditional concepts of national strategy. Emphasis is on the American experience

## Mil 5221 Mapping: Land Navigation

 Fall. 1 credit. Required.Staff.
This course provides practical knowledge of the various forms of topographic representation. Students interpret and use maps in terrain association and land navigation Knowledge of topography is complemented by an orientation on significant environmental influences from physical, social, and climatic factors. Portions of the course offer practical experience in land navigation and orienteering

## Mil S 222 Small Organizational Operations

Spring. 1 credit. Required. Prerequisite: Mil S 102 or instructor approval Staff.
Students learn the basic principles of group dynamics at the level of the smallest military unit, the squad. Troop-leading procedures are introduced through case studies and roleplaying exercises. Leadership theories introduced in Mil S 102 are examined in a variety of realistic settings. The practical application of behavioral theories is explored in the context of small military organizations.

## Junior Year (Mil S III)

Mil S 331 Theory and Dynamics of the Military Team
Fall. 2 credits. Required Staff.
After an initial introduction to techniques of presenting briefings, students are provided with a broad understanding of the principles and application of teamwork in military organizations. Particular emphasis is given to leadership responsibilities of the commander as the team coordinator. Additionally, students have an opportunity to develop an
understanding of the roles and contributions of the various branches of the Army in support of the military team.

## Mil S 332 Leadership in Small-Unit Operations

Spring. 2 credits. Required. Prerequisite: Mil S 331

Staff.
This course provides an understanding of the nature of decision making and the tactical application of the military team. Through the use of conferences and extensive practical exercises, students develop familiarity with the factors influencing a leader's decisions; the processes of planning, coordinating, and directing the operations of military units through operation plans and orders.

## Senior Year (Mil S IV)

Mil S 441 Contemporary Military Environment I
Fall. 2 credits. Required
Lieutenant Colonel M. Merola and staff
An overview of the functions, responsibilities, and interrelationships among small-unit leaders, the commander, and the staff Detailed discussions focus on actions of smallunit leaders, communication skills, the military justice system, and the logistical support of the army in the field.

## Mil S 442 Contemporary Military Environment II

Spring. 2 credits. Required.
Lieutenant Colonel M. Merola and staff. A continuation of Mil S 441. Students examine the leadership environment of the Army officer. Conferences and seminars examine the techniques of effective military leadership with special attention given to professionalism and ethical considerations in the armed forces during peacetime and armed conflict.

## Practical Leadership Training

## All Army Officer-Education Students

As with many laboratory periods, no credit is given, and participation is required for successful completion of the AROTC program. Students may receive physical education credit for the laboratory.
Each semester, cadets register for the appropriate leadership laboratory, consisting of physical fitness training three times per week, two hours of military training each week, and one or two weekend training exercises per semester.

## Mil S I Leadership Laboratory I

Fall. Spring.
0 credits. S/U. 0 credits. S/U.
Mil S 151
Mil S 152
Mil S I cadets meet for two hours each week to learn a variety of military skills including rappelling, first aid, drill and ceremonies, military skiing, and weapons familiarization.

## Mil S II Leadership Laboratory II

## Fall. Spring

0 credits. S/U. 0 credits. S/U.
Mil S $251 \quad$ Mil S 252
Cadets meet for two hours each week as members of the cadet organization to participate in practical leadership exercises. Types of practical activities include familiarization in rifle marksmanship, orienteering, drill and ceremonies, signal communications, physical fitness training, first aid, tactics and field exercises.

Mil S III Leadership Laboratory III
Fall. 0 credits. Spring. 0 credits.
Required. S/U
Required. S/U.
Mil S 351
Mil S 352
Cadets meet for two hours a week and some weekends to prepare for a six-week summer camp that follows the junior year. Emphasis is on the development of individual skills in leadership techniques and practical skills. Cadets rotate through leadership positions to develop an ability to apply decision-making processes to a myriad of situations. Cadets also acquire technical expertise and proficiency in signal communications, physical fitness, drill and ceremonies, rappelling, orienteering, tactics, water survival, and other military skills

Mil S IV Leadership Laboratory IV
Fall. 0 credits. Spring. 0 credits.
S/U. Required.
Required. $\mathrm{S} / \mathrm{U}$
Mil S 451
Mil S 452
Senior cadets plan and operate the leadership laboratory programs for Mil S I-III cadets
The development of planning and supervisory skills is emphasized. Cadets have an opportunity to practice leadership skills developed during previous ROTC training and summer camp experiences. This also includes two to three hours a week devoted to physical fitness.
Mil S V Leadership Laboratory $\mathbf{V}$
Fall. 0 credits.
Spring. 0 credits.
S/U.
S/U.
Mil S 551
Mil S 552
A continuation of Leadership Lab IV expressly for those cadets who need additional leadership skill development as determined by the Professor of Military Science. Enrollment is by instructor approval only.

## Professional Milltary Education (PME) Requirements

In addition to the ROTC classes and leadership laboratories above, a number of courses are required as part of the contracted student's academic program. These courses are offered by the university and round out the student's professional education. The PME component of the ROTC program requires at least one college course in each of the following areas: human behavior, written communication skills, military history, math logic, and an introduction to computers. These courses must be completed prior to graduation and commissioning. Courses that meet these requirements are approved by the Professor of Military Science.

## NAVAL SCIENCE

Captain M. Kehoe, United States Navy, Professor of Naval Science and Commanding Officer, Naval ROTC Unit
Commander L. Landon, United States Navy
Major S. W. Dowling, United States Marine Corps
Lieutenant C. D. Myers, United States Navy Lieutenant K. F. Bernier, United States Navy Lieutenant J. J. Gordon, United States Navy The objective of the Naval Officer Education Program is to prepare selected students for service as commissioned officers in the United States Navy or United States Marine Corps by supplementing their undergraduate education
with instruction in essential concepts of naval science and fostering development in the qualities of leadership, integrity, and dedication to their country and the naval services. The program is compatible with most undergraduate major fields of study, including five-year baccalaureate degree programs on a case-by-case basis.
The objective is achieved through a broad program, normally covering four years, that combines specific courses in naval science and specified academic subjects to supplement weekly professional development sessions in which the practical aspects of naval science and leadership procedures are stressed. It also includes at least one summer-at-sea period.
Non-naval officer education students: Though the Navy-Marine Corps program has been designed to prepare future officers, Naval science courses are open to all students at Comell University as space limitations allow.

## Requirements for Enrollment

An applicant for the Naval ROTC program at Cornell must be a citizen of the United States. Applicants must have reached their seventeenth birthday by June 30 of the entering year and the less than twenty-five years of age on June 30 of the calendar year in which they are commissioned. Waivers of the upper age limit may be available for applicants who have prior active duty military service. Applicants must also meet physical and medical requirements. Interested students can visit the Naval ROTC Unit in Barton Hall or contact their local recruiter.

## Programs

There are two programs: the Scholarship Program and the College Program. They differ primarily in benefits to the student and type of commission earned.

## Scholarship Program

The Scholarship Program provides approximately one thousand scholarships in more than sixty universities nationwide to selected students who want to serve in the Navy or Marine Corps. Financial support is provided students during college preceding the award of the haccalaureate degree.

## Benefits

The program offers several different scholarships, including three- and four-year full tuition and four-year 80 percent tuition. While on scholarship, students also receive money for instructional fees, textbooks, nonconsumable supplies, and a $\$ 100-\mathrm{a}$-month stipend for a maximum of forty months.
Successful completion of the Scholarship Program leads to a commission in the Navy or Marine Corps. At Comell University over 90 percent of NROTC students have a scholar ship. Students entering NROTC without a scholarship are entitled to compete for two- or three-year scholarships controlled by the Chief of Naval Education and Training.

## Entering the Scholarship Program

There are three ways to enter the Scholarship Program:
First, by applying for the national competition each year. This process entails filling out and
sending an appropriate application; being interviewed; having a physical examination; and applying to, and being accepted by, one of the colleges or universities throughout the country that offers an NROTC program.

Second, by enrolling in the College Program at Cornell and being recommended by the Professor of Naval Science for a scholarship after at least one semester in the program.
Third, by entering through the Two-Year Scholarship Program

## College Program

There are two College Programs available. Both lead to a commission in the Naval or Marine Corps Reserve and a minimum of three years of active duty.
Each of these programs provides textbooks for naval science courses, uniforms, and a subsistence allowance of $\$ 100$ a month from the beginning of the junior year.
The regular College Program is four years long. Academic requirements for students in this program are somewhat less than those for scholarship students, as noted in the curriculum section of this booklet.
The Two-Year College Program begins the summer before the junior year, when students attend a required program with pay at the Naval Science Institute in Newport, Rhode Island.

## Summer Training

Each summer, students in the Scholarship Program spend approximately four to six weeks on a Navy ship or with a naval activity anywhere in the world for on-the-job training. College Program students attend one summer training session of the same duration between the junior and senior years.

## Active Duty Requirements

As required by Section 2107 , Title 10, United States Code, selected applicants must enlist in the United States Naval Reserve for eight years in pay grade E-1 (seaman recruit) when being appointed Midshipman, USNR, and receiving compensation. Students who are disenrolled from the NROTC Scholarship Program for reasons beyond their control will, upon disenrollment, be discharged from their enlisted status. It should be understood that two years' active enlisted service may be required of those students who default on the terms of their NROTC contract after the beginning of their sophomore year.
Scholarship midshipmen commissioned in the Navy or Marine Corps Reserve serve on active duty for a minimum of four years. College program midshipmen commissioned in the Naval or Marine Corps Reserve serve a minimum of three years on active duty. Specialized training such as aviation or nuclear power following commissioning adds additional active duty requirements in some cases.

## Choice of Assignment

Graduates have an opportunity to request the duty they prefer upon graduation. These requests are given careful consideration, and every effort is made to assign the newly commissioned officer the duty of his or her choice.

Among the types of assignments are duty in nuclear propulsion for surface ships and submarines, naval aviation, and conventionally powered surface ships. Other specialties are available on a limited basis.

## Marine Corps Options

The United States Marine Corps is an integral part of the Naval Services and is commanded by the Commandant of the Marine Corps. One-sixth of the NROTC scholarship students may be Marine selectees who will be designated Marine-option midshipmen. Upon successful completion of the program they will be appointed second lieutenants in the United States Marine Corps Reserve.

Marine-option midshipmen follow the same program as other NROTC midshipmen for the first two years. Beginning with the junior year, Marine-option midshipmen are taught Marine oriented courses by a Marine Officer Instructor. For first class summer training (after the junior year), known as the USMC Officer Candidate School, Marine-option students travel to Quantico, Virginia, where they undergo six weeks of intensive training Upon commissioning the following year as second lieutenants, they are assigned to the Basic School at Quantico, Virginia. After the Basic School, the Marine officer is assigned duty in a variety of occupational fields. Among the duties available are Infantry, Aviation, Artillery, Tracked Vehicles, Engineers, Communications, Electronics, Supply, Administration, and Computer Science. The officer may serve on board naval vessels or at shore installations of the Marine Corps or Navy, in this country or overseas.
The Marine Corps has a postgraduate training system similar in objectives and organization to that of the Navy. Marine officers selected for aviation receive flight training at the Naval Air Station, Pensacola, Florida, along with their Navy counterparts.

## Curriculum

A student has three categories of requirements to fulfill as a midshipman. The first of these requirements is a weekly naval professional development session each semester. The second requirement is a naval science course each semester. The last set of requirements consists of other required courses prescribed by the Navy to meet the growing need for more and better technically educated junior officers.

## Naval Professional Laboratories

Nav S 141-142, 241-242, 341-342, or 441-442
All students in the program participate in one ninety-minute professional development session each week. The session is held from 2:30 until 4:00 on Wednesday afternoon. This period consists of both drill and professional information briefings. Students gain experience in actual leadership situations and at the same time learn the fundamentals of seamanship, military formations, movements, commands, discipline, courtesies, and honors During information briefings special emphasis is given to applied leadership as it relates to the administrative and managerial aspects of a Navy or Marine Corps officer's duties.

## Naval Science Courses

All Navy and Marine midshipmen take one naval science course together each semester during their freshman and sophomore years Navy-option students continue to take a naval science course each semester during their junior and senior years. Marine-option students are required to take the History of Amphibious Warfare and the Evolution of Warfare courses in either their junior or senior year, depending on when the courses are offered

## Freshman Year (Navy and Marines)

Nav 5101 Fundamentals of Naval Science

## Fall. No credit

Two one-hour classes each week (lecture).
LT John Gordon, USN.
A study of fundamental aspects of naval science, including its contributions to sea power, factors and different warfare communities involved in the physical development of naval forces, resources that must be managed, and prospects for the future. Naval uniforms, customs, and traditions are covered.

## Nav 5102 Sea Power and Maritime

 AffairsSpring. 2 credits
Two one-hour classes each week. LT Kevin Bernier, USN.
Discussions examine the history of the Navy as a force in diplomacy. Relationships between Congress and the military for determining the national defense policy are also explored. An integrated examination of current events and issues gives a historical perspective throughout the course.

## Nav S 157 Principles of Sailing

Fall and spring. Physical education credit
One class each week.
Instruction in basic sailing skills and safery principles. Students sail small boats on Cayuga Lake, weather permitting. Focus is on U.S. Navy Class B inshore skipper certifications.

## Sophomore Year (Navy and Marines)

Nav S 201 Organizational Behavior and Small Group Processes (also Hotel Administration 115)
Fall. 3 credits.
See description for Hotel Administration 115.

## Nav S 202 Naval Ship Systems I (also Mechanical and Aerospace Engineering 101)

Spring. 3 credits. Two lecture classes each week.

Prof. M. Louge, LT John Gordon, USN. An introduction to primary ship-systems and their interrelationship. Basic principles of thermodynamics, propulsion, mechanical operation, internal communications, electronics, ship structure, and other marine systems are considered.

## Junlor Year (Navy)

## Nav S 301 Principles of Navigation

 (also Agricultural Engineering 305)Fall 4 credits
Four classes each week (lecture-recitation-
project work). LT Christopher Myers, USN. An introduction to the fundamentals of marine navigation emphasizing piloting and celestial navigation procedures. The course covers coordinate systems, chart projections, navigational aids, instruments, compass
observations, time, star identificaiton, use of the nautical almanac, tides and currents. Electronic navigation systems are also briefly discussed

## Nav S 302 Naval Operations

Spring. 3 credits.
Three lectures each week. LT Christopher Myers, USN
The course covers the application of the nautical rules of the road and maneuvering board in order to avoid collisions at sea. Other aspects of naval surface ship operations that are introduced include visual and electronic communications methods, tactical disposition of forces, ship handling theory, and deck seamanship topics.

## Senior Year (Mavy)

Nav S 401 Naval Shipa Systems II (Weapons)
Fall. 3 credits.
Two classes each week. LT Kevin Bernier, USN.
The principles and theories used in the development of naval weapons systems are examined. Initially, extensive study is made of sensing and detection systems, especially radar and sonar, followed by discussions of ancillary systems for computing, tracking, stability, and weapons control and delivery.

## Nav S 402 Leadership and Management

 IISpring. Two credits.
Two classes each week.
CDR Larry Landon, USN
A variety of topics important to the naval officer for both professional and managerial development are reviewed. The material is directed at the midshipman for understanding naval administration and for use in the role of the division officer in counseling subordinates. Through the use of lectures, situation problems, and role playing, the student will learn about the various aspects of Navy management and administration.

## Junior or Senior Year (Marine Options)

## Nav $\$ 310$ Evolution of War

Fall. 3 credits
1 seminar class each week. Major Steven W. Dowling, USMC

A study of warfare that examines the relationship of military strategy to geography, economics, sociology, technology, and national political realities and values; the evolution of warfare, including principles of war, weapons, and associated equipment; and the effects of nuclear weapons and guerrilla warfare on traditional concepts of national strategy.

## Nav 5410 History of Amphibious

 WarfareSpring. 3 credits.
1 seminar class each week. Major Steven W. Dowling, USMC.

The history of the development, theory, techniques, and conduct of amphibious operations from 490 B.C. to the present. Special emphasis will be on amphibious operations conducted in the central Pacific during World War II and the future of amphibious operations

## Other Required Courses

## Navy Option Scholarship Program

To be eligible for a commission in the United States Navy, midshipmen must successfully complete all the requirements for a baccalaureate degree in any field of study offered by Cornell University and complete courses in the following subjects (specified courses to be approved by the Professor of Naval Science):
American military affairs or national security policy (one semester)
English (one year)
calculus (one year)
calculus-based physics (one year)
computer science (one semester)
modern foreign language (one semester)--this requirement may be waived by the Professor of Naval Science under some circumstances.
The calculus requirement must be satisfied by the end of the sophomore year and the physics requirement by the end of the junior year.

Although free choice of academic majors is permitted, students are encouraged to pursue majors in engineering and the physical sciences to meet the technological requirements of the modern Navy.

## Havy Option College Program

Navy-option College Program students must complete one year of college-level study in mathematics, physical science, and English as a prerequisite for commissioning. The mathematics course must be completed by the end of the junior year; the physical science course by the end of the senior year. In addition, one term of computer science is required. College Program students who desire entry into the Navy-option Scholarship Program should fulfill all of the requirements applicable to Navy-option scholarship students to be eligible and competitive for a scholarship controlled by the Chief of Naval Education and Training.

## Marine Option

Any midshipman, in either the Scholarship Program or the College Program, who completes all of Comell University's degree requirements in any academic major is eligible for a commission in the United States Marine Corps or United States Marine Corps Reserve. Marine-option students take the same naval science courses and naval professiona! laboratories as Navy-option students for the freshman and sophomore years. During the junior and senior years, Marine-option students meet with the Marine officer instructors for naval professional laboratories and take two naval science courses. In addition, two semesters of courses (a minimum of three hours each) in the subject area of American Military Affairs or National Security Policy are required. One semester of a modern foreign language must be completed.

## University Courses

A wide range of courses satisfy Naval ROTC specified courses. Students should consult their naval science adviser concerning appropriate course selections. A partial list of those Comell University courses that meet academic requirements of the program follows.
Calculus
Math 111, and 112 or 122 Calculus
Math 191 and 193 or 192 Calculus for Engineers

## Physics

Phys 112 or 116, and Phys 213 or 217
Phys 207-208 Fundamentals of Physics
Computer Science
Engr 100 Introduction to Computer Programming
Com S 100 Introduction to Computer Programming
Com S 102 Introduction to Microcomputer Applications
ABEN 102 Introduction to Microcomputer Applications
EDUC 247 Instructional Applications of the Microcomputer
American Military Affairs or National Security Policy
An updated list of courses satisfying the prerequisites of this category is published annually.
English
Fulfilled by completing freshman writing
seminar course requirements.

## Extracurricular Activities

The NROTC midshipman at Comell is offered a broad range of activities, including sail training and a comprehensive intramural sports program in which most midshipmen participate. The unit has won the Independent Division All Sports Trophy for fifteen of the last twenty-one years. Midshipmen participate in a myriad of social events, including the annual Navy/Marine Corps Birthday Ball.

## DEPARTMENT OF AEROSPACE STUDIES

Colonel Cecil L. Eason, Jr., United States Air Force, Professor of Aerospace Studies and Commander, Air Force ROTC Detachment 520
Captain Troy D. Vokes, United States Air Force
Captain Kelvin E. Kupfer, United States Air Force
Captain David A. Levy, United States Air Force
The objective of the Air Force officer education program at Cornell is to prepare men and women for positions as officers in the United States Air Force. The program is designed to teach students about the mission and organization of the Air Force, the historical development of airpower, and leadership and management. Additionally,
students study national security policy and formulation and the role of the military in a modern democratic society. The objectives are achieved through either a four-year or a two-year program. These programs include specific courses in aerospace studies and practical laboratories.

## Requirements for Enrollment

The Air Force officer education program is open to any qualified undergraduate or graduate student enrolled in any major field of study. The student's academic course of study is often a prime factor in determining the kind of career pursued in the Air Force. (See Air Force Careers, below.)

Applicants must be United States citizens. Noncitizens may enroll and will receive certificates acknowledging completion of the course but cannot receive a commission.
Applicants who are interested in flying (as pilot or navigator) or missile duty should make that request known at the time they enter the program.
All applicants receive physical examinations at no cost and must meet certain physical requirements to be accepted. Students who are interested in qualifying for flying categories (pilot or navigator) must meet more stringent physical requirements. In addition, students enrolled in the commissioning program must meet specified physical fitness requirements.
Though the program is designed to prepare future Air Force officers, Department of Aerospace Studies academic courses are open to all students at Cornell.

## Four-Year Program

The Four-Year Program is open to all qualified freshmen. Sophomores may enter the program but require departmental approval. Students in a five-year degree program may enroll in their freshman, sophomore, or junior year.
Veterans of the U.S. armed forces and students entering Cornell from military schools may receive advanced standing, subject to approval by the Professor of Aerospace Studies.
The Four-Year Program consists of the General Military Course (GMC) and the Professional Officer Course (POC). For scholarship cadets, the first year of the GMC carries no military commitment, and students may withdraw at any time. For nonscholarship cadets, both years of the GMC carry no military commitment, and students may withdraw at any time.

## General Military Course

Students in the General Military Course (GMC) take one credit of classroom work offered by the Department of Aerospace Studies each semester. During the freshman year the student examines the organization and mission of the United States Air Force and the role of U.S. military forces in the contemporary world. In the sophomore year, the student studies the history and development of military aviation and American air power. In both years, officership and professionalism within the United States Air Force are emphasized.

Students also spend 2 hours a week in a leadership laboratory. Leadership laboratory provides cadets with the opportunity to put into practice those skills they learn in their aerospace studies classes. These laboratories focus on the development of officer qualities through such activities as drill and ceremonies, group leadership problems, confidencebuilding exercises, and guest lecturers. In addition, all students participate in summer field training for four weeks between their sophomore and junior years.

## Professional Offlcer Course

The Professional Officer Course (POC) is a two-year advanced course of instruction. Students who are accepted for the POC must have successfully completed or validated the basic course and must meet academic and physical standards. Each cadet accepted into the POC must sign an agreement to complete the program and accept, if tendered, a commission in the United States Air Force on graduation.
Classroom study in the POC requires three hours a week each semester. In the junior year, cadets study Air Force leadership and management at the junior officer level. During the senior year, cadets study the elements of national security and the military's role in American society. Leadership laboratory requires 2 hours a week in the junior and senior years. In leadership laboratory, cadets are exposed to advanced leadership experiences and apply principles of leadership and management learned in the classroom.

## Two-Year Program

The Two-Year Program consists of the last two years (Professional Officer Course) of the regular Four-Year Program plus a six-week summer training course preceding enrollment (Details of the Professional Officer Course are given above.)
The Two-Year Program is open to all qualified students with two years of academic study remaining at Cornell (graduate or undergraduate) or at schools under crosstown agreement. Applications are accepted from October through April of the academic year preceding the applicant's planned entry into the program. Selectees are then required to successfully complete a six-week summer training program at government expense.

## Scholarships

Air Force ROTC offers four-year scholarships on a competitive basis in specified majors to high school seniors. Scholarship information can be obtained from a high school guidance counselor, from Air Force ROTC officers at a campus offering Air Force ROTC (Cornell AFROTC phone number is 607-255-4004), from a local Air Force recruiter, or from AFROTC/RROO, Maxwell AFB, AL 361126663. The deadline for submitting a four-year scholarship application is December 1 of the year preceding the academic year in which a student wants to enter the program. Students should apply early
Scholarships for 2 and 3 years also are available to college students. Applications for these scholarships should be made to the Professor of Aerospace Studies during the freshman or sophomore years of college.
selections are based on the student's major scores achieved on the Air Force Officer Qualifying Test, the student's overall grade point average, and the rating from an interview board composed of Air Force ROTC staff officers. Scholarship amounts range from $\$ 2,000$ per year to full tuition and provide a $\$ 100$ monthly nontaxable allowance during the school year. In addition, scholarships pay for the cost of all required course textbooks. Scholarships do not include the cost of room and board.

## Fees

An initial uniform deposit of $\$ 50$ is required on entry into AFROTC. There are two subsequent $\$ 50$ uniform payments clue, one on entry into the POC and the final one before commissioning, at which point the cadet owns the uniform

## Benefits

All cadets in the advanced program (POC)whether they are on scholarship or notreceive a $\$ 100-\mathrm{a}$-month, nontaxable subsistence allowance during the academic year. During the four- or six-week summer field training (see below), each cadet receives the pay allowance authorized by current directives, plus an allowance for travel to and from the field site. Textbooks and most supplies required for Department of Aerospace Studies courses are provided.
All cadets are eligible to participate in AFROTC-sponsored field trips made to Air Force bases throughout the country. Scholarship and advanced cadets (POC) are entitled to space-available travel on Air Force aircraft flying within the continental United States.

## Field Training

There are two types of field training: a fourweek course for cadets in the Four-Year Program and a six-week course for Two-Year Program applicants. Students in these programs normally attend field training between their sophomore and junior years. Field training is hosted each summer by several active Air Force installations.

Field training is designed to stimulate the development of military leadership skills through meaningful experiences. The curriculum consists of aircraft, aircrew, and survival orientation; junior officer training; physical training; small arms training; a socialactions program; and supplemental training. Special emphasis is placed on career orientation and interaction with other young officers in fields of interest to the student. The six-week training program is unique because it has an additional sixty hours of Air Force ROTC academic course work that substitutes for the freshman and sophomore Aerospace Studies courses.
Pilot candidates attend a three-week light aircraft training program between their junior and senior years. Objectives of the program are to train and motivate qualified cadets toward a rated career and to screen those cadets who have the potential to become Air Force pilots.

Between the junior and senior years, cadets may volunteer for one of many Advanced Training Programs. These programs include the Professional Development Program, Army

Airborne Training, Air Force Academy FreeFall Parachute Training, Cadet Training Officer (CTO) Program, the British Royal Air Force (RAF) Exchange Program, Research and Development Experiences, the Academy Soaring Program, and Academy Survival Training.

## Commissioning Obligations

All students who successfully complete the AFROTC advanced program (POC) and who are awarded a baccalaureate degree and are tendered a commission enter the Air Force as second lieutenants.

Second lieutenants commissioned in nonflying categories are required to serve on active duty for four years. Pilots are required to serve on active duty for eight years after completing flying training and receiving their aeronautical rating. Navigators serve six years after completing training. Some newly commissioned officers are allowed to postpone active service to earn advanced degrees through the Administrative and Educational Delay Programs. Limited numbers of active duty assignments to graduate school in engineering and scientific disciplines may also be available in return for an additional active duty service commitment.

## Air Force Careers

Air Force policy has been to assign new officers to a career field appropriate to their educational background. Students in the engineering-scientific category may be assigned to practice in their specialty in research and development, communications, electronics, aeronautics, astronautics, the biological sciences, computer design and maintenance, meteorology, space, or various other engineering and scientific fields. Those graduating in the nontechnical category can anticipate assignments in manpower management, information management, logistics, police and investigation, intelligence, personnel, transportation, accounting and finance, and numerous other career fields They will use their educational backgrounds in positions of responsibility and be given the opportunity to further their development in leadership and management skills.
Any undergraduate major is suitable for those who are qualified and interested in becoming pilots or navigators. After completion of flying training, rated personnel are assigned to a specific type of aircraft.

## Curriculum

Students in the Four-Year Program are required to take all courses listed below Students in the Two-Year Program are required to take all of the courses listed for the junior and senior years.

## Freshman Year

Air S 161 Aerospace Operations
Fall. 1 credit.
One class each week.
The aerospace forces of the United States are studied with emphasis on the organization and resources of the United States Air Force. The elements of strategic offensive, defensive general-purpose, and aerospace support forces throughout the world are also studied.

Air $\mathbf{S} 162$ United States Military Forces Spring. 1 credit.

One class each week.
A study of current U.S. military forces with emphasis on the analysis of the doctrine and mission of the United States Air Force. Army and Navy operations, as contributions to the total national defense, are reviewed. Current factors affecting today's professional military officers are considered

## Sophomore Year

Air S 211 Development of Military Aviation
Fall. 1 credit.
One class each week.
The course studies the development of American air power from World War I through World War II. it concentrates on the evolution of thought on the proper way to employ air power to meet national security objectives. The course addresses the many factors that influenced air-power thinking. The course also examines the employment and effectiveness of air power in the two world wars and assesses major lessons learned.

Air \$ 212 American Air Power since 1947 Spring. 1 credit

One class each week
The course examines the employment of the United States Air Force since World War II in support of national objectives. The role and effectiveness of air power in the Korean conflict, the Vietnam War, and the Gulf War are examined. Emphasis is placed on the factors that most influenced the development of air power

## Junior Year

Air S 331 Air Force Leadership and Management, Part I
Fall. 3 credits.
Two classes each week.
This course is divided into three major parts Part I is an introduction to effective written and oral communication skills. Communication skills are practiced and developed throughout the course. The second part is an analysis of the principles of war, including a discussion of Air Force doctrine. The final portion of the course focuses on the basics of total quality management and its application within a military organization. Student-run seminars, case studies, and oral and written assignments are required.

## Air S 332 Air Force Leadership and Management, Part II

Spring. 3 credits.
Two classes each week.
An introductory course dealing with officer professional development (OPD), leadership, and ethics. Written and oral communication skills are emphasized throughout the course OPD discussions focus on the USAF officer promotion, education, and assignment processes. Leadership is explored through analyzing various leadership styles and determining the impact they have on human motivation and organizational effectiveness. Attention is given to the responsibilities of command. Finally, ethics discussions define acceptable ethical behavior and morality, and center on their necessity while serving in the United States Air Force. Student-run seminars, case studies, and oral and written assignments are required.

## Senior Year

Air S 401 National Security Forces in Contemporary American Society I

## Fall. 3 credits.

Two classes each week
This is an advanced course on U.S. national security policy actors and processes, and current international politico-military issues affecting American security interests. Primary topics of discussion include the role of force in the nuclear age, Executive Branch national security decision-making; and specific issues such as low-intensity conflict, alliances, international forces and peacekeeping, arms control, and terrorism. Roles and missions of the U.S. Air Force in support of U.S. national security objectives are also examined.

## AS 402 National Security Forces in Contemporary American Society II

## Spring. 3 credits.

Two classes each week
This course is a continuation of AS 401. Students explore the challenges to and opportunities for U.S. national security from a regional standpoint. By examining U.S. relations with and interests in the Commonwealth of Independent States, East Asia, The Middle East, Sub-Saharan Africa, and Latin America, students gain an appreciation for the importance of these regions for American national security policy. Special topics in officership, military law, and communicative skills prepare senior cadets to assume responsibilities as new second lieutenants in the United States Air Force.

## Leadership Laboratory Courses

All Air Force cadets spend 2 hours a week throughout the academic year in a leadership laboratory, for which no academic credit is given. Occasionally laboratories are held at times other than the normally scheduled period. All cadets are expected to participate in an evening dining-in and to meet minimum physical fitness and weight standards each semester. Leadership lab is open to students qualified to compete for an Air Force commission.

## Air 5 141-142 Initial Military

 ExperiencesIntroduction to the responsibilities, life, and work of an Air Force officer. Basic knowledge of drill and ceremonies, military courtesies, and the wearing of the uniform. Field trip to a local military installation.

## Air S 241-242 Intermediate Military

 ExperiencesDevelops skills in giving commands for drill and ceremonies. Introduction to the Air Force base environment in which the Air Force officer functions. Includes a look at career areas available based on academic majors. Sudents experience and participate in leadership situations through military drills and ceremonies. Field trip to a local military installation.
Air s 341-342 Junior Officer Leadership
Cadets assume leadership responsibilities similar to those of a junior officer. Emphasis is on comprehending the importance of applying effective human relations in dealing with superiors, peers, and subordinates. Cadets also gain insight into the general structure and progression patterns common to selected Air Force officer career fields.

## Air S 441 Advanced Leadership

 ExperiencesCommand leadership in operating a military organization. Cadets apply effective leadership and managerial techniques with individuals and groups and participate in selfanalysis of leadership and managerial abilities.

Air S 442 Precommissioning Laboratory
Factors that facilitate transition from civilian to military life are reviewed. The need for military security, base services and activities, personal finances, travel regulations, and social obligations are introduced.

## DEPARTMENT OF PHYSICAL EDUCATION AND ATHLETICS

## ADMINISTRATION

Alan E. Gantert, director
George S. "Jack" Writer, assistant director

## COURSES

The courses and fees described in this catalog are subject to change or cancellation at any time by official action of Cornell University.
Enrollment in any course is limited by the space available. Other restrictions are included in the course description. Most courses are coeducational. The specific time and place of class meetings, as well as information about fees, are available at physical education course registration. Course fees are billed through the Office of the Bursar
Additional course offerings may be listed at registration, as the curriculum is frequently reviewed and changed.

## Aquatic Courses

## Lifeguard Training

Fall and spring. Prerequisite: current Red Cross adult CPR and standard first-aid certification.

One class a week, Teagle Hall. An American Red Cross certification course. Practice and execution of survival and lifesaving skills. Certification is awarded on satisfactory completion of the course.

## Scuba, Open-Water

Fall, spring, summer. Fee charged.
Teagle Hall.
Program includes skill training in a pool and open-water training in Cayuga Lake. P.A.D.I open water certification awarded upon successful completion.

## Scuba, Advanced Open-Water

Fall and Spring. Fee charged.
Advanced-level open-water training in Cayuga Lake. For those who have completed the open-water course.

## Rescue Diver

Fall and spring. Fee charged.
Advanced course for scuba divers. For those who have completed Advanced Open-Water Scuba Diving.

## Dive Master

Fall and spring. Fee charged.
Hours to be arranged. Teagle Hall.
Advanced-level scuba course open only to those who have completed the Rescue Diver course.

## Specialty Scuba Diving

Fall and spring. Fee charged.
Courses offered in the following specialty areas: navigation, search and recovery, night diving, deep diving, and underwater photography.

## Bahamas Scuba Diving

Fall and spring. Fee charged
This course is offered during intersession periods. One week of sailing and diving in the Bahamas. See the information sheet at the registration table.

## Springboard Diving

Fall and spring
Two classes a week, Teagle Hall. Instruction in the basic dives, including front (pike and layout), back, and twisting dives.

## Swimming, Introduction to

Fall, spring, and summer.
Two classes a week, Helen Newman Hall and Teagle Hall.
Instruction and practice in basic skills leading to passing the basic swimming proficiency test.

## Swimming, Advanced Beginning

Fall and spring.
Two classes a week, Helen Newman Hall and Teagle Hall.
This course is ideal for all who have taken one term of Beginning Swimming, regardless of whether the swimming test was successfully completed. Areas of special emphasis are the crawl stroke and rotary breathing, back crawl, elementary backstroke, sidestroke, breaststroke, diving, treading water, and underwater swimming. The primary objective of the advanced beginning swim course is to strengthen the student's confidence and competence.

## Swimming, Intermediate

Fall and spring.
Two classes a week, Helen Newman Hall and Teagle Hall.
Practice and perfection of basic skills and five basic strokes.

## Swimming, Advanced

Fall and spring.
Two classes a week, Helen Newman Hall and Teagle Hall.
Practice and perfection of the eleven basic strokes.

## Swimming Conditioning

Fall and spring. Prerequisite: good swimming ability.

Two classes a week, Teagle Hall and
Helen Newman Hall.
Introduction to, and practice of, different training methods. Final objective: to swim 2,500 yards during class period.

## Advanced Competitive Swim Conditioning

Fall. Prerequisites: a previous competitive swim experience and a previous aquatic conditioning class.

Five classes a week. Teagle Hall practice pool.
This course is offered to those who have highly advanced swimming skills and are interested in competitive swim training.

## Swimming, Synchronized

## Fall.

Two classes a week, Helen Newman Hall. Sculling stunts, including the tub, marlin, log roll, front and back tuck somersaults, and front and back pikes.

## Water Aerobics

## Fall and spring

Teagle Hall practice pool and Helen Newman Hall.
Water aerobics is a revitalizing way to get in shape and stay in shape. It offers the participant all of the components of a standard aerobics class in a refreshing aquatic environment: music, rhythmical routines, resistance activities, cardiovascular conditioning, stretching and flexibility. Water exercises have proven, over a extended period of time, to be as effective as the more traditional aerobics' programs but do not produce the injuries. It is the perfect way to exercise for old and young, fit and unfit, prenatal and new mothers, swimmers and non-swimmers.

## Water Skiing

Fall and summer. Fee charged.
Three classes a week.
Introductory course for beginning water skiers. Conducted on the east shore of Cayuga Lake. Students must provide their own transportation to and from the lake.

## Water Safety Instructor

Fall and spring. Prerequisite: American Red Cross Emergency Water Safety course. Three classes a week, Helen Newman Hall and Teagle Hall. Students must not miss first class.
American Red Cross water safety instructor certification is awarded on satisfactory completion of the course.

## Water Safety Instructor Refresher Course Spring.

Three classes a week, Teagle Hall. Selected sessions of the water safety instructor certification course.

## Bowling Courses

## Bowling

Fall and spring. Fee charged.
Two classes a week, Helen Newman Hall. For the beginning and intermediate bowler. Shoe rental is included in the fee.

## Dance Courses

Two or three classes a week, Helen
Newman Hall/Center for Theatre Arts. Develop flexibility, coordination, and the ability to perceive and reproduce phrases of dance movement with rhythmic accuracy, clarity of body design, and fullness of feeling. Auditions are required for admission to some advanced courses, since they require the mental and physical ability to perform morecomplex phrases in various styles.

## Ballet I

Fall and spring.
Two classes a week, Center for Theatre

## Ballet II

Fall and spring
Two days a week, Center for Theatre Arts.

## Ballet III

Fall and spring.
Three classes a week, Center for Theatre Arts.

## Ballroom Dancing

Fall and spring and summer. Fee charged. One class a week, Helen Newman Hall.
Students and their partners must sign up at course registration.
Includes instruction in the waltz, swing, cha cha, calypso, tango, and others.

## Exploration in Movement (A \& B)

Fall and spring.
Two days a week, Center for Theatre Arts.
Jazz I
Fall and spring.
Two days a week, Helen Newman Hall.

## Jazz II

Fall and spring.
Two days a week, Helen Newman Hall.

## Modern Dance I

Fall and spring.
Two days a week, Center for Theatre Arts.

## Modern Dance II

Fall and spring.
Two days a week, Center for Theatre Arts.

## Modern Dance III

Fall and spring.
Two days a week, Center for Theatre Arts.

## Modern Dance IV

Spring.
Three days a week, Center for Theatre
Arts.

## Tap Dance I

Fall
Two days a week, Center for Theatre Arts.

## Tap Dance II

Spring.
Two days a week, Center for Theatre Arts.

## Equitation Courses

## Basic, Intermediate, Advanced

Fall and spring. Fee charged
One class a week, Cornell Equestrian
Center. Class days and hours are arranged at registration.
Instruction in English riding and jumping.

## First Aid/CPR Courses

## First Ald, Responding to Emergencies

Fall and spring. Textbook fee charged. Two classes a week, Alberding Field House.
American Red Cross standard first-aid course. Certification is awarded on satisfactory completion of the course.

## First Aid, Standard

Fall and spring. Textbook fee charged Two classes a week, Alberding Field House.
American Red Cross standard first-aid course. Certification is awarded on satisfactory completion of the course.

First Aid, Advanced and Emergency Care Fall and spring. Fee charged.
American Red Cross certification is awarded on satisfactory completion of the course.

## Cardiopulmonary Resuscitation (CPR) and

 Basic Life Support (BLS)Fall and spring. No credit. Fee charged. One class a week for two to four weeks, Alberding Field House.
American Red Cross CPR certification is issued on satisfactory completion of these courses.

## Fitness Courses

## Aerobic Dance

Fall and spring. Fee charged. Two classes a week.
A simple dance program designed to keep the cardiovascular system in top shape by making the body demand increased amounts of oxygen.

## Exercise-Fitness-Nutrition

Fall and spring.
Two classes a week, Helen Newman Hall Ways in which exercises may be used in weight control, the role of nutrition and diet in weight control, and the design of an individual exercise and running program.

## Fitness and Conditioning

## Fall and spring.

Two classes a week. Teagle Hall.
Physical fitness program that embodies features of stretching exercises, weight lifting, and jogging. Students work on their individual training needs.

## Fitness for Women

Fall and spring.
Two classes a week, Helen Newman Hall. Fitness program that is geared toward women's own interests and abilities. Nutrition, time management, relaxation techniques, and stress management are included.

## Flexibility and Toning

Fall and spring.
Two classes a week, Helen Newman Hall. Overall stretching exercises.

## Jogging

Fall and spring.
Two classes a week, Barton Hall and track. A program to meet the needs of each participant. Increases capacity from jogging a few hundred yards to three miles at the end of twelve weeks.

## Jogging Tours-Distance Running

Fall and spring.
Two classes a week, Barton Hall or Helen Newman Hall.
Each class consists of a two-to-three-mile jogging tour of a local area.

## Triathlon

Fall and spring. Fee charged. Designed to acquaint students with the components of, and conditioning for, triathlon (running, swimming, and bicycling).

## Wellness and Fitness

Fall and spring. Fee charged.
Two classes a week, Helen Newman Hall Welliness Lab.
"Here's to a Healthier You" - A wellness experience for the busy student. This course will assess the student's physical fitness status, blood cholesterol levels, and overall lifestyle health habits. Each student will receive an individual exercise prescription and have access to the Wellness Program fitness room in Helen Newman Hall. Lectures on nutrition and stress management are also presented. This course has been made possible through the generosity of the Bateman family in
memory of Ms. Dorothy Bateman, Cornell's first director of women's sports and physical education (1920 to 1962).

## Golf Courses

## Golf, Introduction to

## Fall and spring. Fee charged.

Two classes a week, Moakley golf course or Alberding Field House.
A PGA program of instruction is geared to all levels of experience and ability. The objective is to give beginners enough skill to play, and to give more-advanced players direction in their thinking, practice, and play, through a thorough understanding of fundamentals. Equipment is furnished.

## Golf, Recreational

Fall and spring. Limited to students who are experienced golfers. Fee charged.

Moakley golf course.
Students must provide their own clubs. Ten rounds of nine holes each must be played to complete the program.

## Gymnastics Courses

## Gymnastics, Introduction to

Fall and spring.
Two classes a week, Teagle Hall. Basic instruction in tumbling, dance for gymnastics, and use of all pieces of apparatus.

## Gymnastics, Intermediate

Fall and spring.
Two classes a week, Teagle Hall.
Prerequisite: Beginning gymnastics or interscholastic or collegiate team experience.

## Ice Skating Courses

Skating, Introduction to
Fall and spring. For beginning to intermediate skaters. Fee charged.

Three classes a week for half a term, Lynah Rink.
Students provide their own skates or rent them at Lynah Rink.

## Figure Skating, Introduction to

Fall and spring. Fee charged.
Three classes a week for half a term, Lynah Rink.
Instruction and practice in basic figure skating techniques: forward and backward, crossovers, turns, and spirals. Students provide their own figure skates or rent them at Lynah Rink.

## Figure Skating, Intermediate

Fall and spring. Limited to experienced skaters. Fee charged.

Three classes a week for half a term, Lynah Rink
Intermediate figure skating techniques.
Students provide their own figure skates or rent them at Lynah Rink.

## Figure Skating, Advanced

Fall and spring. Fee charged
Three classes a week, Lynah Rink. Advanced figure skating techniques. Students provide their own figure skates or rent them at Lynah Rink.

## Martial Arts-Self-Defense Courses

Boxing, Introduction to
Fall and spring.
Two classes a week, Teagle Hall.
Fundamentals of training methods.

## Boxing, Thai

Fall and spring. Fee charged.
One 2-hour class per week, Alberding Field House.
A martial art system developed from the unique culture of Thailand is a blend of art, science, and sport.

## Fencing, Introduction to

Fall and spring. Fee charged.
Two classes a week, Helen Newman Hall. Includes warm-up exercises and all basic offensive and defensive moves. Equipment is furnished.

## Fencing, Intermediate

Fall and spring. Fee charged. Prerequisite: Introduction to Fencing or the equivalent.

Two classes a week, Helen Newman Hall. Interclass competition is stressed. Equipment is furnished.

## Judo, Introduction to

## Fall and spring. Fee charged.

Two classes a week, Teagle Hall.
Conditions and increases suppleness.
Continue to develop skills in the two parts of judo: standing techniques (throws and trips) and mat techniques.

## Judo, Intermediate

Fall and spring. Fee charged.
Two classes a week, Teagle Hall.
Conditions and increases suppleness. Continue to develop skills in the two parts of judo: standing techniques (throws and trips) and mat techniques.

## Karate, introduction to

Fall and spring. Fee charged.
Two evening classes a week, Teagle Hall.
A beginning course taught by professional

## staff.

## Karate, Advanced

Fall and spring. Fee charged.
Two evening classes a week, Teagle Hall. Open to those who have taken Basic Karate or the equivalent.

## Kung Fu

Fall and spring. Fee charged.
Two classes a week, Teagle Hall Exploration of conditioning and fitness procedures used in the major martial arts, such as karate or judo. Covers circular movement for generating strong blocks, kicks, and punches.

## Pa Tuan Chin

## Fall and spring.

Two classes a week, Teagle Hall. Pa Tuan Chin (Eight Pieces of Brocade) is a type of exercise from China that develops strength and energy in the body. Movements, which are coordinated with special breathing patterns, are slow, smooth, and deliberate. Muscle exertion can vary depending upon the needs and life-style of the practitioner.

## Self-Defense for Women

Fall and spring. Fee charged.
Hours to be arranged, 'Teagle Hall.
Basic methods of physical protection for women.
Tae Kwon Do, Introduction to
Fall and spring. Fee charged.
A Korean martial art distinguished by its emphasis on high and powerful kicks. Basic kicking, punching, and blocking are emphasized.

## Tae Kwon Do, Intermediate

Fall and spring. Fee charged.
A Korean martial art distinguished by its emphasis on high and powerful kicks.
Intermediate-level kicking, punching, and
blocking are emphasized.

## Tae Kwon Do, Advanced

Fall and spring. Fee charged.
A Korean martial art distinguished by its emphasis on high and powerful kicks. Advanced-level kicking, punching, and blocking are emphasized.

## T'ai Chi Chuan, Introduction to, and Intermediate

Fall and spring.
Two classes a week, Teagle Hall.
Introduction to T'ai Chi, a system of graceful, slow-movement exercises that aim at nurturing relaxation, deep breathing, and improved circulation.

## Outdoor Education Program

See the brochure for the Cornell University Outdoor Education Program at registration for more information about courses.

## Advanced Climbing Courses

## Ice Climbing

Spring. Fee charged.
Four outings to local state parks and gorges.

## Outdoor Top Roping

Fall, spring. Fee charged.
Two full weekends traveling to climbing areas across New York State.

## Shawangunks Rock-Climbing

Fall, spring. Fee charged.
Four-day climbing camp at the Shawangunks.

## Backpacking Courses

## At Home on Earth

Fall, spring. Fee charged.
Backpacking skills with a strong environmental focus.

## Backpacking in the Finger Lakes

Fall, spring. Fee charged.
Classes lead to two full weekends on the trail.

## Southwest Natural History

Spring. Fee charged.
Spring Break trip to the SW deserts and canyons.

## Trail Maintenance

Fall, spring. Fee charged.
Work with the local trails club to support and maintain trail systems.

## Wilderness Skills

Fall, spring. Fee charged.
Break trip focusing on wilderness travel and living skills.

## Biking Courses

## Bike and Hike

Fall, spring. Fee charged.
Four full days exploring local countryside.

## Bike Repair, Beginning

Fall, spring. Fee charged.
Two evenings of hands-on repair work.

## Bike Repair, Intermediate

Fall, spring. Fee charged.
One evening of hands-on repair work.

## Mountain Biking

Fall and spring. Fee charged.
Four full days exploring local countryside.

## Canoeing Courses

## Canoeing, Adirondacks

Fall. Fee charged.
Break trip explores the beauty of the
Adirondacks via canoe.

## Canoeing, Flatwater

Fall, spring. Fee charged.
Four full days paddling local waterways.

## Canoe/Camping, Flatwater

Fall, spring. Fee charged.
Four full days paddling local waterways including an overnight.

## Canoeing, Whitewater

Fall, spring. Fee charged.
Includes a full weekend of whitewater paddling.

## Caving Courses

## Caving

Fall, spring. Fee charged.
Two full weekends in Pennsylvania caves.

## Fly Fishing Courses

Fly Fishing and Basic Flytying Techniques, Introduction to
Fall and spring. Fee charged.
One class a week, Alberding Field House. Introduction in fly casting skills and the art of tying artificial flies. Special Conditions: N.Y.S. fishing license required and each student must provide their own wader boots.

## Hiking Courses

## Day Hiking

Fall, spring. Fee charged.
Day outings in the Finger Lakes Region.

## Snowshoeing

Spring. Fee charged.
Day outings in the Finger Lakes Region.

## Kayaking Courses

## Whitewater Kayaking

Fall, spring. Fee charged.
Includes a full weekend of whitewater paddling.

## Sea Kayaking

Fall, spring. Fee charged.
Break trip exploring various coastal areas.

## Outdoor Leadership

## Expedition Medicine

Fall, spring. Fee charged.
One evening focusing on staying healthy in foreign countries.

## Outdoor Leadership

Spring. Fee charged.
Training course for outdoor education instructors.
Wilderness Emergency Care, Basic
Fall, spring, summer. Fee charged.
Full weekend of wilderness first aid and CPR.
Wilderness Emergency Care, Advanced
Fall, spring. Fee charged.
Two evenings of specialized wilderness care.

## Rock-Climbing Courses

## Basic Rock-Climbing

Fall, spring, and summer. Fee charged. Seven aftemoons climbing inside on the Lindseth climbing wall.

## Basic Rock-Climbing, for Women

Fall, spring. Fee charged.
Seven afternoons climbing inside on the Lindseth climbing wall taught by and for women.

## Basic Mountaineering

Fall, spring, and summer. Fee charged. Six aftemoons at local parks and wilderness areas, some classes on indoor Lindseth climbing wall.

## Continuing Rock-Climbing

Fall, spring. Fee charged.
Seven afternoons of advanced climbing
techniques on the Lindseth climbing wall

## Skiing-Cross-Country Courses

Cross-Country Skiing, Basic
Spring. Fee charged
Six $31 / 2$-hour classes travel to local areas to ski.

Cross-Country Skiing, Intermediate
Spring. Fee charged.
Six $31 / 2$-hour classes travel to local areas to ski.

## Cross-Country Ski Day Touring

Spring. Fee charged.
Four full-day weekend outings. Emphasis on backwoods touring.

## Telemark Skiing

Spring. Fee charged.
Four evenings of skiing at Song Mountain Ski Area.

## Personal Growth Courses

## Alexander Technique

Fall and spring.
Two classes a week, Helen Newman Hall. Exercise routines that increase sensory awareness.

## Body-Mind Connection

Fall and spring.
One 2-hour class per week, Helen Newman Hall.
Activities in this course are drawn from ancient Eastern practices as well as modern Western psychology, and are designed to give the student first-hand experience of the interaction between their own bodies and minds.

## Explorations in Meditation

Fall and spring.
Two classes a week, Teagle Hall. This course provides the opportunity to explore a variety of ancient and modern methods designed to bring one to the state of meditation. The methods serve to evoke the deep relaxation from which heightened awareness and creativity arise.

## Mealth Education for Student Athletes

 Fall and spring,Two classes a week, Schoellkopf Hall. To promote and encourage lifestyle choices on the part of student athletes that will help them establish and maintain high levels of allaround health, and thereby contribute positively to their academic and athletic achievement.

## Invincible Woman

Fall and spring. Fee charged.
One $11 / 2$-hour class per week, Helen Newman Hall.
A yoga course and more! Techniques include exercise sets, breath regulation, sound-current (mantra) and meditation.

## Relaxation and Stress Management

## Fall and spring.

Two classes a week, Helen Newman Hall. Introduction to basic relaxation techniques for the reduction of everyday stress. Techniques will be taught that can be used in normal everyday living situations.

## Yoga, Introduction to

Fall, spring, and summer. Fee charged.
Two classes a week, Teagle Hall. Fundamentals of hatha-yoga. Covers basic postures, breathing techniques, and deep relaxation. Introduces chanting.

## Yoga, Intermediate

Fall and spring. Fee charged. One (1 1/2
hour) class a week, Helen Newman Hall.
Designed for those who have completed Yoga I or its equivalent.

## Racquet Sports Courses

## Badminton, Introduction to

Fall and spring. Helen Newman Hall.
Two classes a week.
Fundamental shots, scoring, and general play.

## Badminton, Intermediate

Fall and spring, Helen Newman Hall. Two classes a week.
Review of fundamental shots, scoring, and general play.

## Racquetball, Introduction to, Intermedi-

 ate, and AdvancedFall, spring, and summer. Fee charged Two classes a week, Grumman Squash Courts.
Instruction at appropriate levels. Equipment is furnished. Protective eyewear required.

## Racket Games

Fall and spring.
Two classes a week, Grumman Squash
Courts and Helen Newman Hall.
Racquetball, squash, badminton, tennis, and pickleball. Playing fundamentals, scoring, and rules are stressed. Interclass competition.
Squash, Introduction to, Intermediate and Advanced
Fall, spring, and summer. Fee charged.
Two classes a week, Grumman Squash Courts.
Classes for appropriate level of play. Equipment is furnished. Protective eye wear required.
Tennis, Introduction to
Fall and summer (outdoor). Spring (indoor-fee).

Helen Newman Courts/Reis Tennis Center.
Two or three classes per week.
Basic skills taught include forehand, backhand, serve, and volley. Scoring methods taught.

## Tennis, Intermediate

Fall and summer (outdoor). Spring (indoorfee).

Kite Hill courts/Reis Tennis Center. Two
or three classes per week.
Review basic strokes plus topspin and underspin. Doubles strategy emphasized.

## Tennis, Advanced

Fall (outdoor). Spring (indoor-fee).
One to three classes per week. Kite Hill courts/Reis Tennis Center.
Advanced strokes taught and doubles play emphasized. Recommended for tournament players or those with previous team experience.

## Sailing Courses

Board Sailing (Wind Surfing)
Fall, spring, and summer. Fee charged.
Ten instructional lessons plus free practice
times. The equipment is fumished.
A Mistral Board Sailing Academy certificate is awarded on successful completion of the course.

## Catamaran, Introduction to

Fall, spring, and summer. Fee charged
One or two classes per week.
Learn unique skills necessary for sailing multihull catamarans.

Large-Boat Sailing, Introduction to Fall, spring, and summer. Fee charged

One class a week, Cayuga Lake. Instruction in basic sailing skills and safety principles. Students sail small and large boats on Cayuga Lake, weather permitting.
Small-Boat Sailing, Introduction to
Fall, spring, and summer. Fee charged
One or two classes a week, Cayuga Lake. Learn basic skills necessary to sail small sailboats and basic keelboats safely.

## Small-Boat Sailing, Competitive

Fall and spring. Fee charged.
One day per week, Cayuga Lake. Vanguard 420 sailboat used for the course. USYRA Rules Book used as a text for the course. Fee includes one-year membership in university sailing team program.

## Skiing and Snow Boarding

## Downhill Skiing and Snowboarding

Spring. Fee charged.
One class a week, Greek Peak or Song Mountain.
Transportation, instruction, ski-lift fees, and skiing time are offered in a package deal Greek Peak and Song Mountain personnel are present at registration to explain the program and accept fees. Bus transportation to Greek Peak is provided six afternoons a week for six weeks. Bus transportation to Song Mountain (Friday only).
Cross-Country Skiing - See Outdoor
Program.

## Target Shooting Courses

Archery, Introduction to
Fall and spring. Two classes a week, Alberding Field House.
Instruction in the care of equipment; seven
basic steps for shooting; scoring; practice shooting at twenty, thirty, and forty yards.

## Archery, Intermediate

Fall and spring.
For those who have basic experience.

## Pistol, Introduction to

Fall and spring. Fee charged.
Barton Hall range
Instruction in the use of the pistol in the three modes of fifty-foot competitive target
shooting-slow fire, timed fire, and rapid fire. Emphasis placed on safety and responsibility while firing.

## Riflery

Fall and spring. Fee charged.
Two classes a week, Barton Hall
Instruction and practice in the techniques of target riflery from various shooting positions.

## Trap and Skeet

Fall and spring. Fee charged.
Two-hour class one afternoon a week, Teagle Hall.
Includes lectures and shooting at the Tompkins County Rod and Gun Club range.
Guns and shells are furnished.

## Team Sports Courses

## Basketball

Fall and spring. Barton Hall and Aberding Field House.

Two classes a week.
Fundamental drills in passing, shooting, and dribbling. Scrimmages each class session.

## Fieldhockey

Spring.
Two classes a week, Alberding Field House and Schoellkopf stadium. Instruction in basic and advanced skills. 6aside competition on astroturf surface.

## Ice Hockey, Introduction to

Fall and spring. Fee charged.
Two classes a week, Lynah Rink. Stick handling, passing, and shooting are stressed. Students provide their own skates and sticks; all other equipment is furnished.

## Ice Hockey, Intermediate

Fall and spring. Fee charged. Prerequisite: beginning hockey or previous participation in organized hockey.

Two classes a week, Lynah Rink. This course is designed for the intermediate hockey player. Advanced techniques taught include positioning, power play, penalty killing, and offensive and defensive attack. Each session emphasizes game situations and scrimmaging. Skates and hockey sticks must be supplied by the participants. All other necessary equipment will be supplied.

## Lacrosse

Fall.
Two classes a week, Helen Newman Field. Instruction and practice in basic skills (cradling, passing, catching, goal shooting, checking) and team play.

## Soccer

Spring.
Two classes a week, Schoellkopf Field. Introduction to the game. Includes basic individual skills (passing, trapping, shooting) and team play and strategy.

## Team Handball

Fall and spring.
Two classes a week, Alberding multipurpose room.
Team handball combines the skills of running, jumping, catching, and throwing into a fastmoving, exciting game. Elements of soccer, basketball, hockey, and water polo all can be seen in team handball. The basic objective is
to outmaneuver the opponent by passing the ball quickly and then throw the ball past the defense and goalie to score.

## Volleyball, Introduction to

Fall and spring.
Two classes a week, Alberding Field House.
Fundamentals of ball handling, serves,
defensive blocks, and position play are stressed. Classes will scrimmage.

## Volleyball, Intermediate

Fall and spring.
Two classes a week, Alberding Field
House.
Passing and blocking strategy; scrimmages in class.

## Volleyball, Advanced

Fall and spring.
Two classes a week, Alberding Field House.
Offensive and defensive team strategy is emphasized in class scrimmages.

## Weight Training Courses

## Nautilus

Fall, spring, and summer. Enrollment limited to capacity of facilities. Fee charged.

Two or three classes a week, Schoellkopf Hall.
Advanced weight lifting on specifically designed apparatus. There are ten stations in the room.

## Olympic Weight Training

Fall and spring.
Teagle Hall.
Introduces the student to the proper use of olympic weights for improving physical condition and muscular strength. Instruction with focus on the relation between high-rep light weight lifting, low-rep heavy lifting, and the development of bulk, strength, and endurance.

## Universal Weight Training

Fall and spring.
Two classes a week, Teagle Hall. Classes include instruction in correct lifting techniques involving all muscle groups. Recreational classes are established for experienced lifters; structured classes are for novices. Universal weights are used.

## Independent Study

## Independent Study

Fall and spring.
Independent study is designed for those who have difficulty fitting any of the regularly scheduled courses into their academic program. Class activities will be based on personal fitness programs. A term paper is required. Special permission to enter this program must be granted by the program director.

## SCHOOL OF CONTINUING EDUCATION AND SUMMER SESSIONS

The School of Continuing Education and Summer Sessions provides a wide variety of educational opportunities beyond the degreegranting programs of the university. These programs serve virtually all age groups in a great variety of formats and time frames. For information about the following programs write B20 Day Hall, Ithaca, New York 14853-2801; fax 607/255-9697; call 607/255-4987; or e-mail scelconted.comell.edu, unless indicated otherwise below

## ADMINISTRATION

Glenn C. Altschuler, dean
Alicia C. Dowd, media manager
Judith K. Eger, director, program development and marketing
Abby H. Eller, director, Comell University Summer College

Terry L. Hart, computing director
Ralph Janis, director, Cornell's Adult University
Charles W. Jermy, Jr., associate dean, and director, Cornell University Summer Session
Cathy M. Pace, registrar
Diane E. Sheridan, director, finance and administration

## CORNELL UNIVERSITY SUMMER SESSION

The Comell University Summer Session provides unique and unusually attractive opportunities for study and recreation at a time when the Cornell campus and the Finger Lakes region of central New York are at their loveliest and the Ithaca weather is at its best. Participants may choose from a wide spectrum of courses scheduled during three-, eight-, and six-week sessions. Although admission is open to persons of all ages, the majority of summer session participants are matriculated Cornell students. Classes meet daily and are usually kept small to foster a close association between students and teachers.

## SPECIAL AND PROFESSIONAL PROGRAMS

Intensive learning experiences are presented year-round for professionals in many fields. Formats include for-credit courses of one to six weeks and noncredit weekend and weeklong short courses. Programs can also be designed in response to the needs and interests of corporations, professional societies, and other groups. For information call 607/255-7259; fax 607/255-8942; or e-mail sp@cont-ed.cornell.edu.

## SUMMER COLLEGE PROGRAM FOR HIGH SCHOOL STUDENTS

High school juniors and seniors attend regular university courses through Cornell University Summer College and may earn college credit. They also explore career options through specially designed workshops. Students live in residence halls, become familiar with
campus life, and attend seminars describing the college admissions process. The program is designed to help ease the transition from high school to college. For information call $607 / 255-6203$, or fax $607 / 255-8942$.

## CORNELL'S ADULT UNIVERSITY

Cornell's Adult University (CAU) offers weeklong noncredit courses on campus for adults and families during the summer. During the fall, winter, and spring, there are weekend seminars, week-long domestic programs, and international study tours. Developed and led by distinguished members of the Cornell faculty, all programs are inspired by the belief that learning never ends and that one of the roles of a great university is to provide a bridge between traditional formal education and informal, noncredit study. For information, write Cornell's Adult University, 626B Thurston Avenue, Ithaca, New York 148502490 , or call 607/255-6260

## EXTRAMURAL STUDY

Area residents may take courses at the university on a part-time basis by registering through extramural study. Those interested may enroll in almost any course offered in the fall and spring terms if they receive the instructor's written approval. The Visitor's Program is also offered. It allows adults to attend classes in many divisions of the university on a space-available basis at a reduced charge. In this program no credit is given, and no record is kept of attendance or performance. Visitors are required to obtain written permission of the instructor.

## WINTER SESSION

Cornell undergraduate and graduate students, as well as employees and area residents, can earn three to four credits between the fall and spring semesters by enrolling in the winter session. This quiet time on campus allows students to enjoy generally smaller classes and to concentrate on intensive study. Winter session students may enroll in scheduled courses or design individualized study with a faculty member.

## CONTINUING EDUCATION INFORMATION SERVICE

This service provides free information, counseling, and referral to people who have been out of school for several years and want to resume their education.

## EXTENDED EDUCATION INFORMATION SERVICE

This service provides information about extended education opportunities offered by the university to people inside and outside Cornell. These opportunities include short courses of all types, workshops, professional updates, and executive programs. To tell us about your offerings or to learn whether Comell offers a course in a certain area, call $607 / 255-7259$, fax 607/255-8942, or e-mail sp@cont-ed.cornell.edu.

## SUMMER COURSE ROSTER

The Cornell University Summer Session offers a wide variety of courses. The list that follows includes those courses that are usually offered every summer. The list is not exhaustive; many new courses or courses offered only occasionally are not listed. For complete information, contact the Summer Session Office. The summer session catalog is published in February. A preliminary course roster is available beginning in late November and current course offerings are listed and updated on CUINFO from November through June.

## Africana Studies

AS\&RC 205 African Civilizations and Culture
A program in African languages is also offered. Consult the department for a complete listing

## Agricultural Economics

AG EC 220 Introduction to Business Management
AG EC 221 Financial Accounting
AG EC 310 Introductory Statistics
AG EC 320 Business Law I

## Anthropology

ANTHR 101-102 Introduction to Anthropology
ANTHR 201 Lost Tribes and Sunken Continents

## Archaeology

ARKEO 100 Introduction to Archaeology
ARKEO 201 Lost Tribes and Sunken Continents
ARKEO 300 Archaeology of Maritime Commurities

ARKEO 319 Underwater Archaeology
ARKEO 358 Field Archaeology in Honduras
ARKEO 360 Field Archaeology in Greece
ARKEO 361 Summer Program in Etruscan Archaeology at La Piana

ARKEO 365 Field Archaeology in New York State
Other field study opportunities are usually available through this department

## Architecture

ARCH 110 Introduction to Architecture: Design Studio

ARCH 130 An Introduction to Architecture: Lecture Series

ARCH 251 Introductory Photography 1
ARCH 351 Photography II
Consult the Department of Architecture office for a complete list of summer design offerings.

Art
ART 121 Introductory Painting
ART 123 Landscape Painting
ART 133 Introductory Lithography
ART 141 Introductory Sculpture
ART 151 Introductory Drawing
ART 158 Conceptual Drawing
ART 159 Life and Still-Life Drawing
ART 161 Introductory Photography I
ART 168 Black-and-White Photography
ART 169 Color Photography
ART 171 Computer Art
ART 221 Painting II
ART 241 Sculpture II
ART 261 Photography II
ART 263 Color Photography
ART 264 Photo Processes
ART 321 Painting III
ART 341 Sculpture III
ART 361 Photography III: Color
ART 362 Photography IV
ART 372 Special Topics in Studio Art
ART 379 Independent Studio

## Astronomy

ASTRO 105 An Introduction to the Universe
ASTRO 106 Essential Ideas in Relativity and Cosmology

ASTRO 107 An Introduction to the Universe

## Biological Sciences

BIO S 107-108 General Biology
BIO S 160 Oceanography of the Gulf of Maine
BIO S 161 Introduction to Field Marine Science
BIO S 200 Special Studies in Biology
BIO S 204 Biological Illustration
BIO S 205 Ethics and Health Care
BIO S 208 Drawing the Human Figure
BIO S 209 Introduction to Natural-Science Illustration

BIO S 245 Plant Biology
BIO S 261 Ecology and the Environment
BIO S 281 Genetics
BIO S 282 Human Genetics
BIO S 290-291 General Microbiology
BIO S 309 Coastal Ecology and Bioclimates
BIO S 327 Neurobiology of Animal Behavior
BIO S 329 Ecology of Animal Behavior
BIO S 331 Principles of Biochemistry, Lectures
BIO S 363 Marine Biology for Teachers
BIO S 364 Field Marine Science

BIO S 365 Underwater Research
BIO S 366 SEA Introduction to Oceanography
BIO S 367 SEA Introduction to Maritime Studies
BIO S 368 SEA Introduction to Nautical Science
BIO S 372 SEA Practical Oceanography
BIO S 389 Embryology
BIO S 402 Marine Pollution
BIO S 407 Advanced Laboratory Techniques
BIO S 409 Ciliophorology
BIO S 413 Adaptations of Marine Organisms
BIO S 477 Marine Vertebrates
BIO S 499 Undergraduate Research in Biology
BIO S 602 Molecular Biology for Teachers

## Chemistry

CHEM 103-104 Introduction to Chemistry
CHEM 207-208 General Chemistry
CHEM 251 Introduction to Experimental Organic Chemistry

CHEM 252 Elementary Experimental Organic Chemistry

CHEM 253-255 Elementary Organic Chemistry
CHEM 421 Introduction to Inorganic Research
CHEM 433 Introduction to Analytical Research
CHEM 461 Introduction to Organic Research
CHEM 477 Introduction to Research in Physical Chemistry

## City and Regional Planning

CRP 495.9 Contemporary Issues in Latin America
CRP 495.10 Development, Urbanization, and the Environment

## Classics

Greek
CLASS 104 Intensive Greek

## Latin

CLASS 107 Intensive Latin
CLASS 205 Intermediate Latin
CLASS 207 Catullus
CLASS 369 Intensive Medieval Latin Reading
Classical Civilization
CLASS 102 Bioscientific Terminology
CLASS 223 The Comic Theatre
CLASS 226 The Trojan War: Archaeology, History, and Literature

CLASS 236 Greek Mythology
CLASS 360 Field Archaeology in Greece
CLASS 361 Summer Program in Etruscan Archaeology at La Piana

## Communication

COMM 116 Theories of Human Communication
COMM 120 Introduction to Mass Media
COMM 191 History of Television

COMM 201 Oral Communication
COMM 203 Argumentation and Debate
COMM 204 Effective Listening
COMM 216 Communicating Interpersonally
COMM 272 Principles of Public Relations and Advertising

COMM 301 Business and Professional Speaking
COMM 363 Organizational Writing
COMM 410 Organizational Behavior and Communication

COMM 460-461 Video Communication
COMM 490 Communication and Training in Organizations

COMM 624 Communication in the Developing Nations

COMM 625 Communication for Social Change
COMM 688 Participatory Communication for Research and Development

## Comparative Literature

COM L 105 The Hero in Literature
COM L 202 Great Books of the Western Tradition: The Eighteenth to the Twentieth Century
COML223 The Comic Theatre
COML236 Greek Mythology

## Computer Science

COM S 099 Fundamental Programming Concepts
COM S 100 Introduction to Computer Programming

COM S 101 The Computer Age
COM S 211 Computers and Programming
COM S 222 Introduction to Scientific Computation
COM S 410 Data Structures

## Economics

ECON 101 Introductory Microeconomics
ECON 102 Introductory Macroeconomics
ECON 309 Environmental Economics
ECON 313 Intermediate Microeconomic Theory
ECON 314 Intermediate Macroeconomic Theory
ECON 321 Applied Econometrics
ECON 331 Money and Credit
ECON 362 International Monetary Theory and Policy
ECON 363 International Economics

## Education

EDUC 420 Field Experience
EDUC 497 Independent Study
EDUC 501 Communication Workshop EDUC 620/621/622 Internship in Education
EDUC 630 Special Problems in Agricultural and Occupational Education

EDUC 783 Comparative Extension Education Systems

## CONTINUING EDUCATION - 1994-1995

EDUC 800 Master's-Level Thesis Research
EDUC 900 Doctoral-Level Thesis Research

## Engineering

ENGR 100 Introduction to Computer Programming
ENGR 101 The Computer Age
ENGR 202 Mechanics of Solids
ENGR 203 Dynamics
ENGR 211 Computers and Programming
ENGR 221 Thermodynamics
ENGR 222 Introduction to Scientific Computation
ENGR 260 Introductory Engineering Probability
ENGR 270 Basic Engineering Probability and Statistics

ENGR 293-294 Engineering Mathematics
The Engineering Cooperative Program offers a number of other engineering courses. Contact that office for more information.

## English

ENGL 131 Critical Reading and Writing
ENGL 132 The Personal Essay
ENGL 137 Writing Workshop
ENGL 270 The Reading of Fiction
ENGL 275 The American Literary Tradition
ENGL 280 Creative Writing
ENGL 288-289 Expository Writing
ENGL 319 Chaucer
ENGL 327 Shakespeare
ENGL 350 The Early Twentieth Century (to 1914)
ENGL 477 Children's Literature

## English as a Second Language

ENGLF 101-102 English as a Second Language
ENGLF 211 English as a Second Language
ENGLB 215 English for Later Bilinguals

## Floriculture and Ornamental Horticulture

FRDR 210 Sketching in Watercolor

## French Literature

FRLIT 221 Introduction to French Literature

## Geological Sciences

GEOL 101 Introductory Geological Science
GEOL 102 Evolution of the Earth and Life
GEOL 104 The Sea: An Introduction to Oceanography

GEOL 213 Marine and Coastal Geology
GEOL 410 Summer Field Geology in Central Colorado

## Government

GOVT 111 The Government of the United States GOVT 161 Introduction to Political Theory

GOVT 231 Introduction to Comparative Government and Politics

GOVT 281 Introduction to International Relations
GOVT 310 Power and Poverty in America
GOVT 316 The American Presidency

## History

HIST 101-102 Introduction to American History
HIST 151-152 Introduction to Western Civilization HIST 277 American Indian History since 1850 HIST 314 History of American Foreign Policy, 1912 to the Present

HIST 340-341 Recent American History

## History of Art

ART H 202 Survey of European Art: Renaissance to Modern

ART H 261 Introduction to Art History: Modern Art

## Horticultural Sciences

HORT 205 Fruit and Vegetable Gardening
HORT 497 Independent Study

## Hotel Administration

H ADM 174 Microcomputing
H ADM 210 The Management of Human Resources

H ADM 242 Marketing Principles
H ADM 354 Computer-Assisted Design
H ADM 487 Real Estate Law-A Case Approach

## Human Development and Family Studies

HDFS 115 Human Development
HDFS 150 Families and the Life Course
HDFS 216 Human Development: Adolescence and Youth

HDFS 242 Participation with Groups of Young Children
HDFS 344 Infant Behavior and Development
HDFS 461 The Psychology of Television

## Human Service Studies

HSS 380 Community Mental Health

## Industrial and Labor Relations

Collective Bargaining, Iabor Law, and Labor History

ILRCB 200/500 Collective Bargaining
ILRCB 201/501 Labor and Employment Law
ILRCB 608 Special Topics: Sports Arbitration
Economic and Social Statistics
ILRST 210-211 Statistical Reasoning
ILRST 510-511 Statistical Methods for the Social Sciences

## Labor Economics

ILRLE 240/540 Economics of Wages and Employment

Organizational Behavior
ILROB 121/520 Introduction to Microorganizational Behavior and Analysis

ILROB 329 Organizational Cultures
ILROB 627 Leadership in Organizations
Personnel and Human Resource Studies
ILRPR 362 Career Development: Theory and Practice

## Jewish Studies

JWST 103 Elementary Modem Hebrew
JWST 104 Continuing Modern Hebrew
JWST 149 Introduction to Jewish Studies
JWST 223 Introduction to the Bible

## Landscape Architecture

LARCH 400 AutoCAD/LANDCAD
LARCH 500 Landscape Architecture: Art of Place LARCH 600 Site Grading Workshop

## Management

NBA 560 Business Law I

## Marine Science

Consult related department listings for summer offerings in marine science

## Mathematics

MATH 101 History of Mathematics
MATH 105 Finite Mathematics
MATH 106 Calculus for Biologists
MATH 109 Precalculus Mathematics
MATH 111-112 Calculus
MATH 123 Analytic Geometry and Calculus
MATH 191 Calculus for Engineers
MATH 221 Linear Algebra and Calculus
MATH 293/294 Engineering Mathematics
MATH 421-422 Applicable Mathematics
MATH 431 Introduction to Algebra

## Mechanical and Aerospace <br> Engineering

M\&AE 221 Themodynamics

## Modern Languages and Linguistics Chinese

CHIN 160 Introductory Intensive Chinese (Mandarin)
CHIN 201-202 Intermediate Chinese
Dutch
DUTCH 121-122 Elementary Dutch Course
French
FRDML 101 French Basic Course
FRDML 123 Continuing French
FRDML 203-213 Intermediate Composition and Conversation

FRDML 630 French for Reading-Graduate Students

## German

GERLA 121-122 German Elementary Course
GERLA 631-632 Elementary Reading Italian

ITALA 101 Italian Basic Course I
Japanese
JAPAN 160 Introductory Intensive Japanese
JAPAN 203-204 Intermediate Japanese Conversation

JAPAN 403 Teaching of Japanese as a Foreign Language

## Linguistics

LING 101 Theory and Practice of Linguistics

## Nepali

NEPAL 160 Intensive Nepali
Quechua
QUECH 131-132 Elementary Course
QUECH 133-134 Continuing Course
Russian
RUSSA 121-122 Russian Elementary Course
Sinhala (Sinhalese)
SINHA 160 Intensive Sinhala
Spanish
SPAND 101 Spanish Basic Course I
SPAND 123 Continuing Spanish
SPAND 203 Intermediate Composition and Conversation

## Music

MUSIC 101 The Art of Music
MUSIC 105 Introduction to Music Theory
MUSIC 120 Learning Music through Digital Technology
MUSIC 331 Sage Chapel Choir

## Natural Resources

NTRES 201 Environmental Conservation
NTRES 215 Environmental Disruption and Regulation

NTRES 230 Environment and Society
NTRES 306 Coastal and Oceanic Law and Policy
NTRES 417 Wetlands Resources

## Near Eastern Studies

NES 103 Elementary Modern Hebrew
NES 104 Continuing Modern Hebrew
NES 119 Elementary Arabic
NES 223 Introduction to the Bible
NES 309 Advanced Modern Hebrew

## Nutritional Sciences

NS 660 Special Topics in Nutrition

## Operations Research and Industrial Engineering

OR\&IE 260 Introductory Engineering Probability
OR\&IE 270 Basic EngineerIng Probability and Statistics

OR\&IE 622 Operations Research I

## Philosophy

PHIL 101 Introduction to Philosophy
PHIL 145 Contemporary Moral Issues
PHIL 212 Modern Philosophy
PHIL 231 Introduction to Formal Logic
PHIL 245 Ethics and Health Care

## Physical Education

Consult the Physical Education Office for a complete list of summer offerings for credit and recreation.

## Physics

PHYS 101-102 General Physics
PHYS 112 Physics I: Mechanics and Heat
PHYS 202 The World According to Physics-the Way Things Work

PHYS 213 Physics II: Electricity and Magnetism
PHYS 214 Physics III: Optics, Waves, and Particles

PHYS 400 Informal Advanced Laboratory
PHYS 500 Informal Graduate Laboratory
PHYS 510 Advanced Experimental Physics
PHYS 520 Projects in Experimental Physics

## Psychology

PSYCH 101 Introduction to Psychology: The Frontiers of Psychological Inquiry

PSYCH 123 Introduction to Biopsychology
PSYCH 128 introduction to Psychology: Personality and Social Behavior

PSYCH 205 Perception
PSYCH 280 Introduction to Social Psychology
PSYCH 283 Groups and Relationships
PSYCH 311 Introduction to Human Learning and Memory

PSYCH 350 Statistics and Research Design
PSYCH 380 Community Mental Health

## Rural Sociology

R SOC 100 American Indian Studies: An Introduction

R SOC 101 Introductory Sociology
R SOC 324 Environment and Society
R SOC 437 Aging: Issues and Social Policy in the 1990s

R SOC 494 Special Topics

## Sociology

SOC 101 Introduction to Sociology
SOC 283 Groups and Relationships

## Statistics and Biometry

STATS 601 Statistical Methods I

## Theatre Arts

THETR 211 Dance Composition Workshop
THETR 223 The Comic Theatre
THETR 254 Theatrical Makeup Studio
THETR 274 Introduction to Film Analysis: Meaning and Value

THETR 277 Video Production I
THETR 287 Summer Acting Workshop
THETR 362 Lighting Design Studio I: Lighting in the Performing Arts

Theoretical and Applied Mechanics
T\&AM 202 Mechanics of Solids
T\&AM 203 Dynamics
T\&AM 310 Advanced Engineering Analysis I

## Writing

WRIT 137 Writing Workshop

## New York state college of veterinary medicine

## ADMINISTRATION

Robert D. Phemister, dean
Donald F. Smith, associate dean for veterinary education

Douglas D. McGregor, associate dean for research and graduate education
John F. Cummings, secretary of the college
John A. Lambert, assistant dean for administration

Eugenia G. Kelman, assistant dean for student services
Timothy T. Redden, assistant dean for public affairs

Gloria R. Crissey, registrar, director of financial aid
Katherine M. Edmondson, director of educational development

## DEPARTMENT CHAIRS

Anatomy: C. Farnum
Avian and. Aquatic Animal Medicine: B. Calnek

Clinical Sciences: B. Farrow
Diagnostic Laboratory: D. Lein
Microbiology, Immunology, and Parasitology R. Avery

Pathology: B. Pauli
Pharmacology: G. Sharp
Physiology: D. Robertshaw

## THE COLLEGE

The College of Veterinary Medicine offers a professional program that requires four years of full-time academic and clinical study of the normal and abnormal structure and function of the animal body and the diagnosis, treatment, and prevention of animal disease.

Graduates of the college receive the Doctor of Veterinary Medicine (D.V.M.) degree, which is recognized by licensing boards throughout the world. Graduates generally enter private practice, academia, or become engaged in one of the increasing number of other biomedical activities.

Admission requires a minimum of three years of college work, including specific prerequisite courses and experience. Applications must be filed approximately one year before the proposed matriculation date. The competition for admission is keen, since there are many more qualified applicants than can be admitted.

Graduate programs in veterinary research and postdoctoral training in clinical specialties are open to Doctors of Veterinary Medicine and some highly qualified holders of baccalaureate
degrees and lead to the degree of Master of Science or Doctor of Philosophy.
More detailed information is contained in the Catalog of the College of Veterinary Medicine, which may be obtained by writing to the college

Note: 500- and 600-level courses are open only to veterinary students except by written permission from the instructor
The College of Veterinary Medicine has revised its curriculum; the new course requirements apply to the class that matriculates in the fall of 1993 and to subsequent classes. The previous course requirements remain in effect for the Class of 1995 and Class of 1996. Courses in the revised curriculum are designated with the prefix "VTMED"; courses in the previous curriculum are designated with prefixes indicative of their originating department.

## FOUNDATION

VTMED 510 The Animal Body Fall.
VTMED 517 Animals, Veterinarians and Society, Part A Fall.
VTMED 520 Genetics and Development Fall, spring.
VTMED 521 Neuroanatomy and Clinical Neurology Spring.
VTMED 527 Animals, Veterinarians and Society, Part B Fall, spring
VTMED 530 Function and Dysfunction, Part I Spring.
VTMED 531 Function and Dysfunction, Part II Fall.
VTMED 537 Animals, Veterinarians and Society, Part C1 Spring.
VTMED 538 Animals, Veterinarians and Society. Part C2 Fall
VTMED 540 Host, Agent, and Defense Fall.
VTMED 547 Animals, Veterinarians and Society, Part D Fall.
VTMED 550 Animal Health and Disease, Part I Spring.
VTMED 557 Animals, Veterinarians and Society, Part E1 Spring.

## DISTRIBUTION

VTMED 601 Anatomy of the Camivore Spring.
VTMED 602 Anatomy of the Horse Spring.
VTMED 603 Anatomy of the Ruminant Spring.
VTMED 604 Comparative Anatomy; Patterns and Function Spring
VTMED 605 Biomechanics: Concepts and Techniques (also VETA 604) Spring.
VTMED 606 Natural History and Ecology of an Estuary and Barrier Islands Spring.
VTMED 607 The Literature of Natural History Spring.
VTMED 610 Veterinary Aspects of Avian Biology Spring.
VTMED 611 Fish Health Management Spring.

VTMED 612 Management of Aquarium Systems Spring.
VTMED 620 Molecular Biology and Immunology of Host-Parasite Interactions (also VETMI 702) Spring.
VTMED 630 Clinical Biostatistics for Journal Readers Spring
VTMED 632 Senior Seminar Distribution Fall, spring.
VTMED 633 Introduction to Non-traditional Companion and Laboratory Animals Spring
VTMED 634 Introduction to Large Animal Ambulatory Practice Fall, spring, summer
VTMED 635 Introduction to the Professional Literature (also VETCS 601) Spring.
VTMED 636 Introduction to Dairy Management Systems Spring.
VTMED 637 Introduction to Community Practice Service Fall, spring, summer.
VTMED 66020 Questions on ECM (Extracellular Matrix) Spring.
VTMED 680 Behavior Problems of Horses (also VETPH 626) Spring.
VTMED 681 Behavior Problems of Small Animals Spring.
VTMED 682 Acid Base Relations (also VETPH 627 and Biological Sciences 715) Fall, spring.

## ANATOMY

VETA 505 Applied Anatomy Fall.
VETA 506 Applied Anatomy Spring.
VETA 600 Special Projects in Anatomy Fall and spring.
VETA 601 Research Opportunities in Veterinary Medicine Fall, January, spring, and summer.
VETA 602 Advanced Clinical Neurology Spring
VETA 604 Biomechanics: Concepts and Techniques (also VTMED 605) Spring.

## AVIAN AND AQUATIC ANIMAL MEDICINE

VETAV 555 Avian Diseases Fall.
VETAV 614 Research Opportunities in Veterinary Medicine Fall, January, spring, and summer
[VETAV 663 Veterinary Medicine in Developing Nations Spring.]
VETAV 672 Aquavet I: Introduction to Aquatic Veterinary Medicine Mid-May to mid-June.
VETAV 673 Aquavet II: Comparative Pathology of Aquatic Animals Mid-May to early June.
VETAV 770 Advanced Work in Avian Diseases Spring.
VETAV 772 Advanced Work in Aquatic Animal Diseases Fall and spring.
VETAV 773 Advanced Work in Avian Immunology Fall and spring.

## CLINICAL SCIENCES

VETCS 520 Preventive Medicine in Animal Heaith Management Spring.
VETCS 547 Practice Management Fall, spring, and summer.
VETCS 548 Anesthesiology Fall.
VETCS 562 Theriogenology II Fall.
VETCS 563 Large Animal Medicine and Surgery Fall.
VETCS 564 Large Animal Medicine and Surgery Spring.
VETCS 566 Radiographic Techniques Fall.
VETCS 567 Clinical Nutrition Fall.
VETCS 570 Theriogenology Service Spring.
VETCS 572 Senior Seminar Fall and spring.
VETCS 574 Large Animal Surgery Service Fall, spring, and summer.
VETCS 575 Ambulatory Service Fall, spring, and summer.
VETCS 578 Clinical Anesthesiology Service Fall, spring, and summer.
VETCS 580 Radiology Service Fall, spring, and summer.
VETCS 582 Large Animal Surgical Exercises Spring.
VETCS 583 Small Animal Medicine and Surgery Fall.
VETCS 584 Small Animal Medicine and Surgery Spring.
VETCS 586 Small Animal Surgical Exercises Spring.
VETCS 588 Cardiology Service Fall and spring.
VETCS 589 Small Animal Medicine and Community Practice Services Fall, spring, and summer.
VETCS 591 Small Animal Surgery Service Fall, spring, and summer.
VETCS 593 Ophthalmology Service Fall, spring, and summer
VETCS 594 Large Animal Medicine Service Fall, spring, and summer.
VETCS 596 Opportunities in Veterinary Medicine Fall, spring, and summer.
VETCS 598 Dermatology Service Fall, spring, and summer.
VETCS 600 Journal Reading I Fall and spring.
VETCS 601 Dentistry Fall and spring.
VETCS 603 Reproductive Examination of the Mare Fall.
VETCS 605 Selected Topics in Wildife Medicine Spring.
VETCS 616 Research Opportunities in Veterinary Medicine Fall, spring, January and summer.
VETCS 664 Introduction to Epidemiology Fall.
VETCS 665 Study Designs Spring.
[VETCS 666 Advanced Methods in Epidemiology Fall.]
VETCS 675 Special Problems in Large Animal Medicine Fall and spring.
VETCS 676 Special Problems in Large Animal Surgery Fall and spring.
VETCS 677 Special Problems in Theriogenology Fall and spring.
VETCS 678 Fundamental Techniques in Bovine Embryo Transfer Spring.
VETCS 679 Dairy Herd Management and Health Fall.
VETCS 680 Poisonous Plants Fall.
VETCS 681 Horse Health Management Spring.
VETCS 683 Elementary Biostatistics Spring.
VETCS 684 Horse Lameness Spring.
VETCS 686 Goats: Management and Diseases Spring.

VETCS 688 Special Problems in Small Animal Medicine Fall and spring.
VETCS 689 Special Problems in Small Animal Surgery Fall and spring.
VETCS 690 Veterinary Dermatology Spring.
VETCS 691 Advanced Large Animal Internal Medicine Spring.
[VETCS 694 Avian and Reptile Medicine and Surgery Spring.]
VETCS 695 Advanced Equine Surgical Techniques Spring.
VETCS 696 Basic and Therapeutic Horseshoeing Spring.
VETCS 697 Advanced Techniques in Food Animal Surgery Spring.
VETCS 698 Senior Seminar Selective Fall and spring.
VETCS 699 Llama Tutorial Fall and spring.
[VETCS 700 Pathophysiology of Gastrointestinal Surgery Fall.]
[VETCS 701 Pathophysiology of Orthopedic Surgery January.]
[VETCS 702 Pathophysiology of Cardiopulmonary Surgery Fall.]
[VETCS 703 Surgical Principles and Surgery of the Integumentary System Spring.]
VETCS 704 Pathophysiology of Urogenital Surgery Fall.
VETCS 705 Animal Pain and Its Control Spring.
VETCS 706 Pathophysiology of Neurologic Surgery Spring.
VETCS 707 Clinical Biostatistics Spring.
VETCS 708 Epidemiology Seminar Series Fall and spring.
VETCS 766 Graduate Research Fall, spring, and summer.
VETCS 768 Master's-Level Thesis Research Fall and spring.
VETCS 769 Doctoral-Level Thesis Research Fall and spring.
VETCS 799 Independent Studies in Epidemiology Fall and spring.

## DIAGNOSTIC LABORATORY

VETDL 531 Regulatory Medicine Spring.
VETDL 611 Mastitis January.
VETDL 700 Special Projects in Diagnostic Endocrinology Fall and spring.
VETDL 701 Special Projects in Infectious Diseases Fall and spring.
VETDL 702 Special Topics in Infectious Diseases Fall and spring.
VETDL 703 Doctoral-Level Thesis Research Fall and spring.
VETDL 704 Master's-Level Thesis Research Fall and spring.

## MICROBIOLOGY, IMMUNOLOGY, AND PARASITOLOGY

VETMI 315 Basic Immunology Lectures (also Biological Sciences 305) Fall.
[VETMI 318 Pathogenic Bacteriology and Mycology (also Biological Sciences 304) Spring.]
[VETMI 331 Medical Parasitology Fall.]
VETMI 408 Viruses and Diseases (replaces VETMI 417) Spring.
VETMI 605 Special Projects in Microbiology Fall and spring.
VETMI 606 Small Animal Infectious Diseases

Spring.
VETMI 607 Virus Diseases of Cattle Fall.
VETMI 615 Research Opportunities in Veterinary Medicine Fall, January, spring, and summer.
VETMI 651 Clinical Parasitology of Avian Species Spring.
VETMI 700 The Biology of Animal Viruses and Viral Pathogenesis Fall.
VETMI 701 Models of Viral Pathogenesis Fall.
VETMI 702 Molecular Biology and Immunology of Host-Parasite Interactions Fall.
[VETMI 705 Advanced Immunology Lectures (also Biological Sciences 705) Spring.]
VETMI 706 Immunology Seminar Series Fall and spring.
VETMI 707 Advanced Work in Bacteriology, Virology, and Immunology Fall and spring.
VETMI 708 Selected Topics in Animal Virology Spring.
VETMI 709 Laboratory Methods of Diagnosis Fall and spring.
VETMI 710 Microbiology Seminars Fall and spring.
VETMI 711 Independent Study: Joint Physiology Fall.
VETMI 719 Immunology of Infectious Diseases and Tumors (also Biological Sciences 706) Spring.
[VETMI 720 Special Topics in Immunology: Macrophage Function and Regulation Spring.]
VETMI 721 Special Topics in Immunology: Neuroendocrine-Immune Interactions Spring.
VETMI 722 Special Topics in Immunity: Nutrition and Immunity Spring.
VETMI 737 Advanced Work in Animal Parasitology Fall and spring.
VETMI 783 Seminars in Parasitology Fall and spring.

## PATHOLOGY

VETPA 539 Introduction to Laboratory Animal Medicine Spring.
VETPA 540 Pathology Service Fall, spring, and summer.
VETPA 549 Laboratory Animal Clinical Rotation Fall and spring.
VETPA 636 Wildlife Pathology Fall.
VETPA 637 Postmortem Pathology Fall and spring.
VETPA 638 The Bottom Line Fall and spring.
VETPA 640 Principles of Toxicological Pathology Fall.
VETPA 641 Clinical Immunology Fall.
VETPA 713 Cell Cycle and Cancer Biology Spring.
VETPA 736 Pathology of Nutritional Diseases Spring.
VETPA 750 Cancer Cell Biology Spring.
VETPA 788 Seminar in Surgical Pathology Fall and spring.
VETPA 789 Seminar in Necropsy Pathology Fall and spring.

## PHARMACOLOGY

VETPR 607 Introduction to Pharmacology Fall.
VETPR 608 Basic Pharmocology Fall.
VETPR 619 Clinical Pharmacology Fall.
VETPR 620 Advanced Clinical Pharmacology Spring.

VETPR 621 Toxicology (also Toxicology 621) Spring.
VETPR 622 Special Projects in Pharmacology Fall, spring, and summer.
VETPR 629 Research Opportunities in Veterinary Medicine Fall, January, spring, and summer.
VETPR 660 Safety Evaluations in Public Health (also Toxicology 660) Spring.
VETPR 700 Calcium as a Second Messenger in Cell Activation Spring
VETPR 701 Organ System Toxicology (also Toxicology 611)
VETPR 703 Receptor Binding: Theory and Techniques (also Biological Sciences 790, Sec. 02) Spring.
VETPR 704 CNS Neuropharmacology: Mechanisms of Synaptic Transmission Fall.
VETPR 705 Molecular Mechanisms of Receptor-G Protein Coupled Signaling Spring.
VETPR 706 Growth Factor-Coupled Signaling (also Biological Sciences 734)

## Special Projects and Research in Pharmacology

VETPR 711 The Role of Calcium in Stimulus Secretion Coupling Fall, spring, and summer.
VETPR 712 Eosinophil Stimulus-Response Coupling Fall, spring, and summer.
VETPR 713 Mechanisms of Growth-Factor Action Fall, spring, and summer.
VETPR 714 Central Nervous System Neurotransmitters Fall, spring, and summer.
VETPR 718 Structure-Function of the Nicotinic Acetylcholine Receptor Fall, spring, and summer.
VETPR 720 Modulation of Nicotinic Acetylcholine Receptor Function Fall, spring, and summer.
[VETPR 723 The Role of Calcium in the Control of Electrolyte Transport Fall, spring, and summer.]
[VETPR 724 The Control of Hormone Secretion Fall, spring, and summer.]
VETPR 730 Graduate Research in Pharmacology Fall, spring, and summer.

## Special Topics in Pharmacology

VETPR 741 Neuromodulation Fall, spring, and summer
VETPR 742 Receptor Mechanisms Fall, spring, and summer.
VETPR 745 Biochemical Neuropharmacology Fall, spring, and summer
VETPR 747 Amino Acid Neurotransmitters Fall, spring, and summer
VETPR 748 Stimulus-Secretion Coupling Fall, spring, and summer.
VETPR 749 Second Messengers in Cell Activation Fall, spring, and summer.
VETPR 750 Cell Calcium Fall, spring, and summer.
[VETPR 755 Calcium in the Control of Hormone Secretion Fall, spring, and summer.]
[VETPR 756 Mechanisms of Calcium Handling Fall, spring, and summer.]
[VETPR 757 Intestinal Electrolyte Transport Fall, spring, and summer.]
VETPR 760 Advanced Topics In Pharmacology Fall, spring, and summer

## PHYSIOLOGY

[Biological Basis of Sex Differences (Biological Sciences 214) Fall.]
Histology: The Biology of the Tissues (Biological Sciences 313) Fall.

Cellular Physiology (Biological Sciences 316) Spring.
VETPH 346 Introductory Animal Physiology (also Biological Sciences 311) Fall.
Mammalian Physiology (Biological Sciences 458) Spring.
Undergraduate Research in Biology (Biological Sciences 499) Fall and spring
VETPH 612 Research Opportunities in Veterinary Medicine Fall, January, spring, and summer.
Lipids (Biological Sciences 619 and Nutritional Sciences 602) Fall.
VETPH 625 Problems in Dog and Cat Behavior Spring.
VETPH 626 Problems in Equine Behavior Spring
VETPH 627 Acid-Base Relations (also Biological Sciences 715) Fall, spring, and summer.
VETPH 628 Graduate Research in Animal Physiology (also Biological Sciences 719) Fall and spring
[Plasma Lipoproteins (Biological Sciences 712) Spring.]
Stress Physiology (Biological Sciences 711) Fall.
[Cardiac Electrophysiology (Biological Sciences 713) Fall.]
[Physiology of Pregnancy (Biological Sciences 714) Spring.]
[Regulation of Mitosis and the Cell Cycle (Biologica Sciences 716) Spring.]
Structure and Function of Joints with Emphasis on Arthritis (Biological Sciences 717) Fall
[Evolution of Color (Biological Sciences 718) Spring.]
VETPH 720 Special Problems in Physiology Fall and spring.
[VETPH 752 Biological Membranes and Nutrient Transfer (also Biological Sciences 618) Spring.]
VETPH 758 Molecular Mechanisms of Hormone Action (also Biological Sciences 658) Spring.
VETPH 759 Nutrition and Physiology of Mineral Elements (also Biological Sciences 615 and 659) Spring.

Fundamentals of Endocrinology, Lecture (Animal Science 427) Fall.
Fundamentals of Endocrinology, Laboratory (Animal Science 428) Fall.
VETPH 811-812 Advanced Physiologica Methods I and II (Biological Sciences 811, 812) 811, Fall; 812, spring

## FACULTY ROSTER

Aquirre, Gustavo D., Ph.D., U. of Pennslyvania. Alfred H. Caspary Professor, Clinical Sciences
Ainsworth, Dorothy M., Ph.D., U. of Wiscon-sin-Madison. Asst. Prof., Clinical Sciences
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Barr, Stephen C., Ph.D., Louisiana State U. Asst. Prof., Clinical Sciences
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Bertram, John E., Ph.D., U. of Chicago. Asst. Prof., Anatomy
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Bloom, Stephen E., Ph.D., U. of Pennsylvania. Prof., Avian and Aquatic Animal Medicine
Blue, Julia T., Ph.D., U. of Pennsylvania. Assoc. Prof., Pathology
Bowman, Dwight D., Ph.D., Tulane U. Assoc Prof., Microbiology, Immunology, and Parasitology
Bowser, Paul R., Ph.D., Auburn U. Assoc Prof., Avian and Aquatic Animal Medicine Calnek, Bruce W., D.V.M., Cornell U. Rudolph J. and Katharine L. Steffen Professor, Avian and Aquatic Animal Medicine
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Kallfelz, Francis A., Ph.D., Cornell U. Prof., Clinical Sciences
Kern, Thomas J., D.V.M., U. of Missouri. Assoc. Prof., Clinical Sciences
King, John M., Ph.D, Cornell U. Prof., Pathology
Kollias, George V., Ph.D., U. of California at Davis. Prof., Clinical Sciences
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Moon, Paula, D.V.M., Ohio U. Asst. Prof., Clinical Sciences
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Yen, Andrew, Ph.D., Cornell U. Prof., Pathology

## COLLEGE OF ARTS AND SCIENCES

## PROGRAM OF STUDY

## Introduction

The College of Arts and Sciences at Comell is a community of about 4,000 undergraduates and 600 faculty members. It is composed of those departments that teach and study the humanities and the arts, the basic sciences and mathematics, the social sciences and history. It is also a college within a university of about 18,000 students and 1,630 faculty members, and this wider community provides strength and diversity beyond what an isolated undergraduate institution can provide. Students may draw upon the knowledge and facilities of the other undergraduate colleges at Cornell to supplement their studies. Finally, the college is a graduate school and research center attracting faculty whose writing and research require first-rate academic facilities and whose participation in undergraduate teaching brings to their students the most current ideas in modern scholarship. It is this abundant variety and outstanding quality among many disciplines that gives the college its distinctive character.

The richness of the curriculum is extraordinary; there is no course that all students must take, and there are several hundred from which they may choose. By choosing courses each semester, students design their own education. They strike a balance between developing known interests and exploring new subjects. They sharpen their verbal and quantitative skills. They also come to understand more thoroughly the Western tradition and learn something about the nonWestern world and its peoples. An education in the liberal arts means honing one's critical capacities, learning more about oneself in nature and culture, and gaining real experience of views of the world radically unlike one's own. All this is highly individual, and the college relies on each student and faculty adviser to select sensible, challenging, and appropriate courses.
Yet the faculty believe that each student's education should have certain common qualities. These include familiarity with several different ways of acquiring knowledge that are reflected in the natural sciences, in the social sciences, and in those achievements of intellect and imagination that are the focus of the humanities and the arts. In addition to these general areas of knowledge, students study foreign languages, acquire effective writing and quantitative skills, and concentrate on one particular field to develop, as fully as possible, the powers of imaginative and critical thinking. To accomplish these objectives, the college has certain requirements for graduation

## Summary of Basic College Requirements for Graduation

1) Freshman Writing Seminars: Two.
2) Foreign language: Up to four courses to obtain qualification in two languages or proficiency in one.
3) Distribution Requirement I: Four approved sequences of two full-semester courses. Applicable through the Class of 1995. Distribution Requirement II: See below. Applicable starting with the Class of 1996.
4) Major
5) Electives: Four or five courses (or 15 credits) in courses not used to fulfill other requirements and not in the major field.
6) Residence: Eight full-time semesters, unless a student can successfully complete all other requirements in fewer than eight semesters and meets the criteria to accelerate graduation. (See "Acceleration," under the heading "Residence.")
7) Minimum number of courses: Thirty-four courses. A 2 -credit course counts as half a course; a 6-credit language course counts as one and one-half courses; a 1credit course does not count toward this requirement. (See under "Courses and Credits," below.)
8) Credits: A total of 120 credits, of which 100 must be taken in the College of Arts and Sciences.
9) Physical education: Completion of the university requirement. Please note that physical education credit does not count toward graduation or toward the 12-credit minimum required for good standing each semester. See p. 14.
10) Application to graduate

## Freshman Writing Seminars

See "John S. Knight Writing Program." Freshman Writing Seminars may not also be counted toward any other distribution requirement.

## Foreign Language Requirement

The faculty considers competence in a foreign language essential for an educated person. Studying another language helps students understand language itself, our fundamental intellectual tool, and opens another culture for exploration. The sooner the student acquires competence, the more useful it will be. Hence work toward the foreign language requirement should be undertaken in the freshman and sophomore years.
The following departments teach foreign languages or literature or both in the College of Arts and Sciences: Africana Studies and Research Center, Asian Studies, Classics, German Studies, Modern Languages and Linguistics, Near Eastem Studies, Romance Studies, and Russian Literature.
The language requirement may be satisfied in one of two ways:

1) by attaining proficiency in one language or
2) by attaining qualification in two languages.

## Proficlency

Proficiency is attained by passing a 200 -level (intermediate) Cornell course (or Chinese or Japanese 161) or by equivalent achievement determined by examination (see chart below).

Earning 3 credits on an AP language exam carries with it proficiency only if the student scores high enough on the CASE (Cornell Advanced Standing Exam). In other words, even students who earn advanced placement credit with scores of 4 or 5 on an AP language exam should take the CASE to see if they can be awarded proficiency. On the other hand, earning a 4 or 5 on an AP literature exam in French, Spanish, or German earns proficiency, as well as 3 credits, without the CASE. (Such students should take the CASE anyway to see if they can earn an additional 3 credits in language.)

## Qualification

Qualification may be attained in any of the following four ways.

1) Three years of high school study in any one language gives qualification in that language. Note that this route to qualification does not guarantee entrance into a 200 -level course. If you want to continue studying the language, you must be placed in the appropriate course by a score on an examination. Being placed below the 200-level, however, does not cancel the qualification.
2) Passing the requisite course: 102,123 , or 134 in most languages taught by the Department of Modern Languages and Linguistics; Chinese 112-114 or Japanese 160; Near Eastern Studies 102 or 122 in Hebrew, 112 in elementary classical Arabic, 214 in Egyptian Arabic, or 138 in Turkish; Classics 103 or 104 in Greek, 106 or 107 or 108 in Latin, 112 in modern Greek; 132 in Sanskrit; AS\&RC 134 in Swahili.
Note: Completion of language sequences 131-132 does not constitute qualification.
3) A score of 560 or better on the placement test (either in high school or during orientation week).
You may earn a 560 placement test score at the end of a course numbered 122 (second semester of the introductory sequence) and consequently attain qualification without taking 123, the third semester of the introductory sequence. However, with a score of 560 , you may decide to take 123 anyway to be better prepared for the 200 -level courses.
4) Placement into a 200 -level course by departmental, sometimes individual, examination at Cornell (in cases where no placement test is available).

## Placement in Language Courses and Advanced Placement Credil

Placement into language courses and advanced placement credit are separate results of examinations.

## Placement

Entering students who have had two or more years of high school study in a language or who have been awarded credit for language work at another college or university may enroll in a course in the same language only after being placed by examination. The placement exam may have been taken in high school after the last course or at Comell during orientation. Students may retake a language test a year or more since last taking it.

## Advanced Placement Credit

Being placed into a 200-level course does not earn credit toward the degree. Credit is earned only for high school work already at the 200 -level, in other words, for the equivalent of language courses numbered 200 and above here at Comell.
The type of examination depends upon the language and the level of achievement:

1) French, German, Italian, Russian, and Spanish placement tests: Students need to register for the placement tests with the Department of Modern Languages and Linguistics, 203 Morrill Hall.
2) Latin: departmental examination, Department of Classics, 120 Goldwin Smith Hall
3) Ancient and modern Greek: departmental examination, Department of Classics, 360 Rockefeller Hall.
4) Arabic: departmental examination, Department of Near Fastern Studies, 360 Rockefeller Hall.
5) Hebrew: departmental examination, Department of Near Eastern Studies, 360 Rockefeller Hall.
6) Turkish: departmental examination, Department of Near Eastern Studies, 360 Rockefeller Hall
7) Other languages: special examinations, see the professor who teaches the language
8) Students with a placement test score of 650 or above in French, German, and Spanish: the Comell Advanced Standing Examination (CASE).

Even an eligible student who does not want to do further work in a language may earn 3 or 6 credits and proficiency from the CASE

Depending on their placement test scores, students are eligible for the courses and Cornell Advanced Standing Examination (CASE) as listed in the charts below. For languages not listed, or for special problems, students should see the professor in charge.

## French

| Placement Test <br> Reading Score | Language <br> Courses | Literature <br> Courses |
| :--- | :--- | :--- |
| Below 370 | 121 |  |
| $370-440$ | 122 |  |
| $450-550$ | 123 |  |
| $560-640$ | 200,203 , or 205 |  |
| 600 |  | 220 |
| 630 |  |  |
| 650 and above | Apply for the |  |
| AP 4 or 5 in | Cornell Advanced |  |
| language | Standing |  |
| 3 credits of | Examination (CASE) |  |

## German

| Placement Test <br> Reading Score | Language <br> Courses | Literature <br> Courses |
| :--- | :--- | :--- |
| Below 450 | 121 |  |
| $450-550$ | 123 | 201 |
| $560-640$ | 203 |  |
| 650 and above | Apply for the |  |
| AP 3 or better | Cornell Advanced |  |
| in language, | Standing |  |
| 3 credits | Examination (CASE) |  |
| AP 3 or better |  |  |
| in literature, |  |  |
| 3 credits |  |  |
| of proficiency |  |  |

## Italian

| Placement Test Reading Score | Language Courses | Literature Courses |
| :---: | :---: | :---: |
| Below 450 | 121 |  |
| 450-550 | 123 |  |
| 560-640 | 203 | 201 |
| 650 and above | Apply for the |  |
| AP 4 or 5 | Cornell Advanced |  |
| in language, | Standing |  |
| 3 credits | Examination (CAS |  | AP 4 or 5 in

literature,
3 credits
of proficiency

## Russian

Apply for the Cornell Advanced Standing Examination (CASE)

Spanish

| Placement Test <br> Reading Score | Language <br> Courses | Literature <br> Courses |
| :--- | :--- | :--- |
| Below 370 | 121 |  |
| $370-440$ | 112 |  |
| $450-559$ | 123 | 201 |
| $560-640$ | $200,203,213$ |  |
|  | 211 |  |
| 650 and above | Apply for the |  |
| AP 4 or 5 in | Cornell Advanced <br> language, | Standing |
| 3 credits. | Examination (CASE) |  | 3 credits. Examination (CASE)

AP 4 or 5 in
literature,
3 credits
and proficiency

## Distribution Requirement I: Applicable through the Class of 1995

The purposes of the distribution requirement are to acquaint students with a broad range of subjects and disciplines in the liberal arts and sciences and to provide them with the opportunity to explore new areas.
Accomplishing these purposes is part of the task of freshmen and sophomores. Although completion of the requirements may be spread over the eight semesters, successful introductory course work can be followed up with advanced courses only if undertaken early. For purposes of distribution, subjects are divided into four groups. Each of the first three groups has two subdivisions.

## Group 1

a. Physical sciences
b. Biological sciences

## Group 2

a. Social sciences
b. History

## Group 3

a. Humanities
b. Expressive arts

## Group 4

a. Mathematics and computer science
b. One of the subdivisions not used in fulfillment of groups 1,2 , or 3 .
In each of groups 1,2 , and 3 , students must take a sequence of two courses ( 6 or more credits) approved by the department in one subject chosen from either subdivision. For group 4, students are strongly urged to take two courses in mathematics or one in mathematics and another in Computer Science. Those who choose not to satisfy the group 4 requirement with mathematics must choose two courses in one subject from an unused subdivision in group 1,2 , or 3 . For example, a student who fulfills group 1 with biology, group 2 with psychology, and group 3 with theatre arts could then complete group 4 with a sequence of two courses from the list below in the physical sciences, history, or the humanities.

Courses fulfilling the distribution requirement are usually taken in the College of Arts and Sciences (with exceptions noted in the list below) and may be taken for S-U grades. Coistribution taken outside of Arts and Sciences do not count toward the 100 "arts" credits required for graduation. Students may petition to take Architecture 181-182, History of Architecture I and 11, in the Department of Architecture of the College of Architecture, Art, and Planning, to fulfill the requirement in expressive arts.

## Advanced Placement Credit

AP credit is meant to place students into the appropriate level of study and to give them credit for their advanced standing. AP credit counts toward the 120 credits and thirty-four courses required for graduation; it does not count as well as toward the required 100 credits in Arts and Sciences courses. The application of AP credit to distribution requirements is different for each group.
Freshman Writing Seminars. Students who score 5 on the AP exam in English are exempt from one writing seminar and are awarded three credits. A score of 4 will give three credits but no exemption from a seminar. These students, as well as those who score 700 or better on the College Placement Test in literature or composition, are eligible to enroll, space permitting, in the following freshman writing seminars: English 270, 271, 272.
Science. AP credit may be used to fulfill balf the distribution requirement in science. Students who place out of two semesters of introductory science may satisfy the distribution requirement with one non-introductory course in that science or with an introductory sequence of two semesters in another science.
Social sciences or history. AP credit may not be used to satisfy this requirement.
Humanities or expressive arts. AP credit may not be used to satisfy this requirement.

Mathematics. AP credit may be used to fulfill the requirement in mathematics.
Here is a complete list of the courses that fulfill Distribution Requirement 1 .

Group 1: Physical or Biological Sciences a. Physical Sciences

Astronomy: Any two courses: 101 or 211,102 or $212,107,201,202$, or any course numbered 300 or above. If 107 is taken, no other 100 -level course can be used. Note that ASTRO 103, 104, 105 , and 106 do not satisfy the distribution requirement for the College of Arts and Sciences, but may satisfy the requirements of some other college.

Chemistry: 103, 207, 211, or 215 followed by $104,203,204,208,216$, or 222.

Geological Sciences: $101,103,111$, or 202 plus 102, 104, or 206; or 202 plus 102, 104, or 206

Physics: Any two sequential courses such as $101-102,207-208$, or $112-213$, or any combination of the first term of one sequence and the second term of another, such as 101-208. The requirement is also met by any two general education course from the group 200-206, 209, 210 or by a combination of 101,112 , or 207 with one from the group 200-206, 209, 210.
b. Biological Sciences

A two-semester introductory biology sequence selected from Biological Sciences 109-110, or 105-106, or 101/103 plus $102 / 104$, or any combination of the first term of one sequence and the second term of another. Biological Sciences 107108 , offered during the eight-week Cornell Summer Session for 8 credits, satisfies the distribution requirement. Advanced placement in biology with a score of 4 or 5 ( 6 or 8 credits, respec tively) satisfies half the clistribution requirement in the biological sciences The remainder of the distribution requirement may be satisfied by an upper-level course (200+) offered by the Division of Biological Sciences (other than Biological Sciences 200, except by permission of the associate director in the Division): 202, 205, 206, 208, 209, 301, or 367); Anthropology 101; or Chemistry 222

## Group 2: Social Sciences or History

a. Social Sciences

Africana Studies: Any two of 171, 172, 190, 191, 208, 231, 280, 290, 301, 302, $344,345,346,352,400,410,420,451$, 459, 460, 481, 484, 485, 495, 550, 571.

Anthropology: Any two courses in the Department of Anthropology except Anthropology 275, 371, 474.

Archaeology: Archaeology 100 and any one of the following: Archaeology 203, $204,308,317,402,404,493,494$, or Anthropology 203, 204, 354, 355, 356, 402, 404, 456, 493, 494, 656, 663, 664, 666.

Asian Studies: Any two courses in Asian anthropology, economics, government, linguistics, or sociology given by the Department of Asian Studies or listed there under the areas of China, Japan, South Asia, and Southeast Asia, excluding only Freshman Writing Seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any two courses in the
same area, or by taking AS 208, 211, 212, 215 , or 218 , followed by a social science course in that area. Alternative sequences will, under special circumstances, be consiclered but require the permission of the director of undergraduate studies.

Economics: 101, 102, 103, 203, 204, or a combination of one of these courses and any course for which it is a prerequisite if the course is taught by a member of the Department of Economics.

Government: Any two of 111, 131 or $231,161,181$ or 281 ; or any one of these courses followed by a 300 -level course in the same area.

Linguistics: 101 and (1) any other course in linguistics or (2) any other course offered by the Department of Modern Languages and Linguistics for which this introductory linguistics course is a prerequisite.

Near Eastern Studies: Any two NES archaeology courses at the 200 or 300 level that form a reasonable sequence or combination. NES 197 or 198 plus an NES archaeology course will also satisfy the social sciences requirement.

Psychology: Any two courses in psychology with the exception of Psychology 123, 276, 307, 322, 324, 326, $332,350,361,396,422,425,429,470$, $471,472,473,475,476,479,491,492$.
Science and Technology Studies: Any two of the following courses: 350,352 , $360,401,402,407,427,442,467,483$.

Sociology: Any two of 101, 103, 110, 115 , or 101, followed by any course at the 200 level or above in sociology
Women's Studies: (a) Any two of 206, 208, 218, 238, 244, 262, 269, 275, 277, $297,305,321,336,345,353,362,363$, $366,385,406,408,417,425,428,434$, $450,463,466,468,480,636$; or (b) any one of $210,365,454$, plus one course from list a. (Appropriate courses in women's studies taken previously may be approved by the program.)
City and Regional Planning: 100 and 101.
b. History

Africana Studies: Any two of 203, 204, $205,283,344,350,360,361,370,381$, $405,459,460,471,475,483,490,510$.
Asian Studies: Any two courses in Asian history given by the Department of History and listed under the Department of Asian Studies under the areas of China, Japan, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any two courses in the same area, or by taking AS 208, 211, 212. 215 , or 218 followed by a history course in that area.

History: Any two courses in the Department of History, except for Freshman Writing Seminars.
Near Eastern Studies: Any two NES history courses at the 200,300 or 400 level that form a reasonable sequence or combination. NES 197 or NES 198 plus an NES history course will also satisfy the history requirement.

Science and Technology Studies: Any two of the following courses: 233,250 , 281, 282, 287, 288, 292, 350, 401, 433, $444,447,448,482,687$.

Women's Studies: Any two of 227, 238, $273,307,336,357,426$. (Appropriate courses taken previously may be approved by the program.)

## Group 3: Humanities or Expressive Arts

 a. HumanitiesAfricana Studies: Any two of 202, 211, 219, 422, 425, 431, 432, 455.
Archaeology: Archaeology 100 and any of the following: Archaeology 221, 232, 233, 250, 308, 356, 402, 423, 432; Classics $219,220,221,232,233,239,250,309$, $320,322,323,325,326,327,350,356$, $360,423,427,432,434,435,629,630$; Near Eastern Studies 243, 263, 264, 267, 364, 367.
Asian Studies: Any two courses in Asian art, literature, religion or cultural history given by the Department of Asian Studies or listed there under the areas of China, Japan, Korea, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by any two courses in the same area, or by taking AS $208,211,212,215$, or 218 , either using two of these courses as a sequence or by following one with a course in the humanities in that area. Asian Studies 250 together with Religious Studies 101 may also satisfy the humanities requirement.
Classics: (a) any two courses in Greek beginning with 201 or in Latin beginning with 205 that form a reasonable sequence, or (b) any two Classical Civilization and/ or Art and Archaeology courses, 200-level or above.

Comparative Literature: Any two comparative literature courses through the 300 level, excluding Freshman Writing
Seminars; 400 -level courses with permission of the instructor or the director of undergraduate studies.
English: Any two courses in English at the 200 level or above, except English 270, 271, and 272 if used as Freshman Writing Seminars. If students have used English courses to satisfy the expressive arts requirement, they should not take courses numbered in the 80s (e.g., 281, 382) to satisfy the humanities requirement.
French Literature: Any two courses from 200, 220, 221 (formerly 201), 222 (formerly 202), or 300-level literature courses.
German Literature: Any two courses at the 200 level or above.

Italian Literature: Any two literature courses at the 200 level or above.
Near Eastern Studies: Any two NES civilization or literature courses at the 200, 300 or 400 level that form a reasonable sequence or combination, including Hebrew 201-202, Intermediate Arabic 211-212, Advanced Arabic 311-312, Intermediate Modern Hebrew 201-202, Advanced Modern Hebrew 301-302. NES 197 or 198 plus an NES civilization or
literature course will also satisfy the humanities requirement.
Philosophy: Any two courses with the following exceptions: (1) Philosophy 100, if used to satisfy the freshman writing seminar requirement; (2) a combination of two courses in logic, such as 231,331, 431, 436.
Religious Studies: Relig. St. 101 with Asian Studies 250.
Russian Literature: Any two courses at the 200 level or above except 329,330
Science and Technology Studies: Any two of the following courses: 286,381 , 384, 389, 472, 481, 661, 681.

Spanish Literature: Two of 201, 315, 316,318 , or any other 300 -level literature courses.

Women's Studies: (a) Any two of 248 251, 264, 341, 348, 349, 363, 365, 366, $374,390,402,404,445,451,456,460$, $474,475,476,481,491,492$; or (b) any one of $210,365,493$, plus one course from list a. (Appropriate courses in women's studies taken previously may be approved by the program.)
b. Expressive Arts

Africana Studies: Any two of 285, 303, 304, 425, 430, 435.
Anthropology: Any two of 290, 451, 452 , 453, or 455.
Archaeology: Archaeology 100 and any one of the following: Archaeology 423; History of Art 220, 221, 223, 224, 320, 322, $323,325,326,327,423,427,432,434$.
English: Any two of the courses at the 200 level or above that are numbered in the 80s (e.g., 281, 382).
History of Art: Any two courses at the 200 level or above, or Archaeology 100 and one of the History of Art courses listed under Archaeology.
Music: 6 credits in music, except freshman writing seminars. A maximum of 4 credits in Music 321-322 and a maximum of 3 credits in Music 331 through 3468 and 421 through 450 may be used to satisfy this requirement.
Theatre Arts: Any two of the 3- or 4credit courses at the 200 level or above

Group 4: Mathematics or an Unused Subdivision a. Mathematics and Computer Science

Any 6 credits in mathematics except 104 and not including more than one course from 105 or 403. Computer Science 100, 211 , or 212 may be used for three of these credits. The mathematics distribution requirement is also satisfied by a score of 3 or higher on the CEEB calculus BC examination. Mathematics 109 and Education 005 and 115 (College of Agriculture and Life Sciences) do not count toward satisfying the requirement
b. An Unused Subdivision

A sequence of courses in any one of the subdivisions in groups 1-3 that has not been used to fill that group's requirement.

## Distribution Requirement Il: Beginning with students in the Class of 1996

In satisfying the distribution requirements, students become acquainted with a broad range of subject matter in the liberal arts and sciences and explore areas they may not have explored before.
Attaining these two goals is part of the task of freshmen and sophomores. Although students may complete the requirements over the eight semesters, they can follow up introductory and exploratory course work that proves intriguing with advanced courses only if they have taken the introductory courses early.
Students must take a total of nine courses for the distribution requirement: four courses (of three or more credits each) from Groups 1 and 2 below, at least one of which is from Group 2, and at least two of which are from Group 1: for example, one chemistry, one physics, one geology, and one mathematics; five courses from Groups 3 and 4 below, with at least two in each group and two in the same department: for example, one course in sociology, one in history, one in history of art, and two in Theater Arts. No single course may satisfy more than one distribution requirement, and no freshman writing seminar may satisfy any of the distribution requirements.
Students may use one of the approved interdisciplinary courses for distribution as noted below, but may apply such courses to only one category of the distribution requirement and may not count courses offered or crosslisted by their major department for any category beyond the usual category of the major itself.

## 1. Physical and Biological Sciences

Anthropology 101, 275, 371, 390
Astronomy 101 or 211,102 or 212,107 , 201, 202 or any course numbered 300 or above

If 107 is taken, no other 100 -level course can be used. Note that ASTRO 103, 104, 105, 106 do not satisfy the distribution requirement for the College of Arts and Sciences but may satisfy the requirements of another college.

Chemistry (all courses)
Geological Sciences (all courses)
Physics (all courses)

## Bio/Geo 154

Biological Sciences: all courses except 152, 200 (unless permission of the associate directed is obtained, 202, 205, 206, 208, 209, 301, or 367. The following courses are especially suitable for the distribution requirement because they have no prerequisites: Bio $S$ 101-104, 105-106, 107-108, 109-110, 160 170, 192, 201, 207, 212, 246, 275. Note that introductory biology can only count for distribution credit uben taken as a two-semester sequence: 109-110, 105-106, or 101 and 103 plus 102 and 104, or 107-108, or a combination of the first term of one sequence and the second term of another.

## 2. Other Science Courses

In fulfilling the science distribution requirement, students must take at least one course in a traditional science department (those listed under Group 1, "Physical and Biological Sciences").

AnSci 100, 150, 212
Anthro 101, 275, 371, 390, 474, 490
Bio \& Soc 301
Entom 212
Food 200
Nat Res 201, 210, 301
Pl Br 225
Psych 123
Pl Pa 301
SCAS 131, 231
3. Quantitative and formal reasoning

All courses offered by the Department of Mathematics except Math 101 and 109

Biology and Society 202
City and Regional Planning 320
Computer Science 100, 101, 172, 211, 212
Industrial \& Labor Relations 210, 211
Linguistics 316
Operations Research \& Industrial Engineering 115
Philosuphy 231, 331, 431, 436
Physics 205
Physics 209
Physics 210
Psychology 350
Sociology 301
Statistics and Biometry 215
If students choose two courses from this list to satisfy part of the distribution requirement, those two courses may not have significant overlap. For example, students should not choose two beginning courses in statistics.
Advanced placement or transfer credit only in mathematics or computer science may be applied to distribution in quantitative and formal reasoning.

Under exceptional circumstances and upon petition, certain Comell courses not listed above under Group 2, courses such as those appearing on the following auxiliary list, may be used to satisfy the requirement in quantitative and formal reasoning. The petition should provide persuasive rationale both in terms of the student's course of study and in terms of meeting the goals of the requirement
Auxiliary list: Agricultural Economics 310; Agricultural Engineering 151; City and Regional Planning 321; Industrial and Lahor Relations 312; Linguistics 421, 450; Psychology 472-473 (a sequence of two two-credit courses which may count only in its entirety as one course); Sociology 420

## 4. Social sciences and history

Africana Studies 171. 172, 190, 191, 231,
280, 290, 301, 302, 344, 345, 346, 352
382, 400, 410, 420, 451, 459, 460, 481,
484, 485, 495, 550, 571
Anthropology (all courses except
Anthropology 101, 275, 371, 390, 451,
452, 453, 474)
Archaeology 100, 201, 202, 203, 204, 263,
$275,317,353,370,404,493,494$

Asian studies (courses in Asian anthropology, economics, government, linguistics, or sociology)
City and Regional Planning 100, 101
Economics (all courses except 317, 318, 319)

Government (all courses)
Linguistics (all courses)
Near Eastern archaeology
Psychology (all courses except 123, 276,
$307,322,324,326,332,350,361,396$
$422,425,429,470,471,472,473,475$ $476,479,491,492$ )

Science and Technology Studies 350 ,
$352,360,401,402,407,427,442,467$ 483

## Sociology (all courses)

Women's Studies 206, 210, 218, 220, 238 $244,262,269,275,277,281,305,321$ $345,353,362,365,366,372,385,406$ $408,416,417,425,428,435,438,450$ $454,455,463,466,468,478,479,480$ 493

## History

Africana Studies 204, 205, 283, 344, 350,
$360,361,370,381,383,405,460,471$,
475, 483, 490, 510
Engineering 250, 292
History (all courses)
Near Eastern Studies 197, 198, and other courses in Near Eastern history
Science and Technology Studies 233 , 250, 281, 282, 287, 288, 292, 433, 444, 447, 482, 687
Women's Studies $227,238,273,307,336$, 357, 384, 401, 410, 426, 438, 444
5. Humanities and the arts

Africana Studies 202, 211, 219, 422, 425, 431, 432, 455

Anthropology 451, 452, 453, 455
Archaeology 100, 201, 221, 232, 233, 320, $356,357,360,402,423,432,434$

Asian Studies (courses in Asian art, literature, religion, or cultural history)
Classics (except Classics 100 and Classics 102 in Summer Session)

Comparative Literature
English
French Literature
German Literature
Italian Literature
Near Eastern Studies (courses in Near Eastern civilization or literature, including languages courses at the 200 -level or above)

Philosophy (all courses except courses in logic)
Religious Studies 101
Russian Literature
Spanish Literature
Africana Studies 285, 303, 304, 425, 430. 435

Anthropology 290, 451, 452, 453, 455

## Archaeology 423

History of Art
Music (one course of at least 3 credits, excluding musical performance, organizations or ensembles; or two courses, which may include 4 credits in musical performance or 3 credits in organizations or ensembles, but not both)

Science and Technology Studies 286, 381, 384, 389, 472, 481, 661, 681
Theatre Arts (except for technical production studios)

Women's Studies 210, 251, 264, 335, 341, $346,348,363,365,366,374,390,404$, $407,411,433,445,446,451,457,474$, $475,476,481,491,492,493,530,621$, 633, 660
Students may apply up to two courses of approved advanced placement credit in calculus, computer science, and science toward satisfaction of the distribution requirement in Groups 1 and 2 above, provided that they complete at least one science course during their undergraduate career. They may apply no advanced placement credit toward satisfaction of the distribution requirement in Groups 3 and 4 Grades of S-U in courses applied to the distribution requirement are acceptable.

## 6. Breadth requirements

Students must include in their undergraduate curricula at least one course that focuses on an area or a people other than those of the United States, Canada, or Europe, and one course in an historical period before the twentieth century. (Courses focusing on Native American cultures may count toward the breadth requirement.) Courses that satisfy the first breadth requirement, geographical breadth, are marked with a (9) when described in this catalogue. Courses that satisfy the second, historical breadth, are marked with a \#. Many courses satisfy both requirements, and students may in fact use the same course to satisfy both. They may also apply proficiency in a non-Western language toward the geographical breadth requirement and use courses satisfying distribution, major, or elective (but not writing) requirements in satisfaction of either of the breadth requirements. Advanced placement credit may not be applied to either of the breadth requirements.

## The Major

In their last two years, students devote roughly one-half their time to acquiring depth and competence in a major subject. The choice of major is not intended to define a student's intellect or character or to lead to a lifetime's occupation, although it may do the latter. By majoring, students focus the full extent of their imaginative and intellectual capacities on something they care about and sharpen their minds in the process.

Sophomores must be accepted by departments as majors before registering for courses for the junior year. Most departments and programs specify certain prerequisites for admission to the major; students should consult the departmental listings on the following pages. A department may refuse to accept into the major any student whose performance does not meet departmental
standards. To seek admission into a major, students take a copy of their transcript to an appointment with the director of undergraduate studies in their prospective major department.
Available majors. Majors are offered by each of the departments. There are also majors in Africana studies, American studies, archaeology, biology and society, dance religious studies, Russian and East European studies, and women's studies.

Students may count as "arts" credit two or three courses (sometimes more for independent majors) taken outside the college, which the adviser approves as part of the major.
Some students want to pursue an interest that cannot be met within an established major. They may plan, with the help of their faculty adviser, an independent major that includes courses from several departments. See "Independent Major Program," below, under "Special Academic Options."

Students are responsible for completing their majors according to the regulations and with the approval of their departments. Courses that fulfill major requirements may not be taken for S-U grades.

## Double Majors

One major only is required for graduation Some students choose to complete two majors. No special permission or procedure is required; students simply become accepted into both majors and find an adviser in each department. Both majors will be posted on the official transcript. Courses from a second major can fulfill the requirement of 15 elective credits ( $4-5$ courses.) Double majoring often results in a narrower, less interesting curriculum than a single major with wellselected, advanced-level electives or a concentration, especially if the majors are in closely related fields

## Electives

Of the thirty-four courses and 120 credits required for graduation, almost one-third are free electives. How students use these electives frequently makes the difference between an ordinary and a truly interesting curriculum. Students must complete four or five courses or at least 15 credits offered outside the major field and not used to fill another requirement. Students may group electives to form a concentration separate from their major or even a second major Some choose to explore a variety of subjects. Electives taken in other divisions of the university may be used to gain practical training or specialized knowledge. Some students develop a concentration in one particular department or subject outside arts and sciences. Students who choose to complete two majors may count courses in one of those majors as "electives."

## Residence

Eight semesters of full-time study in the College of Arts and Sciences are integral to eaming the A.B. degree. Even if the minimum requirements can be met in fewer semesters, the faculty of the college expects students to take advantage of the resources of the research university for eight full terms and obtain as rich and advanced an education in the liberal arts and sciences as possible.

## ARTS AND SCIENCES - 1994-1995

Approved study abroad, SEA Semester, and Cornell-in-Washington are considered semesters of residence, but students may spend no more than two semesters on such programs and must be on campus during their last semester.
Semesters of extramural study in the Division of Continuing Education and Summer Sessions do not count as semesters of residence.

Transfer students from other institutions must spend a minimum of four semesters on the Comell campus in Ithaca. Transfers fom other colleges at Comell must spend four semesters on campus in Ithaca as students in the internal transfer division or in the college. Mid-year freshmen who study full-time in an approved curriculum at another institution during the fall preceding their matriculation in the college may, but need not, count that semester as a semester of residence.

Students occasionally enter with advanced placement credit from other institutions, take leaves and complete courses at other institutions, or take summer courses at other institutions. The college will accept credit for such courses, if they are comparable to courses at Cornell. Students may not count such credit, however, as part of the 100 credits required in the College of Arts and Sciences. They may use such credit to replace a term of residence if they petition to accelerate (see below), but such credit must be earned before the last semester. Students may not leave the college after fewer than eight semesters of residence and complete their undergraduate degrees with credits earned at other institutions or as part-time or summer students at Comell.

Acceleration. Some students decide that they do not need eight semesters of residence to obtain a solid undergraduate education. These students should discuss their plans with their major adviser and an assistant dean, and must meet certain requirements in addition to those required of other students.

1. Accelerants must meet either condition $a$ or $b$ :
a. Complete sixty credits before the beginning of the last four semesters and complete the prerequisites for admission to the major in time to spend four semesters in the major.
b. Pass 48 credits in College of Arts and Sciences courses numbered " 300 " and above. Upper-level courses taken in other colleges at Cornell University, and approved for the major, may count as College of Arts and Sciences credit.
2. All accelerants are required to complete 100 credits at C or above.
3. Students may not use credits earned while on required leave of absence to reduce their terms of residence.
4. Accelerants may not finish the degree with credits earned in summer or winter session, through part-time study (unless they meet the guidelines for part-time study), or at an off-campus program, including Cornell-in-Washington, SEA Semester, or study abroad. That is, they may not exit through any program other than a regular, full-time Cornell semester in Ithaca.

Students matriculating as freshmen may not compress their undergraduate education into fewer than six semesters in residence. Transfer students, both from other institutions and from Comell, must spend at least four semesters in the college on campus in Ithaca.
Ninth term. Students may spend a ninth term in residence only with permission of the Committee on Academic Records. Such permission is normally granted only under circumstances such as the following:

1. Students who could graduate in eight semesters should do so. If they have a worthy academic plan for a full ninth or tenth semester, the senior dean can approve that plan and ask the registrar of the college to enroll that graduated students as a special student for the additional work. Such a status allows the student to enroll in a full schedule of courses for full tuition, but allows them financial aid only from loans or outside agencies, not from Cornell funds.
2. Students who need only a part-time schedule of courses in a ninth or tenth term in order to graduate should complete the outstanding courses as an extramural student.
3. Students who have been ill or have an exceptionally compelling academic plan for a ninth or tenth semester may be allowed by petition to the Committee on Academic Records to remain as regularly matriculated undergraduates in the college.
4. Dual-degree students, who are pursuing a formalized five-year university curriculum, will continue to be eligible for financial aid for ten semesters.
5. Students attracted late to a field with a hierarchical curriculum-physics, for example-may be allowed ninth or tenth semesters upon petition.
6. Students who are academically underprepared for the curriculum at Cornell and need to begin with a lighter schedule of courses than normal may be allowed ninth or tenth semesters upon petition.
Part-time study. Students are allowed to study part-time (through the university's Division of Continuing Education), during their eight semesters of residence only if they present convincing academic or medical reasons for a reduced schedule, if they are Ithaca residents who are twenty-three years of age or older, or if they meet the following criteria, which are adhered to absolutely:
1) A student who has completed all degree requirements by the end of the seventh term, and could have received permission to accelerate, may receive permission to study part-time during the eighth term.
2) A student who has received permission to accelerate, but who has been forced to drop a course (for reasons beyond his or her control) and has not been able to complete the course work on schedule, may be able to complete the requirements as a part-time student.
3) A student writing an honors thesis who can complete all degree requirements by taking two or fewer courses, one of which is the thesis itself, in the eighth semester may be permitted to register for part-time study.

## Courses and Credits

Students must complete at least thirty-four courses to graduate, that is, an average of four courses during each of six semesters and five courses during each of two semesters. A 3- or 4 -credit course counts as one course; a 2 credit course counts as one-half course. Single-credit courses do not count as part of the thirty-four except in certain cases when they form a part of a series (certain offerings in biology, music, and theatre arts for instance) and two in the same series can be aggregated to count as one-half course. A 6 -credit language course counts as $11 / 2$ courses, while the summer Falcon Programs in Asian languages count as 10 credits and $21 / 2$ courses each. Biology 364, for 6 credits, and most other 5 - or 6 -credit courses count as one course. Archaeology and geology fieldwork for more than 6 credits count as 2 courses each. Biology 281 counts as 1.5 courses. Other 5- or 6-credit courses count as one course.
Students must also complete 120 credits, 100 of which must be from courses taken in the College of Arts and Sciences, to earn the Bachelor of Arts degree. Courses approved for study abroad and courses taken in certain off-campus residential programs may be counted toward the 100 credits required within the college and also toward the required thirty-four courses. Advanced placement credits and credits earned in other colleges at Cornell, or in any subject at U.S. institutions other than Cornell, do not count as part of the 100 . The only exception is for courses (usually no more than three) that a department accepts from other colleges at Cornell as fulfulling major requirements.
A course may not be used to fulfill more than one college requirement, with the following exceptions.

1) A course may be used to fulfill a distribution requirement and also a major requirement, provided that the major adviser agrees.
2) A one-semester course in foreign literature that is acceptable for achieving proficiency in that language may also be used as a partial fulfiliment of the distribution requirement in the humanities.
3) Courses may count toward breadth requirements and toward any other requirement except freshman writing seminars
Repeating courses. Students occasionally repeat courses. If the instructor certifies that the course content has been changed, credit will be granted a second time. If the content has not changed, both grades will appear on the transcript and will be included in any average that is calculated, but credit will be counted toward the degree only once. Students who plan to repeat a course should submit a petition to the college registrar's office, M46 Goldwin Smith Hall. If the original course grade was $F$, no petition is necessary to repeat it.
Transferring credit. The college evaluates credit received from either another school or college at Comell University or another accredited institution of collegiate rank to determine the number of credits and courses the student may apply toward the various requirements for the Bachelor of Arts degree at Comell. Credit evaluations are normally
provided to external transfers at the time they are notified of their admission.

Transfer students must successfully complete at least 60 credits and sixteen courses at Cornell; they must be in residence for four regular semesters. Summer session does not count toward the residence requirement Advanced placement credit awarded by other colleges, either at Cornell or elsewhere, will be re-evaluated by the college and may not be accepted.
Advanced placement credit. See p. 5.
Summer session credit. A student may earn credit toward the degree by completing courses in Cornell's summer session or by petitioning to take courses at other colleges. Students should consult their advisers regarding summer study plans.
Credit for summer courses not taken at Comell must be approved by the appropriate Cornell department. The college registrar's office, M46 Goldwin Smith Hall, can supply approval forms and information. Credit earned in summer courses other than those at Comell will not count toward the 100 credits required in the college (including some summer programs that prepare for a regular semester abroad.) Three credits may be earned in such pre-session summers abroad, which are counted in some cases as out-ofcollege credit. Transcripts from other institutions should be sent to the college registrar's office, M46 Goldwin Smith Hall.
Entering students who want to receive credit toward the degree for courses completed in a summer session away from Cornell should have transcripts sent to the college registrar's office, M46 Goldwin Smith Hall, during the summer before matriculation. Credits completed in Cornell summer sessions will be given automatically.
Summer session at Cornell or elsewhere does not count toward the eight-semester residence requirement.
Noncredit courses. The college does not grant credit toward the degree for every course offered by the university. Courses in remedial or developmental reading (for instance, Human Ecology 100) and supplemental science and mathematics courses offered by the Learning Skills Center, carry credits that are counted toward good standing in a given semester but not toward graduation. Typing, shorthand, and military training courses are among those for which credit is not given and which do not constitute part of the 12 credits required for good academic standing. Faculty legislation strictly prohibits granting credit toward the degree for service as an undergraduate teaching assistant, even though the department may record credit for such service on the transcript.
Auditing. The college encourages its students to take advantage of its rich curriculum by sitting in on courses that interest them but do not fit into their schedules for credit. As long as the instructor agrees, students are welcome to visit courses. Small seminars and language courses are sometimes not open to visitors. Audited courses do not, of course, appear on the student's schedule or transcript.

## Physical Education

See "University Requirements for Graduation," p. 14. The college does not count physical
education credit toward the 120 credits required for graduation, nor toward the twelve credits required for good standing each semester

## SPECIAL ACADEMIC OPTIONS

## Degree Programs

The following programs allow students to work toward more than one degree or to alter the regular college requirements or departmental requirements for the major.

## Independent Major Program

The Independent Major Program allows students to design their own interdisciplinary majors if they want to pursue an interest that cannot be met within an established major. Proposals for an independent major must be supported by a faculty adviser and are assessed by a board of faculty members. Board members consider whether the plan is equivalent in coherence, breadth, and depth to a departmental major, whether it is well suited to the student's academic preparation, and whether it provides a liberal education. Independent majors substitute for established majors, but students must still satisfy all the other requirements for the baccalaureate degree. Students should contact the director of the Independent Major Program, Academic Advising Center, 55 Goldwin Smith Hall, for further information. Deadlines for submitting independent major proposals are listed on the calendar supplement for the College of Arts and Sciences.

## College Scholar Program

The College Scholar Program frees up to forty students in each class from the usual college requirements for a degree and allows them to design their own curricula. It is meant to serve students whose interests and talents would benefit from a little more academic freedom than other students have, who demonstrate exceptional promise, and who show the maturity to plan and carry out, with the help of their adviser, a well-designed program of studies. College Scholars do not all design the same kind of program: Some, for instance, pursue diverse interests, while others integrate a variety of courses with a common theme.
College Scholars must complete 120 credits of course work ( 100 in the college), 34 courses, and, unless they receive special permission from the program to accelerate, eight full terms of undergraduate study. They must complete the physical education requirement. All College Scholars must complete a senior project. They are not required to complete or fulfill the distribution requirements, although members of the College Scholar Advisory Board believe that the spirit of the requirement is a good one.
Each applicant to the College Scholar Program is asked to write an essay, which is due the last Wednesday in April of the freshman year. Mid-year freshmen apply at the end of their first spring semester in the college. Students should contact the Academic Advising Center, 55 Goldwin Smith Hall, for further information.

## Dual Degree Programs with Other Colleges

Ambitious and diligent students who want both a liberal arts education and professional training may earn both a Bachelor of Arts degree from the College of Arts and Sciences and (1) a Bachelor of Science degree from the College of Engineering or (2) a Bachelor of Fine Arts degree from the Department of Art in the College of Architecture, Art, and Planning or (3) a Bachelor of Science degree in urban and regional studies from the Department of City and Regional Planning in the College of Architecture, Art, and Planning or (4) a Bachelor of Science degree in architectural history from the College of Architecture, Art, and Planning. Dual Degree Programs ordinarily take five years to complete, and students are eligible for five years of financial aid. Students enter one of these colleges as freshmen or sophomores and begin the dual degree program with the second college in the second or, in some cases, the third year. For further information students should contact Assistant Dean Saraydar, Arts and Sciences Admissions, 172 Goldwin Smith Hall.

Double Registration with Professional Schools
Registration in the senior year of the College of Arts and Sciences and the first year of Cornell Law School or Cornell Medical College, or the Johnson Graduate School of Management, is possible. A few exceptionally well-prepared students who have earned 105 credits before the start of the senior year and have been accepted by one of the abovenamed professional schools may be permitted to register simultaneously in the college and in one or another of these professional schools during the seventh and eighth terms. Students with eight or fewer credits to complete may apply to enter the Master's of Engineering program during the eighth semester.
Students interested in the joint program with the Law School or the Graduate School of Management, or the Master's of Engineering program should see the dean for the senior class, Academic Advising Center, 55 Goldwin Smith Hall.
Students registering simultaneously in the college and in the Cornell Medical College receive the Bachelor of Arts degree after the first year of medical studies and the Doctor of Medicine degree after the remaining three years of medical college are completed. Interested students should contact the health careers coordinator, 203 Barnes Hall.
Double-registered students must, of course, complete all requirements for the A.B. degree, including 100 credits in College of Arts and Sciences courses.

Teacher Education in Science and Mathematics
Students at Cornell may pursue teaching credentials in biology, chemistry, earth science, general science, mathematics, and physics. Teacher Education in Science and Mathematics (TESM) is a university program jointly conducted by the department of education and mathematics. Although TESM offers options for undergraduate and graduate study, most students enroll in a five-year program, which combines an undergraduate major in mathematics or one of the sciences with a one-year Master of Arts in Teaching degree (MAT). Students from any college at Cornell are eligible to apply to the program as undergraduates, usually during their sophomore year.

For more information, contact the TESM
student support specialist at 255-9255 or the program coordinator, D. Trumbull, 255-3108.

## Special-Interest Options

The following options do not alter the college's requirements but enable students to pursue special interests within the usual program.
Some student organize electives as or around a core of courses in a discipline or department. Such informal minors are not noted on the tarnscript.

## Concentrations and Informal Minors

Interdisciplinary concentrations, described in the pages following the descriptions of the departments and their curricula, provide structures for organizing electives. Completed concentrations are noted on the transcript.

## Independent Study

Independent study affords students the opportunity to pursue special interests not treated in regularly scheduled courses. A faculty member, who becomes the student's instructor for the course, must approve the student's program of study and agree to provide continuing supervision of the work. Students must prepare a proposal for independent study. Ask for a form in the Office of Records and Scheduling, M46 Goldwin Smith Hall. In one semester students may earn up to 6 credits with one instructor or up to 8 credits with more than one instructor.

## Undergraduate Research Program

The Undergraduate Research Program enables students to gain firsthand experience in scholarly research by participating in a faculty member's research project. Participation is recognized by course credit, since the program emphasizes what students will learn rather than what they will contribute to the project. However, students sometimes make contributions of a very high order and publish the results of their work.
Besides leaming research methods that are appropriate to the discipline, students gain awareness of their own research interests and abilities, self-discipline, new insight into the subject matter, and the pleasure of working as scholar-apprentices with professors and other students who share a common interest.

Students interested in this program should see Assistant Dean Williams, Academic Advising Center, 55 Goldwin Smith Hall.

## Language Study

More than forty languages are taught in the College of Arts and Sciences; some of them are available only at Cornell. A full range of language, literature, and cultural courses are available in most of the major ancient and modern languages through the joint efforts of the Department of Modern Languages and Linguistics and the departments that specialize in literary and cultural study: the Africana Studies and Research Center and the departments of Asian Studies, Classics, German Studies, Near Eastern Studies, Romance Studies, and Russian Literature. Semi-intensive courses afford students the option of accelerating the development of language skills.

## FALCON Program (Full-Year Asian

 Language Concentration). FALCON allows students who are interested in the Far East to study Chinese, Japanese, or Indonesian exclusively for one year. They gain proficiency in the language and familiarity with the culture. Students who are interested in the Far East should be aware of the opportunities here to pursue rapid and thorough beginning studies on campus with the objective of studying abroad later-in China, Japan, or Southeast Asia.Language House Program (136 Goldwin Smith Hall)

Daniel H. Evett, academic administrator
A complement to classroom cultural and linguistic instruction, the Language House Program combines residential and academic opportunities for developing and practicing conversational skills in French, German, Italian, Russian, Spanish, and Mandarin Chinese. It helps prepare students who plan to study abroad and helps returning students share their cultural experiences while further increasing their language skills

## Prelaw Study

Law schools neither require nor prefer any particular program of study; they do seek students with sound training in the liberal arts and sciences. It is important that students plan a program in which they are interested and do well. Beyond that, students are advised to take courses that will develop their powers of precise, analytical thinking and proficiency in writing and speaking.
The college offers a concentration in law and society. Students should work toward completion of this concentration because they are interested, not because they believe it will convince law schools of their interest.
The adviser for students in the College of Arts and Sciences who are applying to law school is Assistant Dean Cox, Arts and Sciences Admissions, 172 Goldwin Smith Hall.

## Premedical Study

The breadth and depth afforded by a liberal arts education are invaluable for people who plan medical careers, whether they intend to practice or go into medical research. Such training has a profound effect on the doctor's usefulness to patients, and it affords the flexibility of mind that is needed for major research undertakings. Medical and dental schools do not prescribe or even prefer a particular major; they do, however, require particular undergraduate courses, and most students are well advised to begin chemistry in their freshman year. Students who are interested in medical careers are urged to visit the Health Careers Office, 203 Barnes Hall.
The adviser for students in the College of Arts and Sciences who are planning careers in medicine is Assistant Dean Turner, Academic Advising Center, 55 Goldwin Smith Hall.

## Off-Campus Programs

Many students find it important to their majors or to their overall academic programs to study off campus or abroad for one or two semesters. When it makes academic sense, the college encourages its students to pursue such studies and grants credit toward the degree for work satisfactorily completed.

## Study Abroad

In 1993-94, 200 students in the college studied abroad in dozens of places all over the world (see the section on Cornell Abroad in the introductory pages of Courses of Study). When planning study abroad, students should consult with their advisers and with Barbara Lantz, assistant dean for international programs, in 55 Goldwin Smith Hall.

A request to study abroad must have the support of the faculty adviser and the approval of the college. A successful application will include a strong statement about the academic purpose of the study abroad and its relation to the student's curriculum at Comell.
Students are expected to carry a full course load as defined by the university or program they attend and may earn a maximum of 30 credits for a year or 15 credits for a semester abroad. These credits count as part of the 100 required within the College of Arts and Sciences. On returning, students are responsible for demonstrating that the work undertaken abroad was completed satisfactorily (at C or above) and seek final approval for the work from the appropriate departments. Although in most cases course work satisfactorily completed in an approved program will qualify for Cornell credit, students will want to know before they go abroad what materials to bring back with them to be prepared to present a strong case for receiving a full semester's or year's credit.

Students studying abroad must be in good academic standing the semester before departure. No more than two semesters abroad are allowed. Normally, transfer students entering as juniors will not be allowed to study away from Cornell. Seniors who wish to study abroad during their final semester must petition the college for permission to do so, but such permission is only rarely granted.

## Summer Residential Programs in Archaeology

During the summer months students may participate in a Cornell-sponsored archaeological project. In recent years the program has organized archaeological projects in New York State, Central America, South America, and the Mediterranean region. Students should contact the Archaeology Program for information about the sites currently available.

## Marine Science

Shoals Marine Laboratory is a seasonal field station that offers a variety of courses and experiences designed to introduce undergraduates to the marine sciences. The laboratory is located on Appledore Island, six miles off the Maine and New Hampshire coasts. Students should contact the Division of Biological Sciences for further information.

## Cornell-in-Washington

The Cornell-in-Washington program offers students from all colleges within the university an opportunity to earn full academic credit for a semester in Washington, D.C. Students take courses from Cornell faculty, conduct individual research projects, and work as externs. The Comell-in-Washington program offers two study options: 1) studies in public policy, and 2) studies in the American experience. The program also offers a unique externship opportunity: students serve as externs in a federal agency, congressional
office, or non-governmental organization and take part in a public policy or humanities seminar. They define and carry out individual research projects under the supervision of Cornell faculty. Potential externships are arranged through, and approved by, the Cornell-in-Washington program. For further information, see p. 19 or inquire at 131 Sage Hall, 255-4090. Seniors who wish to study in Washington during their final semester must petition the college for permission to do so. See Dean of Seniors Thak Chaloemtiarana, 55 Goldwin Smith Hall, 255-5004.

## Fieldwork

Sometimes it is appropriate for students to include fieldwork as part of their major. A three-member faculty committee helps the student plan the project, arranges for ongoing supervision, and evaluates the project at the end of the term. Fieldwork almost always involves writing a long paper or several short ones, as well as practical experience. All proposals for fieldwork must be presented in advance to the Academic Records Committee for approval. A maximum of 15 credits in fieldwork may be earned. For further information students should contact the Academic Advising Center, 55 Goldwin Smith Hall.

## ADVISING

The following advisers and offices provide academic advising or information on college procedures and regulations.

## Faculty Advisers

All students are assigned a faculty adviser. The adviser helps students design programs of study and advises them about ways to achieve their academic goals. Advisers and new advisees meet first during orientation week to plan the student's program. New students are encouraged to see their advisers again early in the term, before it is too late to drop courses, to discuss their academic program and to become better acquainted. Academic difficulties may frequently be solved or avoided if students and advisers recognize problems early. Advisers and advisees meet at least once each semester to discuss courses for the following term.
Students who would like to petition for an exception to college rules should discuss the matter with their advisers.
Advisers may also help students with study or personal problems or may direct them to other offices on campus where help is available.

## Student Advisers

Each new student is also assigned a student adviser who can provide information about the college's requirements, courses, and instructors and about life at Comell.

## Major Advisers

After acceptance into a major, students are assigned a major adviser, a faculty member in the major department, with whom they make many of their most important academic decisions at Comell. The adviser eventually certifies the completion of the major. The major adviser should be consulted by the student about all academic plans, including
honors, study abroad, acceleration, and graduate study. The adviser's support is especially important if a student petitions for an exception to the requirements for the degree.

## Academic Advising Center

The Academic Advising Center, 55 Goldwin Smith Hall, 255-5004, and the Office of Admissions, 172 Goldwin Smith Hall, 255-4833, serve as resources for faculty and student advisers and for students themselves and their parents. The advising deans are available to help students define their academic and career goals and to help with special academic options and exceptions to college rules:
Patricia M. Dougherty, college registrar-255-5051
Lourdes Brache, assistant dean and adviser for minority students-255-4833
John Chiment, assistant dean for freshmen-255-5004
Gerry Cox, assistant dean, pre-law adviser, and coordinator of outside scholarships-255-4833
Ken Gabard, assistant dean and adviser for internal transfer students-255-4833
Barbara Jo Lantz, assistant dean for study abroad and international programs-255-5004
Steve Saraydar, assistant dean and adviser for mid-year freshmen and dual degree stu-dents-255-4833
Maria S. Terrell, assistant dean for sophomores and juniors-255-5004
Janice Tumer, assistant dean for minority programs and premedical adviser-255-5004
Peggy Walbridge, assistant dean and adviser for transfer students-255-4833
Marilyn Williams, assistant dean for undergraduate research and academic integrity-255-5004

## REGISTRATION AND COURSE SCHEDULING

## Registration with the University

All students must register with the university at the beginning of each semester. Students may register if they are academically eligible and have paid their tuition. Registration materials are available at a time and place announced each term by the Office of the University Registrar.

## Enrollment in Courses in the College of Arts and Sciences

Students must enroll in courses through the college registrar's office, M46 Goldwin Smith Hall.

## New Students

The Academic Advising Center conducts briefings during orientation week for incoming freshmen and transfer students about scheduling courses.

## Continuing Students

Continuing students are expected to select and schedule courses in advance during the
previous term. Students who fail to sign into courses during the designated period must wait until the beginning of the semester and may have difficulty securing places in the courses they most want. Students may schedule up to five courses during the course enrollment (preregistration) period. Information and materials will be available in the college registrar's office, M46 Goldwin Smith Hall. Before signing into courses, students should make appointments with their faculty advisers to plan their programs. Course enrollment (pre-registration) is the best time to discuss long-range goals with faculty advisers. Students who do not have majors must submit an academic plan, approved by their faculty adviser, with their proposed schedule. All students are welcome to discuss programs and plans with an advising dean in the Academic Advising Center, 55 Goldwin Smith Hall, or in the Binenkorb Center, 172 Goldwin Smith Hall.

Continuing students receive their course schedules at university registration. In the fall they also receive a copy of their transcript and a record of their progress toward the degree, which show the courses taken, grades received, graduation requirements fulfilled, and academic actions. These are not official transcripts, but they reflect the official record and should be corrected in the college registrar's office if they are incorrect.

## Limits on Courses and Credits

To meet the 34 -course requirement, students must normally take four courses during each of six semesters and five courses during each of two semesters. To meet the 120 -credit requirement, students should average 15 credits per semester. (AP credit and/or summer credits may reduce these numbers.) At a minimum, students must carry twelve credits per semester; if for compelling personal or academic reasons students need to carry fewer than twelve credits, they should consult their faculty adviser and the assistant dean of their class. Permission is by petition only. Completion of fewer than twelve credits without permission results in unsatisfactory academic standing. First-term freshmen must petition to register for more than eighteen credits; other students may register for more than eighteen credits a term only if their previous term's average was a B or higher. No more than twenty-two credits may be taken in a regular semester without permission of the Committee on Academic Records. Students who fail to seek approval for excess credits from the committee run the risk of having only 18 credits for the semester count toward the degree.
Any student who is not officially enrolled in a schedule of courses by the end of the third week of classes may be withdrawn from the college.

## Forgery on Forms

Forging signatures or credentials on college forms is an academic offense; sometimes it constitutes academic fraud. In all cases of forgery on academic forms, the effect of the forged documents shall be negated. Students may then petition properly to do whatever they attempted to do improperly. Such incidents will be recorded in the Academic Integrity Hearing Board confidential file for forgeries. If a student forges more than once or if the forgery would advance the student's academic standing unfairly or fraudulently or
if, for any other reason, the situation requires some other response in addition to the uniform penalty, the Academic Integrity Hearing Board might make a different recommendation, such as a notation on the student's transcript, suspension, or dismissal.
Attendance in classes is a matter between students and their instructors. If a student cannot attend classes because of illness or family crisis, the Academic Advising Center will notify instructors when requested to do so, but students must arrange to make up examinations or other work with their instructors. When students will be absent because of religious holidays or athletic competitions, they must discuss arrangements for making up their work with their instructors. Students who must miss an examination should be sure to contact the professor in advance. Alternative arrangements are at the discretion of the instructor.

## Adding and Dropping Courses

After course enrollment (preregistration), students may not adjust their schedules until the new term begins. All program changes for juniors and seniors must be approved by the department and also by the faculty adviser. During the first three weeks of the semester, students may change courses without petition Add/drop forms are available in the college registrar's office, M46 Goldwin Smith Hall.

After the third week of classes, students may petition to add courses, and between the seventh and twelfth weeks petition to drop courses, if (1) the instructor approves; (2) the adviser approves, and (3) no issue of academic integrity is at stake. Students petitioning to withdraw from a course after the seventh week of the term must meet with an assistant dean.

Courses dropped after the seventh week will be noted on the transcript by a "W" where the grade would normally appear. No petitions to withdraw from courses may be submitted after the end of the twelfth week in the term Deadlines for short courses will be adjusted according to the length of the courses. After the midpoint of a short course, students who wish to add or drop the course must petition to do so.

## Leaves of Absence

Taking time off from college to think about goals and progress, to gain additional experiences or funds, or just to take a break from studying is sometimes useful to students. Those in good standing who take a leave before the beginning of any semester or by the end of the seventh week of the semester are welcome to register in the college the following semester. Five years is the maximum length of time a student may be on leave and return without special permission. Leaves of absence are of four types.

1) Personal leaves impose no conditions concerning the right to reenter the college except for the five-year limit. Readmission is automatic upon written request made at least one month before the beginning of the term in which the student wishes to return.
2) Medical leaves are granted by the college only upon recommendation by a physician from Gannett Health Center. Such leaves are granted for at least six months and up to five years with the understanding that the student may return
at the beginning of any term after the medical condition in question has been corrected. In some cases students must satisfy the Gannett Health Center that the condition has been corrected before they may return. The student's academic standing will also be subject to review at the time of the leave and on retum.
3) Conditional leaves may be granted if the student is not in good standing or, in unusual circumstances, after the seventh week of the term. Normally students may not return from conditional leaves for at least two terms or until specific and individual conditions, such as completing unfinished work, have been met.
4) Required leaves: The Academic Records Committee may require a leave of absence if a student is not making satisfactory progress toward the degree. See the section "Academic Actions."
Any student who wishes to take a leave of absence should consult an assistant dean in the Academic Advising Center. On readmission, the student's graduation date will be recalculated according to the number of terms completed, the number of acceptable credits eamed toward the degree, and the requirements for graduation.
Students who take courses elsewhere while on leave may petition to have credits accepted as out-of-college credits allowed toward the 120 credits needed for graduation. Approval depends on the judgment of the relevant departments and acceptable grades. Credits earned cluring a leave do not count toward the eight semesters of residence unless a student petitions successfully to accelerate. See the section "Residence." Credits eamed during a required leave may not be used to reduce the terms of residence.

## Withdrawals

A withdrawal is a voluntary severance of connection with the university. If a student wants to withdraw after registering for the term, the withdrawal must be requested before the end of the seventh week of classes to avoid grades of "W" on the transcript. A notation of "W" will appear on the transcript for any course dropped after the seventh week. On withdrawal it is assumed that the student will not reregister in the college. Students seeking readmission after withdrawing from the college must write to the Committee on Academic Records for permission. If a student fails to register for a term and does not request a leave, the student will be withdrawn from the college for failure to register.

## Transferring within Cornell (Internal Transfer)

Internal transfer from one college or school at Cornell into another is attractive for many students whose intellectual interests change. Students who want to transfer should discuss their eligibility with a counselor at the new school or college.
In some cases students who want to transfer into the College of Arts and Sciences may transfer directly. In other cases they may be referred to the Internal Transfer Division. During the term immediately preceding transfer into the College of Arts and Sciences, students should complete at least 12 credits of courses in the College of Arts and Sciences with superior grades and without any grades of Incomplete, any S-U grades (unless only

S-U grades are offered for that particular course), or any grades below C. Satisfying this minimum requirement does not, however, guarantee admission. Admission to the college is based on consideration of the student's entire record at Comell and the high school record, not just the work of one semester. Interested students should see Assistant Dean Gabard, in Arts and Sciences Admissions, 172 Goldwin Smith Hall.

## ACADEMIC STANDING

Students are in good academic standing for the term if they successfully complete at least 12 credits by the end of the term and receive no more than one $D$ and no $F$ or $U$ grades. If a student completes only three courses, all grades must be above D . In addition, students are expected to make satisfactory progress toward satisfying requirements for the degree, and they are expected to earn grades of C (not C-) or better in at least 100 of the total credits for the degree.

## Application to Graduate

In the first semester of their senior year, students must complete an application to graduate so that the college can check each student's plan for fulfilling college requirements. This process is intended to help seniors identify problems early enough in the final year to make any necessary changes in course selection to satisfy those requirements. Meeting graduation requirements is the student's responsibility; problems that are discovered, even late in the final term, must be resolves by the student before the degree can be granted. Seniors will receive applications and instructions in their packets at College Registration in Barton Hall.
Degree dates. There are three degree dates in the year: May, August, and January. Students who plan to graduate in August may attend graduation ceremonies in the preceding May; students graduating in January are invited to a special recognition ceremony in December.
The degree: The College of Arts and Sciences grants the A.B. (or B.A.) degree. A.B. is the abbreviation of the Latin name for the degree: "Artium Baccalarius," or translated into English, B.A.: "Bachelor of Arts."

## Honors

## Dean's List

Inclusion on the Dean's List for academic excellence is an honor bestowed by the dean of the college. The criteria are subject to change from semester to semester and are available in the College Registrar's Office, M46 Goldwin Smith Hall.

## Bachelor of Arts with Honors

Almost all departments offer honors programs for students who have demonstrated exceptional ability in the major and who seek an opportunity to explore branches of their subject not represented in the regular curriculum or to gain experience in original research. The honors programs are described by individual departments in the following sections. The degree of Bachelor of Arts with honors will be conferred upon students who, in addition to having completed the requirements for the degree of Bachelor of Arts, have
satisfactorily completed the honors program in their major and have been recommended for honors by their major department, the Independent Major Program, or the College Scholar Program. Concentrations do not offer honors programs.

## Bachelor of Arts with Distinction

The degree of Bachelor of Arts with distinction in all subjects will be conferred on students who have completed the requirements for the degree of Bachelor of Arts, if they have met the following requirements by the end of their final semester:

1) completed at least 60 credits while registered in regular sessions at Cornell;
2) ranked in the upper 30 percent of their class at the end of their seventh semester, or next-to-last semester for transfers and accelerants;
3) received a grade below C - in no more than one course;
4) received no failing grade;
5) maintained good academic standing including completing a full schedule of at least 12 credits, in each of their last four terms; and
6) have no Incompletes remaining on their records.

## Failure to Maintain Good Academic Standing

Students are not in good academic standing if they complete fewer than 12 credits; receive more than one $D$, or one $D$ in a schedule with only three courses, or any F or U grades; if they have not made satisfactory overall progress in grades or credits (whether due to failures or incompletes) or in the requirements of the college or the major. Such students will be considered for academic action by the Committee on Academic Records or one of the deans of the college.

## Academic Actions

Warning. Any student who fails to maintain good standing will at least be warned. The warning may be given by an assistant dean in the college or by the faculty's Committee on Academic Records. A warning is posted on a student's unofficial college transcript but is not reported to the university registrar and does not appear on official transcripts.

Required leave of absence. A student in serious academic difficulty may be required by the Committee on Academic Records to take a leave of absence, normally for a full year.
Usually, but not necessarily, the Committee on Academic Records warns students before suspending them. Before being allowed to return and reregister in the college, students must submit a plan for completing the degree In some cases the students will be required to furnish evidence that they are ready to return before being allowed to reregister in the college. Students who request to return in less than a year must present to the committee exceptionally strong evidence of their readiness to return. "Required leave of absence" and the date are posted on the student's transcript.
Required withdrawal. The Committee on Academic Records may dismiss a student from the college because of a highly unsatisfactory record for one term or for failure to make satisfactory overall progress in grades, credits,
or the requirements of the major. This action expels the student permanently from the college. "Required withdrawal" and the date are posted on the student's transcript.

Students being reviewed for academic action are urged to present evidence that will help explain their poor academic performance. Students may appeal a decision or action of the committee if they have new relevant information to present.

## GRADES

## Letter Grades

ee Grading Guidelines.

## S-U Grades

The S-U (satisfactory-unsatisfactory) option allows students to explore unfamiliar subjects or take advanced courses in relatively new subjects without being under pressure to eam high grades. It is not meant to reduce the amount of work a student completes in a course or the amount of effort a student devotes to a course. Students must select their grading option during the first three weeks of the term (virtually no exceptions to this deadline), although the S-U option is contingent upon the instructor's willingness to assign such grades. A grade of $S$ is equivalent to a grade of C - or higher; a grade of U , which is equivalent to any grade below C -, is a failing grade equal to an F. S means the student receives the credit specified for the course. U means no credit is given. A few courses in the college are graded exclusively $\mathrm{S}-\mathrm{U}$; in that case, the final grade appears on the transcript as SX or UX .
Courses that will count toward satisfaction of major requirements should not be taken for an S or U grade unless the department grants permission. Students may elect the S -U option in courses used to satisfy the distribution, language, and elective requirements, provided that such courses do not also count toward major requirements or serve as prerequisites for admission to the major. Students are advised to use the S-U option sparingly if they intend to apply to graduate school or for transfer to another college. There is no limit on the number of courses each term for which students may elect the S-U grade, but within the 120 credits required for the degree, a minimum of 80 credits must be in courses for which a letter grade was received.

## Grades of Incomplete

A grade of incomplete signifies that a course was not completed before the end of the term for reasons beyond the student's control that are acceptable to the instructor. Students must have substantial equity in the course; that is, they must be able to complete the remaining work without further registration and must have a passing grade for the completed portion. When a grade of incomplete is reported, the instructor submits a form stating what work must be completed, when it must be completed, and the grade earned if the work is not completed by that date. When a final grade is reported, it is recorded on the official transcript with an asterisk and a footnote explaining that this grade was fommerly an incomplete.
Students must resolve any incompletes with their instructors before graduation.

## R Grades

R designates two-semester or year-long courses. The R is recorded on the student's transcript at the end of the first term. The grade recorded at the end of the second term evaluates the student's level of performance in the course for the entire year. The total of credits earned for the whole course is listed each term.

## Grade Reports

Grade reports for the fall term are included in spring-term registration materials; grade reports for the spring term are mailed to students at their home addresses.

## Class Rank

The college does not compute class rank.

## CALENDAR SUPPLEMENT

All of the dates in the university calendar at the front of this volume apply to all Cornell students. Listed below are some additional dates that are of importance for students in the College of Arts and Sciences.

|  | Fall | Spring |
| :--- | :--- | :--- |
| First deadline for sub- | Sept. 26 | Feh. 27 | mitting independent

major requests. Go to
Academic Advising
Center, 55 Goldwin
Smith Hall, for
further information.
Last day for adding Sept. 16 Feb. 10 courses without petition.

Last day for changing Sept. 17 Feb. 10 grade option to $\mathrm{S}-\mathrm{U}$ or letter.
Second deadline for Nov. 21 April 3 submitting independent major requests.
Go to Academic
Advising Center,
55 Goldwin Smith
Hall, for further
information.
Last day for requesting Nov. 18 April 21 leave of absence or withdrawal for the current term.

Last day for dropping Oct. 14 March 10 courses without perition.
Deadline for applying to study abroad.

Course enrollment (pre-registration) for the following term (tentative).
Last day to petition Nov. 18 April 21 to drop a course.
Deadline for
applying to the
College Scholar
Program.
Deadline for requesting Dec. 1 May 1
internal transfer to the
College of Arts and
Sciences for the
following term.

April 26
See Comell Abroad, 474 Uris Hall

Oct. 19- March 29-
Nov. 2 April 12

## ADMINISTRATION

Don Randel, dean - 255-4146
Elizabeth Adkins-Regan, associate dean -255-4147
Phillip Lewis, associate dean - 255-4147
Lynne S. Abel, associate dean for undergraduate education - 255-3386
Thak Chaloemtiarana, associate dean and director of admissions - 255-7061
Jane V. Pedersen, director of administration and finance - 255-7507

## Courses and Departments

## SPECIAL PROGRAMS AND AREAS OF CONCENTRATION

The college offers a number of interdisciplinary programs described in the section following the departmental program descriptions.

## GENERAL EDUCATION COURSES

The introductory and advanced courses offered by departments in their respective disciplines and fields comprise the bulk of the curriculum in the College of Arts and Sciences. Most of these courses are accessible to almost all students who are interested in them. However, the faculty of the college also offers general education courses, inclucting interdisciplinary courses for a broad audience, courses that provide insight into a particular discipline for students who are not specializing in that field, and courses for advanced students who consider a discipline in terms of its history, its presuppositions, or its relation to other branches of knowledge. The following courses have been identified by the various departments of the College of Arts and Sciences as particularly appropriate, by that definition, for general education. For full course descriptions consult the departments' sections of the catalog.

## American Studies

See Special Programs and Interdisciplinary Studies.

## Archaeology

Several members of the Archaeology Program offer general education courses suitable for nonmajors. These are listed under the deparments that offer archaeology courses, such as the departments of Anthropology, Classics, History of Art, and Near Eastern Studies. The Archaeology Program itself also offers:

## ARKEO 203 Early People: The

 Archaeological and Fossil Record (also Anthropology 203)Fall. 3 credits.
T. P. Volman

## Asian American Studies

See Special Programs and Interdisciplinary Studies.

## Asian Studies

ASIAN 208 Introduction to Southeast Asia
Spring. 3 credits.
Staff.
ASIAN 211 Introduction to Japan 랑
Fall. 3 credits.
K. Brazell.

ASIAN 212 Introduction to China
Spring. 3 credits ( 4 credits with a special project; consult instructor for information). E. Gunn.

ASIAN 215 Introduction to South Asian Civilizations ©
Fall. 3 credits ( 4 credits with a special project; consult instructor for information). D. Gold.
[ASIAN 21B Introduction to Korea e
Spring. 3 credits. Not offered 1994-95. D. McCann.)

## Classics

CLASS 211 The Greek Experience Fall. 3 credits. F. Ahl.

Class 212 The Roman Experience
Spring. 3 credits.
D. Mankin.

CLASS 217 Initiation to Greek Culture
Fall. 4 credits.
P. Pucci.
[CLASS 218 Initiation to Roman Culture \#
Spring. 4 credits. Not offered spring 1995. Staff.]

CLASS 219 Mediterranean Archaeology (also Near Eastern Studies 267) \#
Fall. 3 credits.
J. Coleman.

CLASS 220 Introduction to Classical Archaeology (also History of Art 220) "

Spring. 3 credits.
J. Coleman.
[CLASS 221 Minoan-Mycenaean Art and Archaeology (also Archaeology 221 and History of Art 221) "
Fall. 3 credits. Not offered 1994-95. J. Coleman.]

CLASS 223 The Comic Theater (also Comparative Literature 223 and Theatre Arts 223) \#
Spring. 3 credits. J. Rusten.
[CLASS 235 Modern Greek Poetry and Politics (also Comparative Literature 235)

Fall. 3 credits. Not offered 1994-95. G. Holst-Warhaft.]

CLASS 236 Greek Mythology (also Comparative Literature 236) *
Fall or summer. 3 credits.
D. Mankin.

## [CLASS 237 Greek Religion and Mystery Cults (also Religious Studies 237) \#

 Spring. 3 credits. Not offered 1994-95; next offered 1996-97. K. Clinton.][CLASS 238 The Ancient Epic and Beyond
Fall. 3 credits. Not offered 1994-95; next offered 1995-96.
H. Pelliccia.]
[CLASS 333 Greek and Roman Mystery Cults and Early Christianity (also Religious Studies 333) *
4 credits. Not offered 1994-95; next offered 1995-96.
K. Clinton.]
[CLASS 339 Ancient Wit (also
Comparative Literature 339)
4 credits. Not offered 1994-95; next offered 1995-96.
F. Ahl.]
[CLASS 363 Representations of Women in Ancient Greece and Rome (also Women's Studies 363)
Spring. 4 credits. Not offered 1994-95. L. S. Abel, J. Ginsburg.]

CLASS 480 Roman Society and Politics under the Julio-Claudians *
Spring. 4 credits. J. Ginsburg.

## English

See, in the department's listing, "Courses Primarily for Nonmajors."

## Geological Sciences

GEOL 101 Introductory Geological Sciences
Fall, spring, summer. 3 credits.
2 lecs, 1 lab, field trips, evening exams in the fall term. Fall, staff; spring, staff. Observation and understanding of the earth, including oceans, continents, coasts, rivers, valleys, and glaciated regions; earthquakes, volcanoes, and mountains; theories of plate tectonics; the origin, discovery, and development of mineral and water resources. Use of topographic and geologic maps, recognition of minerals and rocks, and field trips to Cascadilla Gorge, Fall Creek, and Enfield Glen.
GEOL 102 Evolution of the Earth and Life (also Bio S 170)
Spring. 3 credits. Geological Sciences 101 recommended.

2 lecs, 1 lab, field trips, weekly quizzes, no midterm. J. L. Cisne.
Earth systems and their evolution. Earth history's astronomical context. Plate tectonics, continental drift, and their implications for climate and life. Coevolution of life and the atmosphere. Precedents for ongoing global change. Dinosaurs; mass extinctions; human ancestry Laboratories on reconstructing geological history and mapping ancient geography. Fossil collecting on field trips.
GEOL 103 Introductory Geology in the Flold
Fall. 3 credits. Limited to 35 students.
1 lec, 1 field trip or lab, 1 rec.
A. L. Bloom.

The subject matter of Geol 101, Introductory Geological Sciences, taught as much as possible by field trips in the campus and vicinity on foot and by bus. Weekly field trips until November introduce most of the major topics of the course, supplemented by lectures, recitations, and labs later in the term.

GEOL 104 The Sea: An Introduction to Oceanography (also Biological Sciences 154)
Spring. 3 credits.
2 1-hr lecs, 12 1/2-hr lab. A. L. Bloom, C. Greene.

A survey of the physics, chemistry, geology, and biology of the oceans for both science and non-science majors. Topics include: seafloor spreading and plate tectonics; marine sedimentation; chemistry of seawater; ocean currents and circulation; the oceans and climate; ocean ecology; coastal processes; marine pollution and waste disposal; marine resources.

## GEOL 109 Dinosaurs

Fall. 1 credit.
1 lec.
An entry-level survey course for those interested in dinosaurs who may lack a science background. Lectures examine the fossil evidence and illustrate how various geological and biological disciplines contribute to understanding dinosaurs and their world.
[QEOL 111 To Know the Earth
Fall. 3 credits. Not offered 1994-95.
2 lecs, 1 lab, and field trips. J. M. Bird. A course to acquaint the non-scientist with the earth. Geology as an intellectual challenge, a provider of resources, an environment, a danger, a base for culture, and a science among sciences. The story behind landscapes, mountains, earthquakes, volcanoes, oceans, gold, petroleum, and icecaps. The record of the past, the context of the present, the forecast for the future.]

GEOL 202 Environmental Geology Spring. 3 credits.

2 lecs, 1 rec, lab or field trip. D. E. Karig. Geologic processes that affect or are affected by human society, including stream behavior and floods, earthquakes, land stability and mass-wasting, and volcanic hazards. Applications of geology to engineering, natural resources, and land-use planning. Local examples discussed and visited on short field trips. Best taken as an introduction to geology, for students with primary interests in other environmental sciences.

## GEOL 206 Geologic Perspective on Global Change

Spring. 3 credits. Prerequisites: Geol 101, 102,201 , or permission of instructor.

3 lecs. Kodjo Attoh.
Principles that govern the interactions among the principal components of the climate system (atmosphere, oceans, lithosphere and solar radiation), are used to reconstruct Earth's climates from the geologic record. Continental climate record in rocks. Geological
forcing/responses to climate change.

## German Studies

GERST 320 Postwar German Novel
Spring. 4 credits.
I. Ezergailis.

GERST 330 Political Theory and Cinema (also Comparative Literature 330, Government 370, and Theatre Arts 330)

Fall. 4 credits.

[^3]GERST 383 Faust in Legend, Literature, and the Arts (also Comparative Literature 383)"
Fall. 4 credits.
L. M. Olschner.

GERST 413 Women Around Freud (also Comparative Literature 412 and Women's Studies 413)
Spring. 4 credits.
B. Martin.

## History of Art

All 200-level courses and some 300 -level courses. See department listing.

## Psychology

PSYCH 326 Evolution of Behavior Fall. 4 credits

T R 2:55-4:10. R. Johnston.
PSYCH 418 Psychology of Music
Spring. 3 or 4 credits.
T R 10:10-11:25. C. Krumhansl.

## Russian Literature

[RUSSL 207 Readings from Russian Culture \#
Fall. 3 credits. Not offered 1994-95. M W F 1:25. G. Shapiro.]
[RUSSL 208 Readings from Russian Culture II
Spring. 3 credits. Not offered 1994-95. M W F 1:25. G. Shapiro.]
[RUSSL 350 Education and the Western Literary Tradition (also Comparative Literature 350 and College Scholar 350) \#

Spring. 4 credits. Not offered 1994-95. T R 2:55-4:10. P. Carden.]

## RUSSL 367 The Russian Novel (also

 Comparative Literature 367) \#Spring. 4 credits.
T R 8:40-9:55. G. Gibian.
[RUSSL 373 Chekhov \#
Spring. 4 credits. Not offered 1994-95. T R 1:25-2:40. S. Senderovich.]

## Sociology

SOC 101 Introduction to Sociology Fall and spring. 3 credits.

Fall, S. Caldwell. Spring, H. A. Walker. This course provides an introduction to theory and research in sociology. It demonstrates how the insights, theories, and methods of sociological analysis can be brought to bear on major issues of social life. A primary goal is to convey a sense of the manner in which sociologists formulate theories and how the collection and analysis of data are used to evaluate those theories. The course will provide "hands-on" experience in analyzing sociological issues. Students undertake guided research exercises that involve using computers to analyze actual data. No background experience is presumed; necessary skills are covered in class and section meetings.

## SOC 103 Introduction to Sociology: Microsociology

Fall. 3 credits.
D. P. Hayes.

An introduction to microsociology, focusing on concepts and theory of social processes within small groups, including the family.
Emphasis is on leadership, conformity, social
influence, cooperation and competition, distributive justice, and micro-analyses of interaction.

## SOC 110 Introduction to Economy and

 SocietyFall and spring. 3 credits.
V. Nee.

Modern social thought arose out of attempts to explain the relationship between economic change and the social transformations that gave rise to the contemporary world.
Classical theorists from Marx, Weber, and Durkheim to Polanyi focused their writings on emergent capitalist economies and societies. Contemporary social theorists likewise have sought to understand the interaction between capitalism and the social forces reacting against and emerging from modern economic development. From exchange and rational choice theories to network analysis and structural theories, a central theme in contemporary social thought has been the relationship between the economy and society, economic action and social structure. rationality and fundamental social processes. This course provides an introduction to social thought and research seeking to understand and explain the relationship between economy and society in the modern era.
[SOC 115 Utopia in Theory and Practice Spring. 3 credits. Not offered 1994-95. D. Strang.

This course examines imaginings of the "ideal society" and efforts to realize them. We discuss the classic literary utopias, from Plato's Republic to More's Utopia to Bellamy's Looking Backward, and also the dystopias of Huxley and Orwell. We also examine social experiments like the nineteenth-century American intentional communities, various socialisms, and the design of contemporary political constitutions. Throughout, the emphasis is on two sociological questions. What leads people to conceive of particular social arrangements as ideal? How can we tell social structure that can work from those that cannot?]

## SOC 204 Race and Ethnic Relations

## Fall. 3 credits.

This course focuses on race and ethnic relations in contemporary perspective. It examines the social and behavioral implications of attributions of race and ethnicity in small group interaction, in the world of work, and in the larger society. Topics: Inequalities in income and employment, affirmative action, ethnic political mobilization, patterns of marriage and family formation.
SOC 215 Organizations: An Introduction Spring. 3 credits.
S. Han.

This is an introductory course in the study of organizations. We will start by taking a look at various examples of organizing, including a street gang in a Boston neighborhood, General von Moltke's Prussian army, a government agency, and an industrial corporation. These brief glimpses serve as exercises in looking behind and beyond diverse rhetoric for common patterns in organizational phenomena. We will consider these both from the inside and outside perspectives. The focus of the course is upon research scholarship, not the training of managers. Nonetheless, the analytical skills you will acquire are applicable to work in firms, government agencies, and nonprofit organizations.

## AFRICANA STUDIES MAJOR

See "Special Programs and Interdisciplinary Studies."

## AKKADIAN

See Department of Near Eastern Studies.

## AMERICAN STUDIES

See "Special Programs and Interdisciplinary Studies"

## ANTHROPOLOGY

D. H. Holmberg, chair; R. Ascher, T. C. Bestor, J. Borneman, J. Fajans, D. J. Greenwood, J. S. Henderson, B. J. Isbell, A. T. Kirsch, B. Lambert, K. S. March, E. Povinelli, P. S. Sangren, V. Santiago-Irizarry, J. T. Siegel, M. F. Small, R. J. Smith

Anthropology is unique in that it takes humanity in its broadest sense as its subject matter. It is a discipline that stresses the world's cultural diversity by means of a comparative perspective. This means that anthropologists are interested in cultural differences in and among modern societies, cultural change over time and the evolutionary history of our species. As we look ahead to the twenty-first century, anthropology prepares students to think globally about humankind as thinkers, actors, builders, and as living organisms in a complex and fragile ecosystem.
The three branches of anthropology are archaeology, biological anthropology, and sociocultural anthropology. Archaeologists collect and interpret the record of the past to extend our understanding of human history and social change. That record tells the story not only of "ancient" societies, but also of the rise of civilizations that were the direct forebears of the contemporary nations that we know today. Archaeology also tells the story of human origins, the invention of farming and settled life, the rise of complex social institutions and technologies, and the worldviews of the past, among other themes. Biological anthropologists focus on the natural history of our species. This involves the study of human anatomy, genetics, nutrition, and ecology. In addition, study of our phylogenetic cousins, nonhuman primates, and our fossil record helps biological anthropologists study the diversity of behaviors, social relationships, economies, political and legal orders, worklviews, logics, languages, symbols, myths, and religions-among the many other means human beings invent to create and reproduce social life around the world. Sociocultural anthropologists collect data primarily through ethnographic fieldwork, that is, months or years of participating and observing in the societies they study. Together, the three branches of the discipline offer an integrated approach to the immense diversity of human experience. Through its subject matter, theories, and methods, anthropology also offers students a chance to integrate the three divisions of the university: the humanities, social sciences, and natural sciences. Each branch of anthropology
involves these three subject areas in different ways. For purposes of distribution requirements in the College of Arts and Sciences, most courses in anthropology satisfy the social science requirement and the requirement for geographic and cultural breadth. Some anthropology courses also fulfill the biological sciences requirement or the requirement for historical breadth.
The major is designed to offer students opportunities to study all three branches of anthropology, through courses on particular topics (e.g., agriculture, religion, or economics), on world areas, and on theoretical problems. The requirements for majors are outlined below. Within the major, students may design their own specialties in consultation with a faculty adviser. Specialties may be developed through any combination of 300and 400 -level courses in the department, independent study, courses in related fields, and honors work.

## The Major

1) The major in anthropology requires completion of Anthropology 101 and 102. Preferably, these courses will be taken in the freshman or sophomore years.
2) Students who major in anthropology:
a) Take at least one course at the 200 level or above in each of categories III, IV, V, VI, and VII from the listing below. In satisfaction of this requirement, no course may be used to fulfill more than one category.
b) Develop one or more areas of specialization within the discipline in consultation with his or her faculty adviser. Examples of such specializations might include sociocultural anthropology, anthropological archaelogy, theory and history, and biological anthropology.
c) Take a total of 32 credits of course work above the 100 level. Up to 8 credits of course work in cognate disciplines related to the student's specialization may be accepted for the major with the permission of the faculty adviser.
d) When appropriate, special provisions for meeting major requirements may be arranged with the faculty adviser's approval.
Honors. Honors in Anthropology are awarded for excellence in the major, which includes overall grade point average and completion of an Honors Thesis. Anthropology majors interested in the Honors Program should consult the chair of the Honors Committee at the end of their junior year. To qualify for the Honors Program, a student must have at least a 3.2 grade point average, and the consent of a faculty member in anthropology who will guide the honors thesis. After applying for the program and being admitted as a candidate by the Honors Committee, the student will conduct original research and write a publishable-quality thesis. This thesis will be evaluated by the faculty research adviser and two other faculty members. Honors (i.e., cum laude, magna cum laude, or summa cum laude) are awarded based on the quality of the thesis and the student's overall record. While working on the thesis during the senior year, students may enroll in Anthropology 491 (fall)
and/or 492 (spring) for credit. The credits are variable and grades for these courses are given by the faculty research adviser and based on performance during thesis research and writing.
Facilities. The biological anthropology laboratory (McGraw 303) houses an extensive collection of materials for teaching purposes, including: 1) human skeletal remains, 2) articulated skeletons and cranial casts of strepsirhine primates, 3) articulated monkey skeletons, 4) casts of ape crania and postcrania, 5) casts that demonstrate the human fossil record including early nonhuman primate ancestors, the Australopithecines, and members of our genus Homo. In addition, the department has an extensive collection of archaeological and ethnological materials housed in the Anthropology Collections.

## Special Programs

Specialized individual study programs are offered in Anthropology 497-498, Topics in Anthropology, open to a limited number of juniors and seniors who have obtained consent and supervision of a faculty member. Undergraduates should also note that most 600 -level courses are open to them if consent of the instructor is obtained.
The Department of Anthropology holds colloquia throughout the academic year. Faculty members from Cornell and other universities participate in discussions of current research and problems in anthropology. Students are encouraged to attend.
Undergraduate anthropology majors have also established an anthropology club, which sponsors educational and social events in conjunction with graduate students and faculty in the department.

## I. Introductory Courses

Note: For additional freshman writing seminars in anthropology, see "Freshman Writing Seminars" and the John S. Knight Writing Program's special brochure.

## ANTHR 101 Introduction to Anthropology: Biological Perspectives on the Evolution of Humankind

## Fall. 3 credits.

Faculty.
The evolution of humankind is explored through the fossil record, studies of the biological differences among current human populations, and a comparison with our closest relatives, the primates. This course investigates the roots of human biology and behavior with an evolutionary framework. Fee for lab usage and maintenance, $\$ 5$.

## ANTHR 102 Introduction to

 Anthropology: The Comparison of Cultures 융Spring. 3 credits.
E. Povinelli.

An introduction to cultural anthropology through ethnographies, or the descriptive accounts of anthropologists. Through readings and lectures students acquaint themselves with a number of cultures from several parts of the world. The cultures range in form from those of small-scale tribal societies to those of state societies. Throughout the course we attempt to make sense of exotic cultures in their own terms. Attention is focused on variation in cultural pattems as
they are expressed in social, economic, and ritual practices. In this encounter the principles of anthropology, as a comparative enterprise that poses distinct cultural systems in relief, will be developed. Fiction, films, and exercises supplement the formal anthropological materials.

ANTHR 103 The Scope of Anthropology Fall and spring. 1 credit. Prerequisite: concurrent enrollment in or prior completion of Anthropology 101 or Anthropology 102. S-U grades only.

Staff.
This course is intended for majors in anthropology, prospective majors. Each week a different member of the faculty in anthropology at Comell will make a presentation on the nature of their work within the field and discuss their interests with students. The course is meant to introduce the range of approaches found within anthropology and help students in planning future course work.

## ANTHR 200 Cultural Diversity and

 Contemporary Issues (also HASP 200) 를Fall. 3 credits.
V. Santiago-Irizarry.

This course will introduce students to the meaning and significance of forms of cultural diversity. Drawing from films, videos, and selected readings, students will be confronted with different representational forms that portray people in various parts of the world and they will be asked to examine critically their own prejudices as they influence the perception and evaluation of cultural differences. We shall approach cultures holistically, assuming the inseparability of economics, kinship, religion, and politics as well as their interconnections and dependencies between and within world areas. The course will focus on the life of Hispanic Americans in the United States to consider issues of representation, cultural diversity and "political correctedness," nativism and nationalism, race and ethnicity, institutional culture, gender, and language.

## II. Courses Intended Primarily for Majors

ANTHR 491 Honors Thesis
Fall. Credit to be arranged. Prerequisite: consent of the Honors Committee. Intended for majors graduating in mid-year.

Hours to be arranged. Staff.
Independent work under the close guidance of a faculty member selected by the student.

## ANTHR 492 Honors Thesis

Spring. Credit to be arranged. Prerequisite: consent of the Honors Committee.

Hours to be arranged. Staff.
Independent work under the close guidance of a faculty member selected by the student.

## ANTHR 497-498 Topics in Anthropology

 497, fall; 498, spring. Credit to be arranged. Intended for undergraduate students only.Hours to be arranged. Staff.
Independent reading course in topics not covered in regularly scheduled courses. Students select a topic in consultation with the faculty member who has agreed to supervise the course work.

## III. Archaeological Courses

See also courses listed under Archaeology

## [ANTHR 202 Interpretive Archaeology (also ARKEO 202) <br> Fall. 3 credits. Not offered 1994-95]

ANTHR 203 Early People: The Archaeological and Fossil Record (also Archaeology 203)
Spring. 3 credits.
T. P. Volman.

For course description, see ARKEO 203.

## ANTHR 204 Ancient Civilizations (also Archaeology 204) e\#

Fall. 3 credits.
J. S. Henderson.

An introduction to the archaeology of early civilizations, especially in Mesopotamia, Egypt, India, China, Mexico, and Peru. Emphasis is on the emergence of the first complex societies and their key institutions (the state, kingship, cities, markets, writing, among others). The nature of complex societies and strategies for investigating them archaeologically are considered as general issues.
[ANTHR 216 Ancient Societies @\#
Fall. 3 credits ( 4 by arrangement with instructor). Not offered 1994-95.]

## ANTHR 317 Stone Age Archaeology (also

 Archaeology 317)Fall. 4 credits.
T. P. Volman.

For course description, see ARKEO 317.

## [ANTHR 352 Interpretation of the Archaeological Record <br> Fall. 4 credits. Not offered 1994-95.]

## ANTHR 355 Archaeology of Mexico and Central America 융

Spring. 4 credits.
J. S. Henderson.

A survey of the cultural history of ancient Mexico and Central America, emphasizing Aztec and Maya civilizations. The use of ethnographic and historical information to enrich archaeological interpretation is a general theme. Special topics include the emergence of settles farming life, the rise of civilization and the state, and the development of mechanisms that linked the many societies in the region into a single sphere of interaction.

## [ANTHR 370/670 Environmental

 Archaeology (also ARKEO 370/670)Fall. 4 credits. Not offered 1994-95]
[ANTHR 493 Seminar in Archaeology: The Aztecs (aiso Archaeology 493) ©

Fall. 4 credits. Not offered 1994-95.]
[ANTHR 494 Seminar in Archaeology: The State (also Archaeology 494) @\#

Spring. 4 credits. Not offered 1994-95.]

## IV. Biological and Ecological Anthropology

[ANTHR 275 Human Biology and Evolution (also Biological Sciences 275 and Nutritional Science 275)
Fall. 3 credits. Not offered 1994-95.]

## [ANTHR 371 Human Paleontology (also Biological Sciences 371)

Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 390 Primate Behavior and Ecology <br> Spring. 4 credits. Not offered 1994-95.]

## ANTHR 474 Laboratory and Field Methods in Human Biology (also Biological Sciences 474)

Spring. 5 credits. Limited to 16 . Prerequisite: one year of introductory biology or Anthropology 101 or permissio nof instructor by preregistration in E-231 Corson. Offered alternate years.
K. A. R. Kennedy.

Practical exercises and demonstrations of modern approaches to the methodology of physical anthropology. Emphasis on comparative human anatomy, osteology, description of skeletal and living subjects, paleopathology, skeletal maturation, and relevant field techniques for the archaeologist and forensic anthropologist. This course includes the dissection of a profused nonhuman primate.
[ANTHR 490 Primates and Evolution
Spring. 4 credits. Not offered 1994-95.]

## V. Sociocultural Anthropology

[ANTHR 211 Nature and Culture ©
Spring. 4 credits. Not offered 1994-95.]
[ANTHR 290 Filming Other Cultures (also Theatre Arts 290) ©
Spring. 3 credits. Not offered 1994-95.]
ANTHR 305 Emotion, Gender, and Culture (also Women's Studies 305)

Fall. 4 credits.
B. J. Isbell.

This course introduces students to the current anthropological perspective on the following topics: (1) cultural shaping of emotion, (2) acquisition and production of gender and sexuality, and (3) an historical perspective on cross-cultural studies of psychology and cognition. It is appropriate for students majoring in anthropology, women's studies, psychology, cognitive studies, and human development and family studies.
[ANTHR 306 Ethnographic Description
Fall. 4 credits. Not offered 1994-95.]
ANTHR 313 Anthropology of the City © Fall. 4 credits.
T. Bestor.

An examination of the sociocultural structure and process in urban settings, with emphasis on the role of rural migrants, the relationship of urbanism to political and economic development, the role of voluntary associations, and the adjustment of family and kinship groups to urban life. Asian, African, and Latin American urban centers are emphasized.

## [ANTHR 314 Applied Anthropology

 Fall. 4 credits. Not offered 1994-95.]ANTHR 320 Myth, Ritual, and Symbol © Spring. 3 or 4 credits. To receive 4 credits, students must take a section to be announced. J. Fajans.

This course examines how systems of thought, symbolic forms, and ritual practice are formulated and expressed in primarily nonWestern societies. It focuses on anthropological interpretations of space, time, cosmology, myth, classificatory systems (such as color, totems, food, dress, kinship), taboo, sacrifice, witchcraft, sorcery, and rites of passage (birth, initiation, marriage, death). It will examine
both the roles of specialists (spirit mediums, curers, priests, ascetics, etc.) and nonspecialists in producing these cultural forms.

## ANTHR 321 Sex and Gender in CrossCultural Perspective (also Women's Studies 321] <br> Fall. 4 credits.

K. S. March

An introduction to the study of sex roles cross-culturally and to anthropological theories of sex and gender. The course examines various aspects of the place of the sexes in social, political, economic, ideological, and biological systems to emphasize the diversity in gender and sex-role definition around the world
ANTHR 322 Magic, Myth, Science, and
Religion (also Religious Studies 322)

Fall. 4 credits.
A. T. Kirsch

Surveys various classic anthropological perspectives on the role of religion as a cultural system in human life. Magic, myth, and ritual as cultural markers of and solutions to endemic contradictions, tensions, and transitions are explored. Inquiries into the role of science as cultural system and the present state and prospects for religion in the present and future.

## ANTHR 323 Kinship and Social Organization (e)

## Spring. 4 credits.

B. Lambert.

Much of this course is a survey of forms of the family, descent groups, and marriages systems. The role of age and sex in the social structure is also considered. The last part of the course is devoted to a history of the British and American family and to its fate in utopian communities.
[ANTHR 326 Economic Anthropology © Fall. 4 credits. Not offered 1994-95.]

## ANTHR 328 Conflict, Dispute Resolution, and Law in Cultural Context

## Fall. 4 credits.

V. Santiago-Irizarry.

Rule-making and dispute resolution are integral aspects of social reality in any culture. The ways in which conflict is treated and interpreted-to be then deflected or re-solved-articulate with other cultural domains such as religion, politics, and economics as part of the material and symbolic processes that enable sociocultural interaction. At issue then are the formal and processual means that the treatment of conflict takes in different societies. These means constitute frames for the definition of social experience that are used by social actors in the interpretation of events within the terms of an overriding sociocultural logic that is in turn refigured by these interpretive frames.

## [ANTHR 329 Indigenous Rights,

Contemporary Hunter-Gatherers, and the Nation-State ©
Fall. 4 credits. Not offered 1994-95.]

## ANTHR 332 Culture and Performance, and Performing Culture

## Fall. 4 credits.

B. J. Isbell.

This course has two goals: 1) to examine the anthropology of non-western cultural performances such as: the Japanese tea ceremony, rites of passage, curing and initiation ceremonies in diverse cultures, and 2) to "perform anthropology" through
dramatic readings of epic poems, myths, and experimental plays. The course will focus on diverse materials from Latin America, Asia, and Africa.
[ANTHR 380 State, Nation, and Everyday Life
Spring. 4 credits. Not offered 1994-95.]
[ANTHR 385 Sex, Morality, and the Law (also Women's Studies 385)
Fall. 4 credits. Not offered 1994-95.]
[ANTHR 400 The Craft of Anthropology: Ethnographic Field Methods Spring. 4 credits. Not offered 1994-95.]

## ANTHR 406 The Culture of Lives (aiso Women's Studies 406)

Spring. 4 credits.
K. S. March.

This seminar will look at persons, lives, cultures, and methods in anthropological life history materials. Throughout the seminar we will attend to the evolution of interest in,
forms of, and uses for life history materials in anthropology, with special attention to differences in men's and women's lives and life (re)presentations.

## [ANTHR 408 Gender Symbolism (also Women's Studies 408) <br> Spring. 4 credits. Not offered 1994-95.]

## [ANTMR 417 Person, Gender, and Song

 (also Women's Studies 416) ©Spring. 4 credits. Not offered 1994-95.]

## ANTHR 424 Anthropology Amongst the Disciplines

## Fall. 4 credits.

J. T. Siegel.

Anthropology is distinguished amongst the disciplines in depending on a notion of the not-yet conceptualized, the encounter with which is thought to provide an inassimilable element into thinking about culture and society. The course provides a history and assessment of this idea and illustrations of its embodiment, particularly in studies of ritual.

## [ANTHR 427 The Anthropology of Everyday Life e <br> Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 428 Spirit Possession,

 Shamanism, Curing, and Witchcraft (also Women's Studies 428) © Spring. 4 credits. Not offered 1994-95.]
## [ANTHR 430 Music and Ritual (also MUSIC 430)

Fall. 4 credits. Not offered 1994-95]
[ANTHR 436 Language, Culture, and Society 앙
Fall. 4 credits. Not offered 1994-95]

## ANTHR 439 Culture and Power

Fall. 4 credits.
B. Povinelli.

This course explores the relationship between culture and social power in multi- and crosscultural contexts through theoretical and ethnographic texts. It looks at competing theories of culture including structural, hegemonic and dialogical approaches and how they related to marxist, postmarxist and postmodernist approaches to politicaleconomy and power. How do beliefs, perceptions, and outlooks organize the way that power is constructed and distributed in complex "heteroglossic" societies? Why do certain cultural beliefs and practices dominate any given society? How do political-economic institutions and practices influence or structure
cultural outlooks? Finally, how are the notions of subordination, resistance, and oppression altered depending upon how one conceives of culture and social power?

## [ANTHR 440 Mealth and Healing in

 Cultural PerspectiveSpring. 4 credits. Not offered 1994-95.]
[ANTHR 441/625 Children, Literature, and Society (also Asian Studies 451/ 625) 항

Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 451 Anthropological Boundaries (a) <br> Fall. 4 credits. Not offered 1994-95.]

[ANTHR 452 Portraits, Profiles, and Life Histories ©
Spring. 4 credits. Not offered 1994-95.]

## ANTHR 453 Visual Anthropology

Fall. 4 credits. Prerequisite: permission of instructor. Enrollment limited by appropriate space for showing work. S-U grades only Fee for film screening and maintenance, $\$ 20$. R. Ascher.

The expression of ideas about the human condition through original drawings, graphics, paintings, photographs, cinema, sculpture, and video that take the person as subject. Writing can be combined with visual expression, as, for example, in concrete poetry or photographic essays. Projects must conform to two general guidelines: (1) the student must have prior knowledge of the medium chosen or concurrent course work in it, and (2) the project must be one that can be developed throughout the course and benefit from its particular setting. In the first half, the creative work of others is studied. For example, we read Spiegelman's MAUS and view films made by both anthropologists and the people whom they visit. The second half is devoted to hourlong progress reports and discussions of the work of people in the course.
[ANTHR 455 Theatre of Anthropology e Spring. 4 credits. Not offered 1994-95.]

## [ANTHR 460 Culture and International Order

Spring. 4 credits. Not offered 1994-95.]

## VI. Area Courses <br> ANTHR 230 Cultures of Native North America

Fall. 4 credits.
B. Lambert.

A survey of the principal Eskimo and
American Indian culture areas north of Mexico. Selected cultures will be examined to bring out distinctive features of the economy, social organization, religion, and worldview. Although the course concentrates on traditional cultures, some lectures and readings deal with changes in native ways of life that have occurred during the period of European-Indian contact.

## ANTHR 333 Ethnology of the Andean Region ©

Spring. 4 credits.
B. J. Isbell.

This course will begin with the examination of the consequences of two pressing contemporary issue sin the Andes: The Shining Path and the Drug War in Bolivia. Then we will consider a number of anthropological studies on diverse aspects of Andean culture
including: economy, social structure, gender, religion; as well as cosmology, and astronomy
with emphasis on concepts of time, memory and history. The course will conclude with discussion of the impact of the conquest on the Inka Empire.

## [ANTHR 335 People and Cultures of Mainland Southeast Asia © <br> Fall. 4 credits. Not offered 1994-95.]

## ANTHR 336 Peoples and Cultures of the

 Pacific 당Fall. 4 credits.
J. Fajans.

An overview of the ethnography of Micronesia, Polynesia, and Melanesia exploring the historical relations between these regions as well as the geographical, social and cultural differences among them. In addition to an ethnographic survey of the region, the course will focus on what an anthropological study of this part of the world has contributed to general anthropological theory. In this context, there will be a special focus on the analysis of systems of gender, kinship and descent, exchange and trade, and on the life cycle and social construction of the person

## ANTHR 339 Peoples and Cultures of the Himalayas ©

Spring. 4 credits
K. S. March.

A comprehensive exploration of the peoples and cultures of the Himalayas. Ethnographic materials draw on the lifeways of populations living in the Himalayan regions of Bhutan, India, Nepal, and Tibet. Some of the cultural issues to be examined through these sources include images of the Himalayas in the West, forms of social life, ethnic diversity, political and economic history, and religious complexity.
[ANTHR 343 Religion, Family, and Community In China 숭
Fall. 4 credits. Not offered 1994-95.]
[ANTHR 344 Male and Female in Chinese Culture and Society ©
Spring. 4 credits. Not offered 1994-95.]

## ANTHR 345 Japanese Society

Fall. 4 credits.
R. J. Smith.

A survey of the social structure of Japan and a discussion of trends in urban and rural life during the past century. Topics to be emphasized include the family, ancestor worship, community and social organization, and urbanism and modernization.
[ANTMR 348 Folklore of India (also Asian Studies 348) 장
Fall. 4 credits. Not offered 1994-95.]
[ANTHR 350 Topics in the Anthropology of Europe
Spring. 4 credits. Not offered 1994-95.]
[ANTHR 433 Andean Thought and Culture ©*
Spring. 4 credits. Not offered 1994-95.]
[ANTHR 443 Religion and Ritual in Chinese Society (also Religious Studies 443)
Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 444 Japanese Social

 OrganizationSpring. 4 credits. Not offered 1994-95.]
[ANTHR 448 Contemporary Approaches To South Asian Anthropology ©
Fall. 4 credits. Not offered 1994-95.]

ANTHR 456 Mesoamerican Religion, Science, and History ©\#
Fall. 4 credits.
J. S. Henderson.

An introduction to belief systems in ancient Mexico and Central America, emphasizing the blending of religion, astrology, astronomy, myth history and prophecy. Interpreting text and image in pre-Columbian books and inscriptions is a major focus.

## ANTHR 477 Ethnology of Island

 Southeast Asia ©Fall. 4 credits.
S. Shiraishi.

The peoples and cultures of Island Southeast Asia (Indonesia, Philippines, Singapore, and Malaysia) will be discussed. The region today has been affected by historical encounters with other parts of Asia (China, India), the Islamic world, and Europe. European colonialism and the formation of nation-states mark the most recent, significant events in the area. These events produced concepts such as "tropics," "native temperaments," "exotic cultures," and the "modern European world," which was also part of the local landscape. We will examine the role that ethnographic writings have played in this plural world. The class will read ethnographic texts, historical and contemporary studies of national political cultures, fiction, and biographies and will view films. The main topics include: colonialism, commerce religion, education, class and culture, nationalism, ant and theatre, violence, state and family, development, the tropic rainforest and the environment.

## VII. Theory and History of Anthropology

In addition to the courses listed here, Anthropology 390 may also be used to satisfy the theory requirement.

## [ANTHR 402 Archaeological Research Design (also Archaeology 402) <br> Spring. 4 credits. Not offered 1994-95.]

## ANTHR 404 Approaches to Archaeology (also Archaeology 404) \#

Spring. 4 credits. Prerequisite: permission of instructor.

Staff.
An exploration of the concepts that have shaped archaeology. The course briefly examines the history of theoretical orientations in archaeology, then considers the variety of perspectives and interpretive frameworks that guide present-day investigations. Case studies illustrate the implications of the nature of the archaeological record for reconstructing subsistence and economic systems, trade, social and political organization, demography, and ideology. An undergraduate seminar especially recommended for undergraduate majors and graduate archaeologists but open to anyone with a serious interest in archaeology

## ANTHR 412 Contemporary

Anthropological Theory
Spring. 4 credits.
B. Lambert.

A survey of the assumptions anthropologists make conceming the nature of society and culture and the explanations they have proposed for social behavior, values, belief systems, and ritual. Problems of social continuity and change will be addressed by way of theories of process, conflict, and transaction. Problems of cross-cultural understanding will be explored through
interpretative and structural studies of symbolism, ritual, mythology, concepts of the person, and cultural logic. Examples will be drawn from Western and non-Western societies, past and present.

## [ANTHR 414 Anthropology and History

 Spring. 4 credits. Not offered 1994-95.]
## ANTHR 420 Development of

Anthropological Thought
Fall. 4 credits.
J. Fajans.

An examination of the history and development of anthropological theory and practice. The course will focus on the differences and continuities among the various national and historical approaches that have come to be regarded as the schools of anthropology.

## [ANTHR 426 Ideology and Social Reproduction <br> Spring. 4 credits. Not offered 1994-95.]

## ANTHR 495 Classic Theorists Seminar

 Fall. 4 credits.A. T. Kirsch

This seminar will concentrate on the writings of Freud, Durkheim, and Weber, major figures in the shaping of contemporary social science. In particular, our concern will be how the works of these three classic theorists contributed to the development of holistic anthropological perspectives as well as to a variety of specialized developments such as "culture and personality" studies, "structural functional" analysis, and "cultural-symbolic" studies.

## VIII. Graduate Seminars

600-level courses are open to undergraduates who have fulfilled the prerequisites or by consent of the instructor.
ANTHR 600 Special Topics in Feminist Theory: An Interdisciplinary Graduate Course in Women's Studies (also Women's Studies 600, German Studies 600)
Fall. 4 credits.
B. Povinelli, B. Martin

The course examines sexuality as a product of historically and culturally situated discourses and focuses on sexuality in both Western and non-Western cultures. We are particularly interested in the critical role played by "sexuality" in the formation of the disciplines of anthropology, psychoanalysis, and cultural theory in the nineteenth-century, and in the imbrication of race and sexuality in those formations. For that reason, we will begin with nineteenth-century medical, psychiatric, anthropological, sexological, psychoanalytic, and literary texts and concentrate on the legacy of these discourses on contemporary social practice and cultural theory. Although the course is organized around "sexuality," we will attend consistently to its connections with other discursive and social axes, e.g., race, gender, class, religion.
ASIAN 601 Southeast Asia Seminar: To be announced

ASIAN 602 Southeast Asia Seminar: To be announced
[ANTHR 603 Production, Exchange and Value
Fall. 4 credits. Not offered 1994-95.]

ANTHR 607-608 Special Problems in Anthropology
607, fall; 608, spring. Credit to be arranged Intended for graduate students only.

Hours to be arranged. Staff.
[ANTHR 610 Language of Myth (also Classics 610 and Comparative Literature 615)
Spring. 4 credits. Not offered 1994-95.]

## ANTHR 612 History of Anthropological Thought

Spring. 4 credits.
A. T. Kirsch.

Readings in original sources of importance to the development of anthropological thought.

## NS 612 Methods of Assessing Physical Growth in Children

[ANTHR 614 Reading in the Ethnographic Tradition (1880-1960)
Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 615 Reading Contemporary Ethnographies (1960-1990)

Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 616 The Cultural Production of the Person

Fall. 4 credits. Not offered 1994-95.]
ANTHR 619 Anthropological Approaches to the Study of Budidhisms in Asia
Spring. 4 credits.
A. T. Kirsch.

This seminar will examine the various conceptual and analytical strategies employed by social scientists in the study of Buddhism especially in South and Southeast Asia.
Problems of religious complexity, the social correlates of Buddhism, and the role of Buddhism in social change will be explored.

## [ANTHR 620 Participatory Action Research: Anthropological Perspectives

Fall. 4 credits. Not offered 1994-95.]
ANTHR 621 Gender and Culture (also Women's Studies 621)
Fall. 4 credits. Prerequisite: concurrent attendance in the lectures and films of Anthropology/Women's Studies 321 and permission of instructor

> K. S. March.

This seminar is intended for advanced students planning further study or research on gender issues and desirous of an anthropological perspective on them. It explores the topics, questions, and readings of Anthropology/Women's Studies 321 in greater depth and with attention to the special research interests of the participants each year.
[ANTHR 625/441 Children, Literature, and Society (also Asian Studies 625/ 451)

Fall. 4 credits. Not offered 1994-95.]
[ANTHR 626 Problems in Economic Anthropology
Fall. 4 credits. Not offered 1994-95.]
[ANTHR 627 Seminar in Ethnobotany: To be announced (also Biological Sciences)
Fall. 4 credits. Not offered 1994-95.]
[ANTHR 628 Political Anthropology
Fall. 4 credits. Not offered 1994-95.]
[ANTHR 629 Chinese Ethnology
Spring. 4 credits. Not offered 1994-95.]

## ANTHR 630 The Philosophy of Money

Fall. 4 credits.
J. T. Siegel.

This course will examine varieties of exchange that take place in the form of money. It will focus on the following topics: Myths surrounding money and theories of its origins. The condition of its circulation: money economies versus those based on gift-giving, gambling, and prostitution. The treatment of money in psychoanalysis, its psychic and literary thematization, particularly in relation to gender, race, and anti-semitism. Anthropological material from non-Western cultures will also be introduced. Readings will include the work of Simmel, Marx, Freud, Bataille, and Derrida
[ANTHR 631 Kingship and Cultural Identity in Mesoamerica: Interpretive and Comparative Issues Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 632 Andean Symbolism

Spring. 4 credits. Not offered 1994-95.]
[ANTHR 633 Andean Research
Fall or spring. 4 credits. Not offered 1994-95.

ANTHR 634-635 Southeast Asia: Readings in Special Problems
634, fall; 635, spring. Credit to be arranged. Hours to be arranged. Staff.
[ANTHR 636 Cognition and Classification Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 637 Anthropological

Perspectives on Human Rights, Democracy, and Violence in Latin America
Spring. 4 credits. Not offered 1994-95.]

## ANTHR 639 The Feminine Sybolic

Spring. 4 credits.
B. J. Isbell.

A number of French and British feminists have constructed challenges to Lacan's reading of Freud in regard to the Feminine Symbolic as the 'symbolism of lacking a Phallus.' This seminar will address this literature from an anthropological perspective by comparing the Feminine Symbolic in diverse cultural constructions of sexual difference, desire, the body, identity, power and the subject. Each participant will write a research paper on the feminine symbolic in a specific culture using art, ritual, texts, myths, or popular culture as the material to be analyzed. Hopefully a wide range of cultures will be represented by participants to allow discussion of the anthropological application of the theoretical framework under consideration.
ANTHR 640-641 South Asia: Readings in Special Problems
640, fall; 641, spring. Credit to be arranged.
Hours to be arranged. D. H. Holmberg,
K. S. March.

Selected readings in society, religion, and culture in South Asia.

## ANTHR 644 Research Design

Spring. 4 credits.
T. Bestor.

This seminar focuses on preparing a full-scale proposal for anthropological fieldwork for a dissertation. Topics include identifying of appropriate funding sources; defining a researchable problem; selecting and justifying a particular fieldwork site; situating the ethnographic case within appropriate theoretical contexts; selecting and justifying
appropriate research methodologies;
developing a feasible timetable for field research; ethical considerations and human subjects protection procedures; and preparing appropriate budgets. This is a writing seminar, and students will complete a proposal suitable for submission to a major funding agency in the social sciences.

## ANTHR 645 Japanese Ethnology

 Fall. 4 credits.Hours to be arranged. R. J. Smith. This seminar is designed for advanced students who plan to conduct social science research in Japan. It deals with questions of historical continuity, the relationship of the individual to society, and the nature of contemporary Japanese social organizations. A reading knowledge of Japanese is strongly recommended.
[ANTHR 648 Marriage and Death
Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 649 Narrative and the Analysis of Culture

Fall. 4 credits. Not offered 1994-95.]

## [ANTHR 651 Anthropological

 Boundaries: Seminar on FilmSpring. 4 credits. Not offered 1994-95.]

## ANTHR 653 Myth onto Film (also Theatre

 Arts 653)Fall. 4 credits. Enrollment limited by available studio space and equipment. Prerequisite: some knowledge of one of the following: anthropology, filmmaking, mythology. graphics, drawing, or painting. Open to undergraduates and graduate students with permission of instructor. Fee for film screening and maintenance, $\$ 50$.

## R. Ascher.

In myths, whales fly, pebbles throw themselves across streams, and trees are transformed into women. Toward the end of visualizing myths-in particular the myths of other people-we explore the possibilities of animated film. The technique used is cameraless animation; that is, we draw and paint, frame by frame, directly onto movie film. The intellectual problem is to visualize the myths of others so that they are comprehensible to us but are not thought to be of us. Reading includes introductory works on both myth and animation and there is background reading on the particular myth that is committed to film.

## [ANTHR 656 Maya History

Fall. 4 credits. Not offered $1994-95$.]

## [ANTHR 665 Native American

 Contributions to Anthropological
## Thought

Spring. 4 credits. Not offered 1994-95.]
ANTHR 673 Human Evolution: Concepts, History and Theory (also Biological Sciences 673)
Fall. 3 credits.
K. A. R. Kennedy

The historical background of present-day concepts of man's evolutionary variations and adaprations in space and time is surveyed. The formation of biological anthropology as an area of scientific inquiry within the social and biological sciences is reviewed. Students select their own topics within a broad range of readings in the history of Western concepts of human origins, diversity, and place in nature.

Related Courses in Other Departments
5 HUM 407 The Politics of Grief: Greece, the Balkans, Ireland
R SOC 723 Social Movements in Agrarian Society

ARABIC AND ARAMAIC
See Department of Near Eastern Studies.

## ARCHAEOLOGY

S. Baugher (city and regional planning), A. L. Bloom (geological sciences),
R. G. Calkins (history of art), K. M. Clinton (Classics), J. E. Coleman (Classics), D. Evett (Language House Program), R. T. Farrell (English), J. S. Henderson (anthropology), P. I. Kuniholm (history of art), D. I. Owen (Near Eastern Studies), A. Ramage (history of art), S. Saraydar (Arts and Sciences), B. S. Strauss (history), T. P. Volman (archaeology; director of undergraduate studies).
Archaeology is an interdisciplinary field at Cornell, which is one of the few universities in the United States to offer a separate archaeology major. Program faculty members, affiliated with several departments, coordinate course offerings and help students identify opportunities for fieldwork, graduate study, and professional positions.

## The Major

Prospective majors must complete Archaeology 100 or one of the basic courses as defined below before they will be admitted to the major. This initial course will not be counted toward the major requirements.
Because the major draws on the teaching and research interests of faculty from many departments to present a broad view of the archaeological process, interested students should discuss their course of study with a participating faculty member as early as possible. In some areas of specialization, intensive language training should be coordinated with other studies as early as the freshman year.
Once admitted to the major, students must take an additional 32 credits from the courses listed below, selected in consultation with a major adviser of their choosing. These courses should provide exposure to a broad range of archaeologically known cultures and the methods of revealing and interpreting them. Sixteen of the credit hours should be at the 300 level or above. At least two courses must be taken from each of categories B-E.
Courses basic to the discipline of archaeology are marked with the word "Basic" after the number of credit hours. It is recommended that majors who are planning to pursue graduate studies in archaeology should take at least two of the basic courses in each category. Further courses in languages and in geology are also recommended.
Honors. Honors in archaeology is awarded on the basis of the quality of an honors essay and the student's overall academic record. Prospective honors students should have a 3.5 gradepoint in the major and a 3.0 gradepoint overall. They should consult with the director of undergraduate studies before the beginning
of the senior year. The honors essay is normally prepared in consultation with a faculty adviser during the senior year; students may enroll in Archaeology 481, fall; 482, spring for this purpose.
Fieldwork. Every student should gain some practical experience in archaeological fieldwork on a project authorized by his or her adviser. This requirement may be waived in exceptional circumstances. The Jacob and Hedwig Hirsch bequest provides support for a limited number of students to work at excavations sponsored by Cornell and other approved institutions.

## The Concentration

Students in Cornell schools and colleges other than Arts and Sciences may elect a concentration in archaeology. To concentrate in archaeology, the student must complete five courses from categories B-D below, all with a grade of C or better. The five courses may consist of either (1) Archaeology 100, three basic courses and one other course from categories B-D, or four basic courses and one other course from categories B-D. Concentrators are encouraged to gain some fieldwork experience. They are eligible on the same basis as majors for Hirsch Scholarships in support of fieldwork.

## Freshman Writing Seminars

For course descriptions, see the freshman writing seminar brochure.

## A. Introductory Courses and Independent Study Courses

## ARKEO 100 Introduction to

## Archaeology *

Spring. 3 credits.
T. P. Volman.

A broad introduction to archaeology-the study of material remains to answer questions about the human past. Case studies illustrate current methods and interpretive frameworks. Guest lectures by members of the Cornell Archacology Program are an integral part of the course.

## ARKEO 300 Individual Study in

 Archaeology and Related FieldsFall and spring. Credit to be arranged. Prerequisite: Archaeology 100 or permission of instructor.

Hours to be arranged. Staff. Students pursue topics of particular interest with the guidance of a faculty member.

## ARKEO 481-482 Honors Thesis

481, fall; 482, spring. 4 credits. Prerequisite: admission to Honors Program:

Hours to be arranged. Staff.
The student, under faculty direction, will prepare a senior thesis.

## ARKEO 600 Special Topics in

 ArchaeologyFall and spring. 4 (V) credits.
Hours to be arranged. Staff.
Students pursue advanced topics of particular interest under the guidance of a faculty member(s).

## ARKEO 681-682 Master's Thesis

681, fall; 682, spring. $4(\mathrm{~V})$ credits. Limited to students admitted to Master's Program in Archaeology.
Students, working individually with faculty member(s), prepare a Master's Thesis in Archaeology.

## B. Theory and Interdisciplinary Approaches

[ARKEO 202 Interpretive Archaeology (also Anthropology 202) *
Fall. 3 credits. Basic. Limited to 60 students. Not offered 1994-95.
T. P. Volman.

An introduction to the analysis and interpretation of archaeological data, especially stone and ceramic artifacts, and related contextual data, such as the remains of plants and animals. Emphasis is on the use of archaeological data to answer questions about ancient human behaviors, lifeways, and culture change. Topics include the formation of the archaeological record, the characterization and classification of artifacts, and the analysis of artifact distributions through space and over time. Section meetings include demonstrations, visits to campus facilities, and analyses of artifacts from Comell archaeological collections.]

ARKEO 203 Early People: The Archaeological and Fossil Record (also Anthropology 203)
Fall. 3 credits. Basic.
T. P. Volman.

A survey of the archaeological and fossil record of human evolution. Contributions by researchers from a variety of disciplines are highlighted, as are the discoveries, personalities, and controversies that have enlivened the study of human evolution for more than a century. Critical evaluation of evidence and interpretations will be stressed. Demonstrations and films supplement the lectures.
ARKEO 204 Ancient Civilizations (also Anthropology 204) ©\#

## Fall. 3 credits. Basic.

J. S. Henderson.

An introduction to the archaeology of early civilizations, especially in Mesopotamia, Egypt, India, China, Mexico, and Peru. Emphasis is on the emergence of the first complex societies and their key institutions (the state, kingship, cities, markets, writing, among others). The nature of complex societies and strategies for investigating them archaeologically are considered as general issues.

## ARKEO 317 Stone Age Archaeology

 (also Anthropology 317)Fall. 4 credits.
T. P. Volman.

A survey of current approaches to the archaeological record of Stone Age peoples, from the earliest sites to those of recent times. Case studies are used to illustrate the nature of archaeological occurrences, excavation procedures, and analytical methods. Multidisciplinary efforts to expand our knowledge of prehistoric lifeways and behaviors are a major concern of the course.

## ARKEO 404 Approaches to Archaeology

 (also Anthropology 404)Spring. 4 credits. Basic. Prerequisite: permission of instructor.
J. S. Henderson and T. P. Volman. An exploration of the concepts that have shaped modern archaeology. The course
briefly examines the history of theoretical orientations in archaeology, then considers the variety of perspectives and interpretive frameworks that guide present-day investigations. Case studies illustrate the implications of the nature of the archaeological record for reconstructing subsistence and economic systems, trade, social and political organization, demography, and ideology. An undergraduate seminar especially recommended for undergraduate majors and graduate archaeologists but open to anyone with a serious interest in archaeology.
[ARKEO 494 Seminar in Archaeology: The State (also Anthropology 494) e"

Spring. 4 credits. Not offered 1994-95.
J. S. Henderson.]

## LA 261 Urban Archaeology (also CRP

 261)Fall. 3 credits
S. Baugher

For description, see Landscape Architecture

## LA 569 Archaeology in Historic

 Preservation PlanningFall. 3 credits
S. Baugher

For description, see Landscape Architecture

## C. Old World Archaeology

[ARKEO 221 Minoan-Mycenaean Art and Archaeology (also Classics 221 and History of Art 221) "
Fall. 3 credits. Basic. Students may not obtain credit for both this course and Classics 319. Not offered 1994-95.
J. Coleman.J
[ARKEO 232 Archaeology in Action I (also History of Art 224 and Classics 232) \#

Fall. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95
P. I. Kuniholm.]
[ARKEO 233 Archaeology in Action II (also History of Art 225 and Classics 233) \#

Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1994-1995

## P. I. Kuniholm.]

【ARKEO 243 The History and Archaeology of Ancient Israel to 450 B.C.E. (also Near Eastern Stuclies 243, Religious Studies 243 and Jewish Studies 243) ©
Spring. 4 credits. Basic. Recommended for students planning to participate in Near Eastern STudies 364, Introduction to Field Archaeology in Israel. Not offered 1994-1995 D. I. Owen.]

ARKEO 247 Introduction to Jewish Art and Archaeology from the
Mellenistic to the Rabbinic Period (also NES 247, Classics 249, JWST 247, and RELST 247) ©
Fall. 3 credits.
L. Kant.

In this course, we will examine material evidence of Judaism from the Fourth Century B.C.E. to the Fifth Century C.E. Equal attention will be given to Palestine and the Diaspora. We will look at various kinds of structures, including tombs and cemeteries, prayer buildings and synagogues, houses, fortresses, palaces, and the Jerusalem Temple All types of objects will come under consideration, such as paintings, mosaics, sarcophagi
jewelry and gemstones, coins, inscriptions, and papyri. In general, we will attempt to understand this material both in terms of its Near Eastern heritage and the powerful influence of the Graeco-Roman environment. Attention will also be paid to relations to early Christian art and archaeology.
[ARKEO 263 Introduction to Biblical Mistory and Archaeology (also NES 263 and Jewish Studies 263)
Spring. 3 credits. Not offered 1994-95 D. I. Owen.]
[ARKEO 275 Ancient Seafaring (also Near Eastern Studies 261)
Spring. 3 credits. Not offered 1994-95 D. I. Owen.]

ARKEO 320/620 An Introduction to Early Medieval Archaeology and Culture (also English 311/603) *
Fall. 4 credits. Limited to 15 students.
Permission of instructor.
M W F 11:15-12:05. R. T. Farrell
This course will center on the early Christian period in England, though attention will also be paid to Ireland, the Continent, and Scandinavia. Frequent oral reports will be required. There will be a midterm and a final, both take-home and open book. Graduate students will be expected to do more extensive reports and a term paper. Undergraduates may elect to do a term paper in place of part or all of the final exam. Participants will be strongly encouraged to follow their own research interests. If money can be found to cover insurance and transport, we plan to ask the Metropolitan Museum of Art for early medieval artifacts, roughly one per student.
ARKEO 357 Greek Sanctuaries and Pausanias (also Classics 357 and Classics 457) \#
Fall (357) 3 credits; (457) 4 credits
K . Clinton and J. Coleman.
Many Greek sanctuaries were described by Pausanias, who wrote a guide to Greece in the second century C.E. By comparing his descriptions (and other written sources) with the archaeological remains at the actual sites, the course will examine how these sanctuaries functioned and what they meant to Greeks of his day. Students in Classics 457 will read relevant sections of Pausanias and other documentation such as inscriptions in Greek.

## ARKEO 362/662 The History and

 Archaeology of Anicent Syria (also NES 362/662 and Jewish Studies 362) - "Spring. 4 credits. Any archaeology ancient history course or permission of instructor.

## D. I. Owen

Wide ranging discoveries in Syria over the past two decades have increased dramatically our knowledge and understanding of the history of ancient Syria. This course will survey both the new discoveries and the older data-archaeological and written-from sites such as Ebla and Ugarit and provide a synthesis of the historical and archaeological developments. Relationships to the contemporary civilizations in Mesopotamia, Anatolia, Israel and Egypt from 3000 to 500 BCE will be stressed
[ARKEO 424 Sardis and the Cities of Asia Minor (History of Art 432 and Classics 432) ©
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95

## A. Ramage.]

[ARKEO 434 The Rise of Classical Greece (also Mistory of Art 434 and Classics 434)
Spring. 4 credits. Recommended: Classics 220 or 221 or History of Art 220 or 221 preferred. Not offered 1994-95. P. I. Kuniholm.]

ARKEO 520 Seminar in Classical Archaeology (also Mistory of Art 520) Spring. 4 credits. Letter only.
P. I. Kuniholm.

Selected problems in Aegean Prehistory including the Anatolian Neolithic, Bronze Age. and rise of Classical Greece.
[ARKEO 629 The Prehistoric Aegean and Cyprus (also Classics 629) 순
Fall. 4 credits. For graduate students, and advanced undergraduates with permission of instructor. Not offered 1994-95; next offered 1995-96.

> J. Coleman.]

CLASS 219 Mediterranean Archaeology (also Near Eastern Studies 267)
Fall. 3 credits. Basic
J. Coleman.

For description, see Classics.
CLASS 220 Introduction to Classical Archaeology (also History of Art 220) \#
Spring. 3 credits. Basic.
J. Coleman.

For description, see Classics.
CLASS 326 Greek Clities and Towns (also History of Art 326)
Spring. 4 credits. Prerequisite: Classics 220
or History of Art 220
J. Coleman

For description, see Classics
[CLASS 333 Greek and Roman Mystery Cults and Early Christianity (also Religious Studies 333)
Spring. 4 credits. A previous course in Classics (civilization or language) or Religious Studies 101 is recommended. Not offered
1994-95; next offered 1995-96. K. Clinton.]
[CLASS 630 Seminar in Classical Greek Archaeology: Graduate
Fall. 4 credits. Not offered 1994-95. J. Coleman.J
[ART H 320 Arts and Monuments of Athens (also Classics 320) *
Fall. 4 credits. Prerequisite: Classics 220 or permission of instructor. Not offered 1994-95. A. Ramage.]
[ART H 322 Arts of the Roman Empire (also Classics 350)
Fall. 4 credits. Prerequisite: History of Art 220 or permission of instructor. Not offered 1994-95

## A. Ramage.]

ART H 325 Greek Vase Painting (also Classics 325) \#
Fall. 4 credits. Prerequisite: previous enrollment in a History of Art or Classics course or permission of instructor.
A. Ramage.

For description, see History of Art
[ART H 327 Greek and Roman Coins (also Classics 327) \#
Spring. 4 credits. Prerequisite: History of Art 220 or permission of instructor. Not offered 1994-95.
A. Ramage.]

ART H 427 Seminar on Roman Art and Archaeology (also Classics 435) \#
Spring. 4 credits. Prerequisite: permission of instructor.
A. Ramage

For description, see History of Art.
[NES 367 History and Archaeology of Ancient Egypt @\#
Fall. 4 credits. Basic. Not offered 1994-95 D. I. Owen.]
D. New World Archaeology
[ARKEO 493 Seminar in Archaeology The Aztecs (also Anthropology 493) ©\#

Fall. 4 credits. Not offered 1994-95 J. S. Henderson.]

ANTHR 355 Ancient Mexico and Central America @\#
Spring. 4 credits. Basic J. S. Henderson.

For description, see Anthropology.
ANTHR 456 Mesoamerican Religion, Science, and History ©i"
Fall. 4 creclits.
J. S. Henderson

For description, see Anthropology
[ANTHR 656 Maya History
Fall. 4 credits. Not offered 1994-95 J. S. Henderson.)

LA 360/666 Pre-Industrial Cities and Towns of North America (also CRP 360/666)
Spring. 3 credits. S. Baugher.

For description, see Landscape Architecture

## E. Methodology and Technology

ARKEO 285 Art, Archaeology, and Analysis (also Engineering 185, MS\&E 285, Physics 200, English 285, Art 372, NS\&E 285 and Classics 285)
Spring. 3 credits Staff.

ARKEO 308 Dendrochronology of the Aegean (also History of Art 309 and Classics 309)
Fall and spring. 4 credits. Limited to 10 students. Prerequisite: permission of instructor.
P. I. Kuniholm

For description, see History of Art

## [ARKEO 356 Practical Archaeology (also

 Classics 356)Spring. 4 credits. Basic. Prerequisite: one course in archaeology. Not offered 1994-95. J. Coleman.]
[ARKEO 370 Environmental Archaeology (also Archaeology 670 and Anthropology 370 and 670)
Fall. 4 credits. Prerequisite: two previous courses in archaeology or permission of instructor. Not offered 1994-95. T. P. Volman.

A survey of selected topics in paleoenvironmental analysis and reconstruction, with emphasis on how they inform interpretations of the archaeological record

The course ranges broadly from a general consideration of human ecology and the role of environment in culture change to detailed study of specific techniques and approaches.]

## [ARKEO 402 Archaeology Research

 Design (also Anthropology 402)Spring. 4 credits. Basic. Prerequisite permission of instructor. Not offered 1994-95 J. S. Henderson, T. P. Volman.

Archaeological practice demands careful definition of research objectives and appropriate strategies before excavation or other fieldwork begins. Critical information lies in the arrangement and associations of objects and structures; this context should be a basic concern of any field investigation, particularly when it is destroyed by excavation. This course relies on case studies to illustrate how surveys, excavations, and analytical tech niques must be tailored to solving specific problems. A seminar especially recommended for undergraduate majors and graduate archaeologists but open to anyone with a serious interest in archaeology.]
[ARKEO 423 Ceramics (also History of Art 423 and Classics 423)
Fall. 4 credits. Prerequisite: permission of instructor Not offered 1994-95
A. Ramage.]

## ARKEO 601 Graduate Colioquium in

 ArchaeologyFall. A credits. Open to graduate students and advanced undergraduates by permission of instructor

Staff.
Faculty members of the Program in Archaeology and invited speakers will present summaries of the different aspects of archaeological analysis. Topics may include lithics, ceramic typology, petrographic and neutron activation analysis, dendrochronology and other chronological techniques, settlement patterns, inscriptions, human and animal bones.
[ARKEO 670 Environmental Archaeology (also Archaeology 370 and Anthropology 370 and 670
Fall. 4 credits. Prerequisite: two previous courses in archaeology or permission of instructor. Not offered 1994-95. T. P. Volman

For description, see Archaeology 370.]
[ANTHR 371 Human Paleontology (also Biological Sciences 371)
Fall. 4 credits. Prerequisite: one year of introductory biology, Anthropology 101, or permission of instructor. Not offered 1994-95 K. A. R. Kennedy.]

ANTHR 474 Laboratory and Field Methods in Human Biology (also Biological Sciences 474)
Spring. 5 credits. Prerequisite: one year of introductory biology, Anthropology 101, or permission of instructor K. A. R. Kennedy.

For description, see Biological Sciences.
ANTHR 673 Human Evolution: Concepts, History and Theory (also Biological Sciences 673)
Fall. 4 credits. Prerequisite: one year of introductory biology, Anthropology 101, or permission of instructor
K. A. R. Kennedy.

For description, see Biological Sciences.

GEOL 441 Geomorphology
Fall. 3 credits. Prerequisites: Geological Sciences 102 or 201 , or permission of instructor
A. L. Bloom

For description, see Geological Sciences.
GEOL 442 Glacial and Quaternary Geology
Spring. 3 credits. Prerequisite: Geological Sciences 441 or permission of instructor.
Offered alternate years.
A. L. Bloom.

For description, see Geological Sciences.

## ASIAN AMERICAN STUDIES

See Special Programs and Interdisciplinary Studies.

## ASIAN STUDIES

D. R. McCann, chair ( 388 Rockefeller Hall, 255-5095); S. Akiba, B. R. Anderson,
J. Badgley, R. Barker, M. G. Bernal, K. Brazell
T. Chaloemtiarana, S. Cochran, J. Cody,
R. D. Colle, E. W. Coward, Jr., B. de Bary,
G. Diffloth, C. D'Orban, E. C. Erickson, S. Feldman, G. Fields, J. W. Gair, M. D. Glock, D. Gold, E. M. Gunn, M. Hatch, D. Holmberg, J. Jasanoff, M. Katzenstein, K. A. R. Kennedy,
A. T. Kirsch, J. V. Koschmann, J. M. Law, L. C. Lee, T. Lyons, J. McRae,
B. G. MacDougall, K. March, T. L. Mei,
G. M. Messing, C. Minkowski, S. Mohanty, V. Nee, S. J. O'Connor, C. A. Peterson, J. R. Piggot, T. Poleman, M. Rebick, N. Sakai, P. S. Sangren, C. L. Shih, T. Shiraishi, V. Shue, J. T. Siegel, R. J. Smith, K. Taylor, N. Uphoff, J. Wheatley, J. Whitman, J. U. Wolff, D. Wyatt, M. W. Young

The Department of Asian Studies encompasses the geographical areas of East Asia, South Asia, and Southeast Asia and offers courses in most of the disciplines of the social sciences and the humanities. Asian studies courses through the 400 level (ASIAN is the prefix) are taught in English and are open to all students in the university. Some of these courses may be counted toward majors in other departments; others fulfill the humanities distribution requirement. Courses listed under Asian Studies offered through other departments may fulfill distribution requirements in history, social sciences, and arts.

## The Major

The applicant for admission to the major in Asian studies must have completed at least one area studies course selected from among those listed under the Department of Asian Studies and must receive permission for admission to the major from the director of undergraduate studies. The student must have received a minimum grade of C in this course and in all other courses counted toward the major.
A student majoring in Asian studies is required to complete two courses at the 200 level (a minimum of 6 credits with a grade of $C$ or better) in one of the Asian languages offered at Cornell. The major consists of at least 30 additional credits (which may include up to 6 credits of further language study) selected by the student in consultation with his or her adviser from among the courses listed under
the Department of Asian Studies and numbered 250 and above. Majors in Asian studies normally specialize in the language and culture of one country and often choose an additional major in a traditional discipline.

## Concentration in South Asia Studies

A candidate for the Bachelor of Arts or
Science degree at Comell may take a concentration in South Asia Studies by completing at least 18 credits of course work including Asian Studies 215 (Introduction to South Asia) and four courses or seminars at the intermediate or advanced levels, two of which may be South Asian language courses.
Students taking a concentration in South Asian studies are considered members of the South Asia Program and will have an adviser from the program faculty. (This adviser will be for the student's concentration and is not a substitute for a student's academic adviser in his or her major.)

One South Asian graduate course may be taken for the concentration with consent of both the instructor and the adviser. The same applies for one South Asia-related course with a research paper on a South Asian subject. Additional courses may be added if offered with comparable South Asia content.

## Concentration in Southeast Asia Studies

A candidate for the Bachelor of Arts or Bachelor of Science degree at Cornell may take a concentration in Southeast Asia studies by completing 15 credits of course work. A recommended plan would include Asian Studies 208 and three courses at the intermediate or advanced stage, two of which could be a Southeast Asian language. Students taking a concentration in Southeast Asia studies are members of the Southeast Asia Program and are assigned an adviser from the program faculty. Such students are encouraged to commence work on a Southeast Asian language either at the 10 -week intensive courses offered by the Southeast Asia Studies Summer Institute or by studying for one semester at IKIP Malang, Indonesia; Khon Kaen University, Thailand; and Hanoi University, Vietnam; fellowships are available for undergraduates through the Cornell Abroad Program.

## Distribution Requirement for Nonmajors through the Class of 1995

Humanities: any two courses in Asian art, literature, or religion given by the Department of Asian Studies or listed there under the areas of China, Japan, Korea, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any two courses in the same area or by taking ASIAN $208,211,212,215$, or 218 , either using two of these courses as a sequence or following one with a course in the humanities in that area.
Social Sciences: any two courses in Asian anthropology, economics, government, linguistics, or sociology given by the Department of Asian Studies or listed there under the areas of China, Japan, Korea, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any
two courses in the same area or by taking AS $208,211,212,215$, or 218 , followed by a social science course in that area.

History: any two courses in Asian history given by the Department of History and listed under the Department of Asian Studies under the areas of China, Japan, Korea, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any two courses in the same area or by taking AS 208, $211,212,215$, or 218 , followed by a history course in that area.
Honors. To be eligible for honors in Asian studies, a student must have a cumulative grade average of A- in all Asian Studies area courses, exclusive of language study only, and must successfully complete an honors essay during the senior year. Students who wish to be considered for honors should apply to the director of undergraduate studies during the second term of their junior year. The application must include an outline of the proposed project and the endorsement of a faculty adviser. During the first term of the senior year the student does research for the essay in conjunction with an appropriate Asian studies course or Asian Studies 401 Students of China and Japan must also complete Asian Studies 611 or 612 , respectively. By the end of the first term the student must present a detailed outline of the honors essay and have it approved by the faculty sponsor and the director of undergraduate studies. The student is then eligible for Asian Studies 402, the honors course, which entails writing the essay. At the end of the senior year, the student has an oral examination (with at least two faculty members) covering both the honors essay and the student's area of concentration.

## Intensive Language Program (FALCOM)

For those students desiring to accelerate their acquisition of Chinese, Japanese, or Indonesian, Cornell offers a full-time intensive language program, the Full-Year Asian Language Concentration (FALCON). FALCON students spend six hours a day, five days a week, for periods of up to a full year studying only the language and thus are able to complete as many as twelve hundred hours of supervised classroom and laboratory work in one year. For further information, students should contact the FALCON Program Office, Department of Modern Languages and Linguistics, 203 Morrill Hall (telephone 607/255-6457).

## Study Abroad

Cornell is a member of the Inter-University Centers for Chinese Language Study in Taipei and for Japanese Language Study in Yokohama and a member of the Council on International Educational Exchange offering study in China at Peking University and Nanjing University. These centers offer intensive training in both spoken and written forms of the languages. The Kyoto Center for Japanese Studies (KCJS) is an undergraduate program for students who want to spend a year in Japan studying both language and culture.
Cornell is a class-A member of the American Institute of Indian Studies, which offers fellowships in India for intensive language study in Hindi, Bengali, and Tamil. The

Intercollegiate Sri Lanka Education program (ISLE) offers an undergraduate curriculum in Sinhala, Buddhist studies, and the culture and civilization of Sri Lanka, at Peradeniya University in Kandy. Cornell also offers study abroad opportunities in South Asian studies at the School of Oriental and African Studies at the University of London. For further details, contact the South Asia Program office, 170 Uris Hall (telephone: 607/255-8923).
Cornell and the central campus of the Nepalese national university-Tribhuvan-at Kirtipur, Kathmandu, cosponsor an academic semester or year in Nepal. North American students study and live with Nepalese students who come from outside the Kathmandu Valley to Tribhuvan University. Students may participate in one or two semesters. Courses are offered both at Tribhuvan University and at the Cornell-Nepal Study Program House adjacent to the university. All courses are officially taught in English. A five-week, incountry orientation program includes classes in intensive Nepali conversation, cultural orientation programs, and a ten-day field trip and trek. Semester course offerings include Nepali language (Tibetan and/or Newari Languages also possible), contemporary issues in Nepalese studies, field research design and methods in sociology/anthropology and ecology/environment, and guided field research.
Juniors and seniors in good academic standing from any major field may participate. Students must have a desire to study on the other side of the world, to participate in a multicultural program, and to undertake rigorous field research. No experience in Nepal is necessary and instruction is in English, but some prior Nepali language study is strongly recommended. Students interested in the study abroad in Nepal program should consult with the Cornell Abroad office (474 Uris Hall) for further information.
Other opportunities include a junior year abroad at IKIP-Malang, in Indonesia, or at the School of Oriental and African Studies, University of London. Many other options for study in Asia exist, including in Indonesia, Thailand, and Vietnam through the Council for International Educational Exchange. Undergraduates should consult the Cornell Abroad Office; graduate students should inquire at the East Asia Program, the South Asia Program, or the Southeast Asia Program offices.

## General Education Courses

ASIAN 208 Introduction to Southeast Asia ©
Spring. 3 credits.
T. Chaloemtiarana and L. Stifel.

This course is for anyone curious about the part of Asia with the most diversity; it defines Southeast Asia both as the nation-states that have emerged since 1945 (Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Viet Nam) and as a larger cultural world extending from southern China to Madagascar and Polynesia. Students will find a serious, organized introduction to a variety of disciplinary and topical approaches to this region, including geography, linguistics, history, religion and ideology, anthropology, marriage and family systems, music, literacy and literature, art and architecture, agriculture, industrialization and urbanization, politics and
government, warfare and diplomacy, ecological and human degradation, business and marketing. The course aims to teach both basic information and different ways of interpreting that information.
ASIAN 211 Introduction to Japan Fall. 3 credits.
N. Sakai.

An interdisciplinary introduction to Japanese society and its history especially designed for students not majoring in Asian Studies. The first part of the course focuses on the historical changes in Japanese society from the eighth century down to the nineteenth century; the second part analyzes modern society from a variety of perspectives. It also addresses the question of how Japan is represented in the U.S. mass media. Guest lecturers from five or six different fieids offer their opinions on Japanese history, culture, and politics.

ASIAN 212 Introduction to China (e)
Spring. 3 credits ( 4 credits with a special project; consult instructor for information). E. Gunn.

An interdisciplinary introduction to Chinese culture especially designed for students not majoring in Asian studies.

ASIAN 215 Introduction to South Asian Civilization ©
Fall. 3 credits ( 4 credits with a special project; consult instructor for information).
D. Gold.

An interdisciplinary introduction to the culture and history shared by India and other states of South Asia. Designed for students not majoring in Asian Studies. Guest lecturers will provide the perspective of their disciplines to the general themes of the course: cultural diversity and the role of tradition in contemporary life

## [ASIAN 218 Introduction to Korea ©

 Spring. 3 credits. Not offered 1994-95. D. McCann.]
## Asia-Literature and Religion Courses

The following courses are taught entirely in English and are open to any Comell student.

## ASIAN 250 Introduction to Asian Religions (also Religious Studies 250) ©

Spring. 3 credits
J. McRae.

A survey of the major religious traditions of India, China, and Japan, focusing on Vedic ritual and Brahmanical Hinduism; Indian, Chinese, and Japanese Buddhism; the native Chinese traditions of Confucianism and Taoism; and Shinto, Confucianism, and the new religions in Japan. Emphasis will be on the great traditions of these cultures, with frequent reference to the differing realms of popular religions.

## ASIAN 251 Women's Experience in Asian

 Religions (also Religious Studies 251) 웅Fall. 3 credits
J. M. Law.

This course is a survey of a number of themes and issues relating to the experience of and discourse about women in Asian religions. We will look at cases from India, China Japan, and Korea and will focus on the following topics: 1) constructions of women's identities (and ideas of the feminine) in religious discourse; 2) practice and doctrine
relating to inscribing, controlling, processing, and representing women's bodies; 3) traditional and innovative pathways for the expression of spirituality by women; 4) the role of women (or ideas about who women are) in the production of power and authority; and 5) women's roles in contemporary religious movements. In each of these cases, we will explore how constructed ideas of "woman" interact with other aspects of the specific cultural context.

## [ASIAN 270 Midden Songs in Greece and

 Asia (also Comp. Lit. 224 and Classics 224) @\#Spring. 3 credits. Not offered 1994-95. D. McCann, G. Holst-Warhaft.]

## ASIAN 291 Classical Indian Narrative

 (also Classics 291) ©\#Spring. 3 credits. C. Minkowski

Reading in translation from the principal story collection of ancient India. Sources will include the Vedas, the Sanskrit epics, the Buddhist Jatakas, the Kathasaritsagara, the Pancatantra, and related collections. Attention will be given to comparisons with Greek narrative, and to the diffusion of Indian narratives into the world's literature.
[ASIAN 310 Pre-Modern Korean Culture and Literature ©\#
Fall. 4 credits. Offered alternate years. Not offered 1994-95.
D. McCann.]

ASIAN 311 Modern Korean Culture and Literature @
Spring. 4 credits. Offered alternate years. D. McCann.

Modern Korean literature as expression or mediation of change in twentieth-century Korean society and culture. Topics include the intellectual pioneers and the novel; literature and culture from the Japanese colonial period; the Korean War and literature; economic development and political oppression in post-Korean War literature; and contemporary writers.
ASIAN 313 Japanese and Asian Film (also Theatre Arts 313 and Comparative Literature 313) © Spring. 4 credits B. de Bary.

The course will explore the relationship between thematic and formal concerns of Japanese film and narratives of modern Japanese history dealing with such issues as the nature of the Meiji Restoration, the rise of Taisho commodity culture, the Pacific War, postwar reconstruction, postmodernity and "new nationalism." Weekly analyses of specific films will be accompanied by readings that provide historical context and pose relevant interpretive and theoretical questions, particularly those of gender and cultural difference. Study of works by Ozu,
Mizoguchi, Kurosawa, and Naruse will constitute the introductory portions of the course, followed each year by a series featuring recent works of contemporary directors.

## [ASIAN 338 Democracy and War

Spring. 4 credits. Not offered 1994-95; next offered 1995-96.
D. McCann and B. Strauss.]
[ASIAN 348 Folklore of India (also Anthropology 348) (a
Fall. 4 credits. Not offered 1994-95. An examination of styles, performative contexts, and cultural meanings of India's rich and diverse oral traditions.]

ASIAN 351 The Religious Traditions of India (also Religious Studies 351) @\#

Spring. 4 credits
D. Gold.

A study of the relationships between the main currents of Indian religion. The course will first focus on the Hindu tradition and its holistic worldview within the context of the caste system. It will then describe the rise of Jainism and Theravada and Mahayana Buddhism, as well as Hindu and Buddhist Tantrism, as religious phenomena reflecting the emergence of individualism.
[ASIAN 354 Indian Buddhism (also Religious Studies 354) ©\#
Spring. 4 credits. Not offered 1994-95 C. Minkowski.]
[ASIAN 355 Japanese Religions (also Religious Studies 355) ©
Spring. 4 credits. Not offered 1994-95 J. M. Law.]
[ASIAN 357 Chinese Religions (also Religious Studies 357) ©\#
Fall. 4 credits. Not offered 1994-95. J. McRae.]

ASIAN 358 Chinese Buddhism (also Religious Studies 356) ©
Fall. 4 credits
J. McRae

Buddhism was a mature tradition when it came to China, a society of great sophistication and antiquity, and in their remarkable religious and cultural encounter both Buddhism and China were transformed. We will consider Buddhism's introduction and acceptance, the social impact of its monastic system and moral ideals, the literary and artistic contributions of its scriptures and sculpture, the efflorescence of its doctrine and various schools, and its role in Chinese history.

## ASIAN 359 Japanese Buddhism (also

 Religious Studies 359) ©Spring. 4 credits. J. M. Law.

This course explores a number of major dynamics in Japanese Buddhism within the context of the larger Japanese religious ethos. We will focus on the following: 1) strategies used in the introduction and spread of Buddhism in Japan, and systems of accommodation, with special attention to the Lotus Sutra; 2) the formulations of Buddhist doctrine and practice of four major figures in Japanese Buddhism: Saicho, Kukai, Nichiren, and Dogen; and 3) understandings of Buddhist practice expressed in the "new" religions, with Reiyukai as our case. Readings are in English, with optional readings in Japanese for graduate students.

## [ASIAN 371 Chinese Philosophical

 Literature ©Spring. 4 credits. Not offered $1994-95$; next offered 1995-96.
T. L. Mei.]

ASIAN 373 Twentieth-Century Chinese Literature ©
Fall. 4 credits.
E. Gunn.

A survey of the principal works in English translation, the course introduces fiction, drama, essays, and poetry of China beginning with the Republican era and continuing up to the present in the People's Republic and Taiwan, with attention to social and political issues and literary theory.

## ASIAN 374 Chinese Narrative <br> Literature *

Spring. 4 credits
E. Gunn.

Selected works in classical Chinese fiction are read in translation. Major novels, such as The Dream of the Red Chamber and W'ater Margin, are emphasized.

## ASIAN 375 Japanese Poetry and Poetic Prose ©

Spring. 4 credits. Alternates with Asian Studies 377.

> K. Brazell.

An introduction (in English translation) to the great poets of premodern Japan. This course will cover court poetry, linked verse, haiku, poetic memoirs, travel diaries, and poem tales written between the eighth and eighteenth centuries.

## ASIAN 376 Modern Japanese Literature: From Meiji through the Pacific War (also Comparative Literature 369) 숭

## Fall. 4 credits.

> B. de Bary.

We will read Japanese works of fiction, poetry, and critical theory written from the Meiji Restoration into the Showa Period. The course will take up such issues as modernization and the narrative of discovery, imperialism and the non-Western novel, the politics of visibility, gender and representation, and Japanese colonialism. We will consider how writings of critics like Karatani, Fujii, and Layoun have complicated modernizationist schemas of literary development. We will also attempt to explore what Nagahara Yutaka has called the "phenomenology of discrimination" in relation to Japanese literary texts, pursuing contradictions between egalitarianism and discrimination in the legacy of Meiji Enlightenment thought. Reading of non-Japanese (other Asian, as well as African, American, and European) texts raising pertinent theoretical perspectives will be integrated into the coursework.

## [ASIAN 377 Japanese Narrative Literature @ \#

Spring. 4 credits. Alternates with AS 375. Not offered 1994-95.
N. Sakai.!
[ASIAN 378 The Postwar and the Postmodern in Japanese Literature 웅
Fall. 4 credits. Alternates with Asian Studies 375. Not offered 1994-95.
N. Sakai.]

## ASIAN 380 Vietnamese Literature in Translation * *

Spring. 4 credits.
K. Taylor.

A study of Vietnamese poetry, short stories, and novels available in English translation.
The course will focus primarily upon texts from the last three centuries, with particular attention to contemporary literature.

## ASIAN 385 Cultural History of Vietnam (2)

## Fall. 4 credits.

K. Taylor.

Cultural survey of Vietnamese historical experience from ancient to contemporary times. Major themes are relations with China; internal, political, social, and intellectual development; Buddhism, Confucianism, and Marxist-Leninism as ruling-class ideologies; southward expansion; military tradition; discontinuities introduced by French colonialism; modern nationalism and the making of a revolution; wars of decolonization; and the efforts of Vietnamese to establish a place for their nation in the modern world. This course will fulfill a humanities distribution requirement.

## ASIAN 393 Images of Humanity in Medieval China (also History 393) $\#$

Fall. 4 credits. Prerequisite: any course in premodern China or Chinese religions, or permission.
J. McRae, C. Peterson.

The middle period in China's history, essentially the Tang and Sung dynasties, feature some of the highest achievements of Chinese civilization. These centuries (the seventh through the thirteenth) are distinguished by the exceptionally high levels of literature, art, religious and secular thought, and proto-scientific development, as well as by fundamental changes in state, society, and the economy. This seminar will explore the China of this age by examining the lives of several representative figures-a politician, a poet, a Buddhist monk, a Taoist priest, an emperor, an empress, a "detective," and others. The aim will be to reconstruct the inner and outer worlds of men and women perhaps not so far removed from ourselves in their basic motivations and daily concerns.

## ASIAN 395 Classical Indian

Philosophical Systems (also Classics 395 and Religious Studies 395) (e) Fall. 4 credits. Prerequisite: some background in philosophy or in classical culture. C. Minkowski.

A survey of the traditions of philosophical inquiry in ancient India, especially Nyaya, Sankhya, Mimamsa, and Vedanta. Topics will include; the origins in and relationship to the Vedas, the formation of distinct positions on such subjects as perception, language, identity, karma, and liberation; the dialogue with Buddhist, Jains, skeptics, materialist, cynics; new theistic models, particularly among the Saiva philosophers in Kashmir.
[ASIAN 410 Chinese Performing Arts ©
Spring. 4 credits. Not offered 1994-95. E. Gunn.]
[ASIAN 414 Literature and Society
Spring. 4 credits. Not offered 1994-95. Staff.]
[ASIAN 417 Legacy of the Cultural Revolution
Fall. 4 credits. Not offered 1994-95. Staff.]
[ASIAN 421 Religious Reflections on the Human Body (also Religious Studies 421)

Fall. 4 credits. Not offered 1994-95. J. M. Law.|
[ASIAN 440 Meditation Schools of East Asian Buddhism \{also Religious Studies 440) *
Spring. 4 credits. Prerequisite: ASIAN 250 or equivalent. Not offered 1994-95.

Time to be arranged. J. McRae.]
[ASIAN 441 Mahayana Buddhism (a) \# Fall. 4 credits. Not offered 1994-95. J. McRae.]

ASIAN 449 History and Methods of the Academic Study of Religion (also Religious Studies 449) *
Fall. 4 credits. Prerequisite: one course
satisfying the Religious Studies major.
J. M. Law.

The first segment of this course explores the rise of the discipline of Religionsurissenschaft in Europe in the mid-nineteenth century as a self-consciously non-sectarian and academic approach to the study of religious texts and phenomena. We explore the ways this discipline interacted with existing disciplines in the academy, giving special attention to the growing fields of sociology and anthropology. We then look at a number of assumptions inherent in this intellectual movement and focus on a) the conception of the sacred; b) the idea of rationality, and c) the "discovery" and construction of non-Westem religious tradition. The second segment surveys major approaches to the academic study of religion currently used today: anthropology, hermeneutics, history, history of religions, literary studies, phenomenology, sociology, and theology. For each of these cases, we will be studying how these angles on religious data both build upon the nineteenth-century assumptions of Religionsuissenschaft, and address twentieth-century religious issues.
ASIAN 451/625 Children, Literature, and Society (also Anthropology 441/) 625) 불

Spring. 4 credits.
S. Shiraishi.

This course explores the world of children and consists of three parts: (1) Children in Anthropological Studies; (2) Representations of Childhood; and (3) School and Cultural Politics. The basic underlying question behind all three approaches is how and what we, who have all once been children, can learn from children after removing the layers of adult conceptions of childhood. If "tradition" prescribes our present life, the "future" which children symbolize has the potentiality to open up the restrictions imposed on current society. Emphasis will be placed on case studies of Indonesia, other Southeast Asian countries, and Japan, but the scope will extend to immigrants' experiences as well.
[ASIAN 460 Indian Meditation Texts (also Religious Studies 460) (3) Spring. 4 credits. Not offered 1994-95. D. Gold.]

## ASIAN 463 Readings in Hindi and Urdu

 Literature ©Fall. 4 credits.
D. Gold.

Selected topics in Hindi and Urdu literature, with readings in the original; discussions in Hindi-Urdu and English. May be repeated for additional credit with consent of instructor.
[ASIAN 470 The Japanese Noh Theater and Modern Dramatists (also Comparative Literature 470) 앙
Fall. 4 credits. Alternates with ASIAN 471
Not offered 1994-95.
K. Brazell.]

ASIAN 471 Japanese Theatre (also Theatre Arts 471) ©
Fall. 4 credits. Altemates with ASIAN 470. K. Brazell.

A study of traditional forms of Japanese theater. Topics will include ritual and theater, nob and kyogen, kabuki and the puppet theaters, and contemporary theatrical use of traditional forms. Special emphasis will be placed on dramaturgy, acting styles, performance aesthetics, and theories of performer training.
[ASIAN 475 Modernization and the Korean Family (also MSS 490 sec 30) (9)

Fall. 3 credits. Not offered 1994-95. D. McCann and J. Mueller.]
[ASIAN 481 Translation and Identities Fall. 4 credits. Not offered 1994-95. N. Sakai.]
[ASIAN 483 Internationalism, Nationalism, and Modern Japanese Discursive Space ©
Spring. 3 credits. Not offered 1994-95. N. Sakai.]
[ASIAN 496 Tokugawa Literature and Thought ©
Spring. 4 credits. Not offered 1994-95. N. Sakai.]

## Asia-Graduate Seminars

For complete descriptions of courses numbered 600 or above, consult the graduate faculty representative.
ASIAN 601 Southeast Asia Seminar: Writing the Literary History of Malay and Indonesian (also Comparative Literature 601)
Fall. 4 credits.
H. H. J. Maier.

This course is meant to explore issues and problems that come up when an effort is made to write some kind of historical survey of a discursive formation, in this case "Malay," the term that is used for a wide variety of language forms. How to gain control, how to organize, how to present the materials available in the second part of the twentieth century? How to account for influence, source, translation? How to create an order within that formation? How to discuss the tensions and interferences between "oral" and "written" texts? How to explore the sudden rise of concepts like "literature" as a distinct genre in Malay discourse? How to make a plausible narrative?
ASIAN 602 Southeast Asia Seminar: Essences and Alternatives
Spring. 4 credits.
K. Taylor.

Reading and discussions about ways of finding and creating language, culture, tradition, and politics in Southeast Asia, with particular reference to Vietnam.
[ASIAN 604 Southeast Asia Seminar Not offered 1994-95.]

ASIAN 605-606 Master of Arts Seminar in East Asian Studies
605 , fall; 606 , spring. $2-4$ credits.
Hours to be arranged. Staff.

## ASIAN 607-608 The Plural Society

 Revisited (also Government 653)Spring. 4 credits. 607 may be taken independently for credit; 607 is a prerequisite for 608.
B. R. Anderson.

## ASIAN 609 Modern Japanese Studies: The Formation of the Field (also History 609)

Fall. 4 credits.
B. deBary and V. Koschmann. The course will provide both a historical introduction to and critical analysis of the constitution of Japanese Studies as a "field" of postwar academic inquiry. While reading texts particularly influential in the early and contemporary formation of the field, we will consider such questions as the domestic and international contexts in which Japanese Studies has been institutionalized and maintained, and the relationship between "Japan" as an object of area studies discourse and "Japan" as represented in American journalism, popular culture, and politics Interdisciplinary and team-taught, the course will aim to introduce students to a range of methodologies and approaches developed in American Japan Studies, problematizing assumptions in each case. Possibilities for cross-disciplinary research (along lines recently undertaken in areas such as feminist criticism and cultural studies, for example), will also be explored.

## ASIAN 611 Chinese Bibliography and Methodology

Spring. 1 credit. Prerequisite: permission of instructor. Required of honors students and M.A. candidates.
C. D'Orban.

ASIAN 612 Japanese Bibliography and Methodology
Fall. 1 credit. Prerequisite: permission of instructor. Required of honors students and M.A. candidates.
S. Akiba.

ASIAN 621-622 South Asia Seminar: Topic to be announced
621, Fall; 622, Spring. 4 credits.

## ASIAN 650 Graduate Seminar in Asian

 ReligionsSpring. 2-4 credits. Prerequisite: permission of instructor.
J. McRae.

ASIAN 676 Southeast Asia Research Training Seminar
Staff.
ASIAN 701-702 Seminar in East Asian Literature
701, fall; 702, spring. 1-4 credits.
Hours to be arranged. Staff.

## ASIAN 703-704 Directed Research

703, fall or spring; 704, fall or spring. Credit to be arranged.

Hours to be arranged. Staff.
For additional courses on Asian religion, see "Related Courses" in the China and Japan area courses listing.

## Asia-General Courses

ASIAN 401 Asian Studies Honors Course
Fall. 4 credits. Intended for seniors who have been admitted to the honors program.

Hours to be arranged. Staff.
Supervised reading and research on the problem selected for honors work.

## ASIAN 402 Asian Studies Honors: Senior

 EssayFall or spring. 4 credits. Prerequisite: admission to the honors program.

Hours to be arranged. Staff.
The student, under faculty direction, prepares an honors essay.

## ASIAN 403-404 Asian Studies

 Supervised ReadingFall, spring, or both. Credit to be arranged. Prerequisite: permission of instuctor. Open to majors and other qualified students. Intensive reading under the direction of a member of the staff.

Hours to be arranged. Staff.

## Literature in Chinese

CHLIT 213-214 Introduction to Classical

## Chinese © 융

213, fall; 214, spring. 3 credits each term. Prerequisite: qualification in Chinese or permission of instructor. May be taken concurrently with Chinese 101-102, 201-202, 301-302.
T. L. Mei.
[CHLIT 314 Classical Narrative Texts en
Spring. 4 credits. Permission of instructor.
Not offered 1994-95.
T. L. Mei.]

## CHLIT 420 T'ang and Sung Poetry ©

Spring. 4 credits. Prerequisite: permission of instructor.

## T. L. Mei.

## CHLIT 421-422 Directed Study

Fall or spring. 2-4 credits each term.
Prerequisite: permission of instructor. Staff.

## [CHLIT 424 Readings in Literary

 CriticismFall or spring. 4 credits. Prerequisite: permission of instructor. Not offered 1994 95.)
[CHLIT 435 Chinese Buddhist Texts e\%
Spring. 4 credits. Not offered 1994-95. J. McRae.]

CHLIT 603 Seminar in Chinese Fiction and Drama
Fall. 4 credits. Prerequisite: permission of instructor.

## E. Gunn.

## [CHLIT 605 Seminar in Chinese Fiction

 and DramaFall. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.

Hours to be arranged. E. Gunn.]

## [CHLIT 610 Chinese Cultural Criticism

Fall. 4 credits. Not offered 1994-95.
E. Gunn.]

## CHLIT 621-622 Advanced Directed

Reading: Chinese Mistorical Syntax
Spring. 2-4 credits. Prerequisite: permission of instructor.

Hours to be arranged. Staff.

## Literature in Japanese

JPLIT 406 Introduction to Classical Japanese © ©
Fall. 4 credits. Prerequisite: permission of instructor.

Hours to be arranged. K. Brazell.

## [JPLIT 407 Advanced Classical

 JapaneseSpring. 4 credits. Prerequisite: JPLIT 406 or permission of instructor. Not offered 1994-95 K. Brazell.]

## JPLIT 421-422 Directed Readings

421, fall; 422, spring; credits to be arranged. Prerequisite: for Japanese 421, Japanese 402 or equivalent; for Japanese 422, Japanese 421 or equivalent.

Hours to be arranged. Staff.
Note: For complete descriptions of courses numbered 600 or above, consult the appropriate instructor

## [JPLIT 611 Seminar in Classical

 Japanese LiteratureSpring. 2-4 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1994-95.
B. de Bary and K. Brazell.]
[JPLIT 612 Seminar in Medieval Japanese Literature
Spring. 2-4 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1994-95.
K. Brazell.\}
[JPLIT 613 Seminar in Tokugawa Culture and Thought: Otherness, Text, and Body
Spring. 2-4 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1994-95
N. Sakai.]
[JPLIT 614 Seminar in Modern Japanese Literature
Fall or spring. 2-4 credits. Prerequisite permission of instructor. Offered alternate years. Not offered 1994-95.
N. Sakai.]
[JPLIT 621 Advanced Readings in PreModern Japanese Narrative Literature
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95. Staff.]

## Graduate-Level Reading Courses

JPLIT 622 Advanced Readings in PreModern Japanese Poetry
Spring. Credit to be arranged. Prerequisite: permission of instructor K. Brazell
[JPLIT 623 Advanced Readings in PreModern Drama
Fall or spring. Credit to be arranged.
Prerequisite: permission of instructor. Not offered 1994-95.

Staff.]
JPLIT 624 Advanced Readings in Modern Japanese Literature
Spring. 4 credits. Prerequisite: permission of instructor. Offered alternate years

Hours to be arranged. B. deBary.
Note: See courses listed under Asia-
Literature and Religion Courses for Japanese literature courses in translation.

## Japanese Language

See Modern Languages and Linguistics.

## FALCON Program

255-6457; R. Sukle, 412 Morrill Hall, 255-0734;
J. Whitman, 320 Morrill Hall, 255-0737;
J. Wheatley, 416 Morrill Hall, 255-9301.

## Literature in Korean

[KORLIT 403 Readings in Korean Literature
Fall. 4 credits. Not offered 1994-95. D. McCann.]

## Literature in Sanskrit

Sanskrit 251, see DMLL.
[SNLIT 467-468 Reading in Sanskrit Literature: The Vedas ©\#
Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95.
C. Minkowski.]

## Literature in Vietnamese

VTLIT 470 Vietnamese Literature: Cultural and Intellectual History
Fall. 4 credits.
K. Taylor.

A study of two early Vietnamese texts written in Chinese: Viet dien u linh (14th-century collection of tales) and Lenb Nam chich quai (15th-century collection of folklore). Will address methodologies for textual study; SinoVietnamese cultural, literary, and intellectual issues; and theoretical problems of translation, narrative, the organization of knowledge, and the interaction of literary form and expression. Reading knowledge of Chinese or Vietnamese required.

Related Courses in Other Departments
ANTHR 313 Anthropology of the City @
ANTHR 474 Laboratory and Field Methods in Human Biology (also Bio S 474)

ANTHR 619 Anthropological Approaches to the Study of Buddhism in Asia

ANTHR 673 Human Evolution: History, Concepts and Theory (also Bio S 673)
[GOVT 348 Politics of Industrial Societies Not offered 1994-95.]

GOVT 349 Political Role of the Military
[GOVT 647 Political Anthropology
Not offered 1994-95.]
[GOVT 648 Graduate Seminar in Political Economy of Change: Rural Development in the World
Not offered 1994-95.]
HIST 190 Introduction to Asian Civilizations ©
[HIST 191 Introduction to Asian Civilizations in the Modern Period
Not offered 1994-95.
ART H 280 Introduction to Art History: Asian Traditions ©\#
ART H 396 The Arts of Southeast Asia © \#
ART H 482 Ceramic Art of China and Southeast Asia ©\#
[ART H 580 Problems in Asian Ant
Not offered 1994-95.]
RELST 101 Understanding the Religions of the World

## SOC 497 Social Relations Semina

## Related Courses in Other Colleges

The courses listed below will count as College of Arts and Sciences credit only for Asian studies majors.

AG EC 100 Introduction to Global Economic Issues

AG EC 464 Economics of Agricultural Development

AG EC 660 The World's Food
AG EC 665 Food and Nutrition Policy (ALSO Nutritional Science 685)

AG EC 763 Macro Policy in Developing Countries
ARCH 342 Architecture as a Cultural System
ARCH 445 Architecture and the Mythic Imagination

ARCH 448 The Indian Example and the Visual Tradition in Culture
[ARCH 667-668 Architecture in Its Cultural Context
Not offered 1994-95.]
COMM 624 Communication in the Developing Nations

COMM 685 Training and Development: Theory and Practice

ECON 473 Economics of Export-Led Development
[GOVT 482 International Relations of East Asia Not offered 1994-95.]

GOVT 692 Administraton of Agricultural and Rural Development
[ILR 637 Labor Relations in Asia and the Pacific Rim
Not offered 1994-95.]
[R SOC 751 Applications of Sociology to Development Programs
Not offered 1994-95.]
SOC 110 introduction to Economy and Society

## China-Area Courses

[ANTHR 326 Economic Anthropology ©
Not offered 1994-95.]
[ANTHR 343 Religion, Family, and Community in China 융
Not offered 1994-95.]
[ANTHR 443 Religion and Ritual in Chinese Society
Not offered 1994-95.]
ECON 369 Economy of China
[GOVT 347 Chinese Government and Politics 사 Not offered 1994-95.
[GOVT 391 Chinese Foreign Policy
Not offered 1994-95.]
[GOVT 443/643 Socialism and the Market in China (응
Not offered 1994-95.]
[GOVT 645 Politics of China
Not offered 1994-95.]
[HIST 243 China and the West before Imperialism (3) \#
Not offered 1994-95.]
[HIST 293 History of China up to Modern Times ©\#
Not offered 1994-95.]
[HIST 294 History of China in Modern Times © Not offered 1994-95.]
[HIST 360 Early Warfare, East and West \# Not offered 1994-95.]

HIST 492 Undergraduate Seminar in Medieval Chinese History © \#
[HIST 493 Self and Society in Late Imperial and Twentieth-Century China ©
Not offered 1994-95.]
[HIST 494 The Japanese in Asia
Not offered 1994-95.]
[HIST 499 Problems in Modern Chinese History Not offered 1994-95.]
[HIST 691 Chinese Historiography and Source Materials
Not offered 1994-95.]
[HIST 693-694 Problems in Modern Chinese History
Not offered 1994-95.]
[HIST 791-792 Seminar in Medieval Chinese History
Not offered 1994-95.]
[HIST 793-794 Seminar in Modern Chinese History
Not offered 1994-95.]
ART H 396 The Arts of Southeast Asia @\#
[ART H 481 The Arts in Modern China © Not offered 1994-95.]

ART H 482 Ceramic Art of China and Southeast Asia @\#
[SOC 545 Peasants, Market, and the State Not offered 1994-95.]

Other courses dealing extensively with China are Architecture 667-668; History 190, 191 and 494;History of Art 280, 381, 482, 580, and 596.

## China-Language Courses

CHIN 101-102 Elementary Mandarin
CHIN 109-110 Elementary Reading
CHIN 111-112 Cantonese Elementary Speaking
CHIN 113-114 Cantonese Elementary Reading
CHIN 161-162 FALCON (1)
CHIN 201-202 Intermediate Mandarin (1)
CHIN 211-212 Intermediate Cantonese (0)
CHIN 301-302 Advanced Mandarin I ©
CHIN 303-304 Advanced Mandarin Conversation (6)
CHIN 311-312 Advanced Cantonese ©
[CHIN 401 History of the Chinese Language Not offered 1994-95.]
[CHIN 403 Linguistic Structure of Chinese I Not offered 1994-95.]
[CHIN 404 Linguistic Structure of Chinese II
Not offered 1994-95.]
[CHIN 405 Chinese Dialects
Not offered 1994-95.]
CHIN 411-412 Advanced Mandarin II
CHIN 413-414 Current Events

CHIN 415-416 Correspondence and Composition
[CHIN 607 Chinese Dialect Seminar
Not offered 1994-95.]

## Japan-Area Courses

ANTHR 345 Japanese Society (a)
ANTHR 645 Japanese Ethnology
[GOVT 334 Business and Labor in Politics Not offered 1994-95.]
[GOVT 346 Politics in Contemporary Japan © Not offered 1994-95.]

GOVT 605 Comparative Politics Field Seminar
[HIST 191 Introduction to Asian Civilization in the Modern Period
Not offered 1994-95.]
HIST 192 Japan and the West
Not offered 1994-95.]
HIST 297 State, Society, and Culture in Japan to 1750 © $\#$

HIST 298 State, Society, and Culture in Modern Japan ©

HIST 352 The Past as Prelude? Japan in Asia, German in Europe

HIST 420 Tale of Genji in Historical Perspective
[HIST 489 The Ideology of the Meiji Restoration Not offered 1994-95.]
[HIST 494 The Japanese in Asia ©
Not offered 1994-95.]
HIST 497 Premodern Japan-Historical Perspectives

HIST [797]-798 Seminar in Japanese Thought
ILR 341 Postwar Japanese Economy
ILR 645 Japanese and Korean Labor Markets
ART H 384 The Arts of Japan @\#
NBA 580 Industrial Policy: Lessons for the United States from Japan and Europe
[R SOC 492 Development in the Pacific Rim Not offered 1994-95.]
Other courses dealing extensively with Japan are Anthropology 313; Architecture 667-668; Education 678; History 190 and 191; History of Art 280, 491, 580, and 596.

## Japan-Language Courses

JAPAN 101-102 Elementary Japanese
JAPAN 123 Accelerated Introductory Japanese
JAPAN 161-162 FALCON ©
JAPAN 201-202 Intermediate Japanese Reading I ©

JAPAN 203-204 Intermediate Japanese Conversation (9)

JAPAN 301-302 Intermediate Japanese Reading II ©

JAPAN 303-304 Communicative Competence ©
JAPAN 341-342 Advanced Japanese for Business Purposes 상

JAPAN 401-402 Advanced Japanese Reading (1)
[JAPAN 404 Linguistic Structure of Japanese Not offered 1994-95.]

JAPAN 407-408 Oral Narration and Public Speaking
[JAPAN 410 History of Japanese Language @\# Not offered 1994-95.]

JAPAN 421-422 Directed Readings
JAPAN 543-544 Intermediate Japanese for Business Purposes

JAPAN 545-546 Advanced Japanese for Business Purposes

## South Asia-Area Courses

ABEN 754 Sociotechnical Aspects of Irrigation
AG EC 660 The World's Food
AG EC 754 Sociotechnical Aspects of Irrigation
[ANTHR 275 Human Biology and Evolution
Not offered 1994-95.]
ANTHR 339 Peoples and Cultures of the Himalayas ©
[ANTHR 347 Culture and Environment in India Not offered 1994-95.]
[ANTHR 348 Folkiore of India (also ASIAN 348) ©

Not offered 1994-95.]
[ANTHR 371 Human Paleontology
Not offered 1994-95.]
[ANTHR 448 Contemporary Approaches to South Asian Anthropology (a)
Not offered 1994-95.]
ANTHR 619 Anthropological Approaches to the Study of Buddhism in Asia

ANTHR 640-641 South Asia: Readings in Specific Problems

ARCH 342 Architecture as a Cultural System
ARCH 441-442 Special Topics in Architectural Culture and Society

ARCH 445 Architecture and the Mythic Imagination
ARCH 446 Topics in Architecture, Culture, and Society

ARCH 447 Architectural Design and the Utopian Tradition

ARCH 448 The Indian Example and the Visual Tradition in Culture

ARCH 647-648 Architecture in its Cultural Context I \& II

ARCH 649 Graduate Investigations in Architecture, Culture, and Society
[ARCH 667-668 Architecture in Its Cultural Context
Not offered 1994-95.]
BIO S 474 Laboratory and Field Method in Human Biology
BIO S 673 Human Evolution: Concepts, History, and Theory
CRP 101 The Global City
CRP 671 Seminar in International Planning
[CRP 775 Transnational Corporations and Developing Regions
Not offered 1994-95.]
CRP 777 Theories of Development and Underdevelopment

COMM 490 Special Topics in Communication

COMM 611 Human Communication in Organizations
COMM 624 Communication in the Developing Nations

COMM 685 Training and Development
GOVT 351 India: Social and Economic Change in a Democratic Polity
[GOVT 367 Politics of Development
Not offered 1994-95.)
[GOVT 436 Environmental Politics
Not offered 1994-95.]
GOVT 640 Political Economy of India
[GOVT 648 The Political Economy of Change
Not offered 1994-95.]
[GOVT 649 Agrarian Political Economics Not offered 1994-95.]
[GOVT 651 Agrarian Change in South AsiaPolitics, Society, and Culture
Not offered 1994-95.]
GOVT 687 International Environmental Policy
GOVT 692 The Administration of Agricultural and Rural Development

HDFS 436 Language Development
HDFS 633 Seminar on Language Development
[HIST 250 Colonial S. Asia 1858-1947: Social and Political Foundations
Not offered 1994-95.]
[HIST 417 Social and Political Movements in Colonial S. Asia
Not offered 1994-95.]
[HIST 434 Islam in S. Asia
Not offered 1994-95.]
[HIST 479 South Asia since 1947
Not offered 1994-95.]
[ART H 386 Art of South Asia
Not offered 1994-95.]
ART H 489 Miniature Paintings and Drawings of India
[ILR 637 Labor Relations in Asia and the Pacific Rim
Not offered 1994-95.]
[LING 619 Rigveda
Not offered 1994-95.]
LING 635-636 Indo-European Workshop
LING 701-702 Directed Research
R SOC 205 Rural Sociology and International Development
[R SOC 425 Gender Relations and Social Change Not offered 1994-95.]
[R SOC 492 Developments in the Pacific Rim Not offered 1994-95.]
[R SOC 645 Rural Economy and Society Not offered 1994-95.]
[R SOC 725 The Sociology of "Third World" States Not offered 1994-95.]
[R SOC 751 Applications of Sociology to Development Programs
Not offered 1994-95]

Other courses dealing extensively with South Asia are Anthropology 321 and 611; Agricultural Economics 464; Communication Arts 626; History 190 and 191; History of Art 280, 482, 580 , and 596.

## South Asia-Language Courses

BENGL 121-122 Elementary Bengali
BENGL 201-202 Intermediate Bengali Reading (e)
BENGL 203-204 Intermediate Bengali Composition and Conversation (a)

BENGL 303-304 Bengali Literature I, II
HINDI 101-102 Elementary Hindi-Urdu
HINDI 109-110 Accelerated Elementary HindiUrdu
[HINDI 201-202 Intermediate Hindi Reading © Not offered 1994-95.]
HINDI 203-204 Intermediate Composition and Conversation 셩

HINDI 301-302 Advanced Readings in Hindi Literature 옹
[HINDI 303-304 Advanced Composition and Conversation ©
Not offered 1994-95.]
[HINDI 305-306 Advanced Hindi Readings © Not offered 1994-95.]
NEPAL 101-102 Elementary Nepali
NEPAL 106 Intensive Nepali
NEPAL 201-202 Intermediate Nepali Conversation ©
NEPAL 203-204 Intermediate Nepali Composition (a)
[PALI 131-132 Elementary Pali
Not offered 1994-95.]
SINHA 101-102 Elementary Sinhala
SINHA 160 Intensive Sinhala
SINHA 201-202 Intermediate Sinhala Reading 웅
SINHA 203-204 Intermediate Composition and Conversation (1)
TAMIL 101-102 Elementary Tamil
[SANSK 131/132 Elementary Sanskrit (also Classics 131/132)
Not offered 1994-95.]
SANSK 251/252 Intermediate Sanskrit (also Classics 251/252) ©
CLASS 403-404 Independent Study in Sanskrit Undergraduate
CLASS 703-704 Independent Study in Sanskrit Graduate

## Southeast Asia-Area Courses

ABEN 754 Sociotechnical Aspects of Irrigation
AG EC 464 Economics of Agricultural Development
AG EC 754 Sociotechnical Aspects of Irrigation (also Agricultural and Biological Engineering 754 and Government 644)
[ANTHR 306 Ethnographic Description
Not offered 1994-95.]
ANTHR 322 Magic, Myth, Science, and Religion ©
[ANTHR 334 Ethnology of Island Southeast Asia Not offered 1994-95.]
[ANTHR 335 Peoples and Cultures of Mainland Southeast Asia @
Not offered 1994-95.]
ANTHR 424 Anthropology amongst Disciplines
ANTHR 441/625 Children, Literature, and Society
[ANTHR 610 Myth and Mythology
Not offered 1994-95]
ANTHR 619 Anthropological Approaches to the Study of Buddhism in Asia
[ANTHR 628 Political Anthropology: Indonesia Not offered 1994-95.1

ANTHR 634-635 Southeast Asia: Readings in Special Problems
GOVT 344 Government and Politics of Southeast Asia (1)
[GOVT 652 Political Problems of Southeast Asia Not offered 1994-95.]

## GOVT 653 Plural Societies Revisited

HIST 190 Introduction to Asian Civilizations
[HIST 191 introduction to Asian Civilization: Modern Period ©
Not offered 1994-95.]
HIST 395 Southeast Asia to the Eighteenth Century ©
HIST 396 Southeast Asian History from the Eighteenth Century (3)
HIST 695 Early Southeast Asia: Graduate Proseminar

HIST 696 Modern Southeast Asia: Graduate Proseminar
[HIST 697 Seminar in Southeast Asian Palaeology Not offered 1994-95.]
HIST 795-796 Seminar in Southeast Asian History
ART H 280 Introduction to Art History: Asian Traditions © \#
ART H 396 The Arts of Southeast Asia \# \#
ART H 482 Ceramic Art of China and Southeast Asia ©
[ART H 580 Problems in Asian Art
Not offered 1994-95.]
[ART H 595 Methodology Seminar
Not offered 1994-95.]
LING 203 Introduction to Southeast Asian Languages and Linguistics
LING 405-406 Sociolinguistics
LING 600 Field Methods
ILING 653-654 Seminar in Southeast Asian Linguistics
Not offered 1994-95.]
[LING 655-656 Austronesian Linguistics
Not offered 1994-95.]
[LING 657-658 Seminar in Austro-Asiatic Linguistics
Not offered 1994-95.]
LING 701-702 Directed Research
[MUSIC 103 Introduction to Musics of the World (1)
Not offered 1994-95.]

MUSIC 245 Gamelan in Indonesian History and Cultures

MUSIC 345-346 Introduction to the Gamelan
MUSIC 445-446 Cornell Gamelan Ensemble
MUSIC 604 Enthnomusicology: Areas of Study and Methods of Analysis

NBA 529 Business Environment in Southeast Asia
R SOC 205 Rural Sociology and International Development
Other courses dealing with Southeast Asia are Agricultural and Biological Engineering 771;
Anthropology 102 and 420; Architecture 667-668; Asian Studies 250, 351, and 650; Education 685; Government 692; History 190; International Agriculture 603 and 703; Nutritional Sciences 680.

## Southeast Asia-Language Courses

BURM 103-104 Burmese Conversation Practice
BURM 121-122 Elementary Burmese
BURM 123 Continuing Burmese
BURM 201-202 Intermediate Burmese Reading
BURM 301-302 Advanced Burmese Reading
BURM 401-402 Burmese Directed Individual Study
[CEBU 101-102 Elementary Cebuano
Not offered 1994-95.]
INDO 161-162 FALCON ©
INDO 121-122 Elementary Indonesian
INDO 123 Continuing Indonesian
INDO 205-206 Intermediate Indonesian (a)
[INDO 300 Linguistic Structure of Indonesian Not offered 1994-95.]
[INDO 301-302 Advanced Readings in Indonesian and Malay
Not offered 1994-95.]
[INDO 303-304 Advanced Indonesian Conversation and Composition
Not offered 1994-95.]
[INDO 305-306 Directed Individual Study Not offered 1994-95.]
[INDO 401-402 Advanced Readings in Indonesian and Malay Literature
Not offered 1994-95.]
JAVA 131-132 Elementary Javanese
JAVA 133-134 Continuing Javanese
JAVA 203-204 Directed Individual Study
KHMER 101-102 Elementary Khmer
KHMER 201-202 Intermediate Khmer Reading ©
KHMER 203-204 Intermediate Composition and Conversation (a)

KHMER 301-302 Advanced Khmer ©
KHMER 401-402 Directed Individual Study
[KHMER 403-404 Structure of Khmer
Not offered 1994-95.]
TAG 121-122 Elementary Tagalog
TAG 123 Continuing Tagalog
TAG 205-206 Intermediate Tagalog ©
[TAG 300 Linguistic Structure of Tagalog Not offered 1994-95.]

THAI 101-102 Elementary Thai
THAI 201-202 Intermediate Thai Reading
THAI 203-204 Intermediate Composition and Conversation 망

THAI 301-302 Advanced Thai (3)
THAI 303-304 Thai Literature
THAI 401-402 Directed Individual Study
VIET 103-104 Vietnamese Conversation Practice
VIET 121-122 Elementary Vietnamese
VIET 201-202 Intermediate Vietnamese Reading
VIET 301-302 Advanced Vietnamese
VIET 401-402 Directed Individual Study

## ASTRONOMY

Y. Terzian, chair (512 Space Sciences Building, 255-4935); M. P. Haynes, director of undergraduate studies ( 530 Space Sciences Building 255-0610); J. A. Bums, D. B. Campbell, D. F. Chemoff, J. M. Cordes, M. M. Davis, P. J. Gierasch, R. Giovanelli, P. F. Goldsmith, T. L. Herter, J. R. Houck, P. D. Nicholson, C. E. Sagan, E. E. Salpeter, S. L. Shapiro, S. W. Squyres, G. J. Stacey, S. A. Teukolsky, J. F. Veverka, I. M. Wasserman. Emeritus: T. Gold, T. Hagfors, M. O. Harwit

Cornell's astronomy faculty, research staff, and graduate students are active in diverse areas of modern astronomy ranging from theoretical astrophysics and general relativity to radio and radar astronomy, infrared and optical astronomy, and the exploration of the solar system. Cornell operates two local optical observatories, the world's largest radio telescope at Arecibo, Puerto Rico, and with two other institutions, the 200 -inch optical telescope at Mt. Palomar in California.
The department offers a number of courses to satisfy a general interest in astronomy. These courses have few or no prerequisites and are not intended for the training of professional astronomers. The 100 -level courses and Astronomy 201-202 are designed primarily for nonscience majors. The alternative introductory sequence Astronomy 211-212 is geared toward sophomore physical science and engineering majors and requires coregistration in beginning calculus. Astronomy 332 is designed for nonmajors as an introduction to astrophysics and requires at least one year of calculus and college physics as prerequisites. The other courses numbered below 400 have no college prerequisites at all.
Courses numbered above 400 are intended for students who have had two to three years of college physics and at least two years of college mathematics. Astronomy 440, Independent Study, permits students to engage in individual research projects under the guidance of a faculty member.
Interested students are encouraged to become members of the undergraduate Cornell Astronomy Club. The club has access to the Fuertes Observatory on campus and conducts regular observing and astrophotography sessions. All students are invited to visit the Space Sciences Building, see the exhibits on
display there, and consult a faculty member about career plans or choice of courses.

## The Major

The purpose of the major in astronomy is to provide in-depth knowledge and education about the nature of the universe. Astronomy relies heavily on preparation in physics and mathematics. Consequently, many courses in these fields are included as prerequisites. In preparation for the major, a student would normally elect the introductory physics sequence Physics 112-213-214 or 116-217218 plus Physics 316 and 318 and the complementary pathway in mathematics, Mathematics 111-122-221-222 or 191-192-293-294 (or equivalent). The sophomore seminar Astronomy 233 "Topics in Astronomy and Astrophysics" will provide an introduction to current research in astronomy and astrophysics for prospective majors, but is not required of students who elect to major in astronomy after the sophomore year. Students are also urged to acquire computer literacy. Acceptance to the major will first be considered after completion of three semesters of introductory physics and mathematics and in general will require a GPA of 3.20 in physics and mathematics courses.
The major requirements stress the importance of building a strong preparation in physical science. The following upper level courses are normally required:
Physics 317, 327, 341, and 443
Mathematics 421 and 422 (or equivalent, eg. A\&EP 321-2)
Astronomy 410, 431, and 432.
Students are encouraged to supplement the above courses with any astronomy, physics, or other appropriate courses at or above the 400 level. Advanced seniors can enroll in astronomy graduate courses with the consent of the instructor. Students are also encouraged to work with faculty members on independent study projects (Astronomy 440). Students whose interest in astronomy is sparked somewhat late in their undergraduate careers are encouraged to discuss possible paths with the Director of Undergraduate Studies in Astronomy.

Honors. A student may be granted honors in astronomy upon the recommendation of the Astronomy Advisers Committee of the astronomy faculty.
Double majors. A double major in astronomy and another subject is possible in many circumstances. However, the set of courses used to fulfill the requirements for each major must be completely independent.
Concentration. Students majoring in other fields but interested in astronomy are encouraged to supplement their major with a concentration in astronomy, an option that is somewhat less intensive than a major. Normally Astronomy 431 and 432 are required for a concentration.

## Distribution Requirement

The distribution requirement in physical sciences is met by A101 or A211, A102 or A212, 107, A201, A202 or any course numbered 300 or above. If 107 is taken, no other 100 -level course can be used. Note that ASTRO $103,104,105$, and 106 do not satisfy the distribution requirement for the College of Arts and Sciences, but may satisfy the requirements of some other college.

## Courses

ASTRO 101 The Nature of the Universe
Fall. 4 credits. No prerequisites. Labs and discussions limited to 20 students each.

Lecs, M W F 11:15; labs, every other week:
M or W 2:30-5 or M T W or R 7:30-10
p.m.; disc, one hour every week: M or W $1: 25,2: 30,3: 35$, or $7: 30 \mathrm{p} . \mathrm{m}$., or T or R $2: 30$ or $3: 35$ p.m. Y. Terzian, T. Herter; labs, P. D. Nicholson.
The history of the universe and the physical nature of existence. An examination of the universe and our place in it and the possible existence of life and intelligence elsewhere in the cosmos. The nature of stars, galaxies, and quasi-stellar sources. The birth, evolution, and death of stars and the formation of the chemical elements, including discussions of supernovae, pulsars, neutron stars, and black holes. The physical state and composition of the interstellar material and its influence on the evolution of our galaxy. An introduction to the special and general theories of relativity. The nature of time. Modern theories of cosmology and the structure and evolution of the universe.

## ASTRO 102 Our Solar System

Spring. 4 credits. No prerequisites. Labs and discussions limited to 20 students each.

Lecs, M W F 11:15; labs every other week:
M or W 2:30-5 or M T W 7:30-10 p.m.;
disc, one hour every week: $M$ or $W$ 1:25,
$2: 30,3: 35$, or $7: 30$ p.m. or T or R 2:30 or
3:35. J. F. Veverka; labs, P. D. Nicholson. A survey of the current state and past evolution of our solar system, with emphasis on results from the direct exploration of planets by spacecraft. The course is divided into four parts: theories of formation; the inner planets; the outer solar system; and the search for life in the solar system and elsewhere. Stress is placed on the important processes that have shaped the evolution of planets and satellites.

## ASTRO 103 The Nature of the Universe

## Fall. 3 credits

Identical to Astronomy 101 except for omission of the laboratory (see description above). This course does not satisfy the distribution requirement in physical sciences for students in the College of Arts and Sciences.

## ASTRO 104 Our Solar System

Spring. 3 credits.
Identical to Astronomy 102 except for omission of the laboratory (see description above). This course does not satisfy the distribution requirement in physical sciences for students in the College of Arts and Sciences.

## ASTRO 105 An Introduction to the

 UniverseSummer. 3 credits.
M-F 11:30-12:45; evening labs to be arranged. Staff.
How do we measure the size of our galaxy and the size of the universe? Is the universe round or flat? How are the stars born, why do they shine, and how do they die? What are the chemical elements, and how were they formed in stars? What are quasars, pulsars, and black holes? How was the solar system formed? What are the environments of other planets like? What is the basic structure of Earth and the other planets? Will man catastrophically alter the earth? Does life exist elsewhere in the universe? How can we find
out? Each student has an opportunity to make observations with small telescopes.
ASTRO 106 Essential Ideas in Relativity and Cosmology
Summer. 3 credits. Prerequisites: high school algebra and trigonometry.

M-F 10-11:15. Staff.
Einstein's theories of special and general relativity, which brought about a fundamental change in our conceptual understanding of space and time, will be studied. Correspondence to, and conflicts with, common sense will be pointed out. Applications to various areas will be studied: in special relativityspace travel, equivalence of mass and energy, nuclear fission and fusion, and thermonuclear processes in the sun; in general relativitymotion of light and particles in curved spacetime, cosmological models, and the question of whether the universe is open or closed.

## ASTRO 107 An Introduction to the

 UniverseSummer. 4 credits.
M-F 11:30-12:45; lab R 2:30-5:00; evening labs TBA. Staff.
Identical to Astronomy 105 except for the addition of the afternoon laboratory. This course meets the science distribution requirement in the College of Arts and Sciences.
ASTRO 201 Our Home in the Universe Fall. 3 credits. Assumes no scientific background. Preference given to freshmen and sophomores. Limited to 25 students.

T R 10:10-11:25; informal labs TBA.
M. Haynes, T. Herter.

A general discussion of our relation to the physical universe and how our view of the universe has changed from ancient to modern times. Four themes are covered over the course of semester: (1) our view of the night sky from the ancient Greeks to the Hubble Space Telescope, (2) the search for planets and life elsewhere; (3) the death of stars and the formation of black holes, and (4) the origin, evolution, and fate of the universe. We present a nonmathematical introduction to these subjects and discuss uncertainties and unresolved issues in our understanding.

## ASTRO 202 Our Home in the Solar

 SystemSpring. 3 credits. Prerequisite: some background in science. Limited to 25 students.

T R 1:25-2:40. P. Gierasch. A comparison of the Earth with the other worlds in our solar system, with an emphasis on the nature and fragility of planetary environments. Topics to be discussed include the climate and weather, species extinctions, the history of climate change, evolution of the atmosphere of the Earth and other planets, ecology and biological interdependence, and threats to the current global environmentincluding ozone layer depletion, greenhouse warming, and nuclear winter. Possible solutions to these problems, including their economic and social costs and their ethical implications, will be considered. The course will attempt to develop skills in writing and in elementary physics and chemistry.

## ASTRO 211 Astronomy: Stars, Galaxies,

 and CosmologyFall. 4 credits. Intended for engineering and physical sciences freshmen and sophomores. Prerequisite: introductory calculus or coregistration in Mathematics 111 or 191.

Lecs, M W F 11:15-12:05. J. Houck.
The formation and evolution of stars, supernovae, pulsars, quasars, and black holes. The interstellar medium. Cosmology and the structure and evolution of galaxies.
ASTRO 212 The Solar System: Planets, Satellites, and Rings
Spring. 4 credits. Intended for engineering and physical sciences freshmen. Prerequisite: introductory calculus or coregistration in Mathematics 111 or 191.

Lecs, M W F 11:15-12:05. S. Squyres,
D. Campbell.

The origin of the solar system; celestial mechanics; tidal evolution; the physics and chemistry of planetary surfaces, atmospheres, and satellites; interiors; planetary rings; asteroids, comets, and meteorites; the search for other planetary systems.

## ASTRO 233 Topics in Astronomy and

 AstrophysicsFall. 2 credits. Prerequisites: Physics 112 and 213, Mathematics 112 and 221, or permission of instructor.

T R 1:25-2:15. M. Haynes, P. Nicholson. A seminar course on advanced topics in astronomy and astrophysics designed for prospective astronomy majors. Content will vary from year to year, but will include topics from the fields of planetary, galactic, and extragalactic research.
ASTRO 332 Elements of Astrophysics
Spring. 4 credits. Prerequisites: calculus and Physics 213. Physics 214 strongly recommended.

Lec M W F 11:15-12:05. R. Giovanelli. An introduction to astronomy, with emphasis on the application of physics to the study of the universe. Physical laws of radiation. Distance, size, mass, and age of stars, galaxies, and the universe; stellar evolution and nucleosynthesis. Supernovae, pulsars, and black holes. Galaxies and quasars. Introduction to cosmology. Mainly intended for students of science, engineering and science education, interested in astronomy and astrophysics.

## ASTRO 410 Experimental Astronomy

Fall. 4 credits. Prerequisites: Physics 214 (or 310 or 360 ), Physics 325 (or co-registration) or permission of instructor. Limited to 10 students.

T R 1:30-4:30 plus night-time observing.
J. Cordes, P. Goldsmith, J. Houck.

Observational astrophysics. Major experiments will involve techniques in CCD (charge-coupled-device) imaging, optical photometry, optical spectroscopy, radiometry, radio spectroscopy and radio astronomy. The experiments involve use of the 24 -inch Hartung-Boothroyd Observatory and a radio telescope mounted on top of the Space Sciences Building. The laboratory covers the fundamentals of using astronomical instrumentation and data analysis as applied to celestial phenomena, asteroids, normal stars, supernova remnants, globular clusters, planetary nebulae, the interstellar medium and galaxies.
ASTRO 431 Introduction to Astrophysics and Space Sciences I
Fall. 4 credits. Prerequisites: mathematics above the 200 level and physics above the 300 level; co-registration in Physics 341 and 443 is recommended.

T R 10:10-11:25. D. Chernoff. A systematic development of modern astrophysical concepts for physical science
majors. Atomic and electromagnetic processes in space. Introduction to star formation, stellar structure and evolution, radiative transfer, and the interstellar medium. At the level of Astrophysical Concepts, by Harwit.

## ASTRO 432 Introduction to Astrophysics and Space Sciences II

Spring. 4 credits. Prerequisite: Astronomy 431 or permission of instructor
G. Stacey

This course is divided into two broad topics; the astrophysics of the interstellar medium and cosmology. The interstellar medium section will cover thermal equilibrium and radiative transport in HII regions, atomic gas regions, and molecular clouds. We will also discuss the propagation of shocks in the interstellar medium in the context of expanding supernovae shells. The cosmology section will include expansion of the universe, metrics, Frjedmann equations, dark matter, cosmological tests, the early universe, and the cosmological production of the elements. At the level of Astrophysical Concepts by Harwit.

## [ASTRO 434 The Evolution of Planets

Fall. 4 credits. Not offered 1994-95. An introduction to the physical and chemical processes that have been active in altering the environments of planets and satellites from their original to their present state. Theories of the formation of the solar system are revealed with special emphasis on chemical differentiation of the primeval solar nebula. A critical assessment is made of how well the various theories account for the clues left in the meteorite record and how well they explain the current environments of the planets and satellites. The main ideas about the formation and evolution of terrestrial planets, satellite systems, and asteroids are considered in detail. Some specific topics included are the history of the earth-moon system, the probable evolution of Jupiter's Galilean satellites, and the comparative histories of Venus, Earch, and Mars.]

## ASTRO 440 Independent Study in

 AstronomyFall or spring. $2-4$ credits. Prerequisite: permission of instructor. Recommended: familiarity with the topics covered in

## Astronomy 332, 431, or 434.

Hours to be arranged. Staff.
Individuals work on selected topics. A program of study is devised by the student and instructor. Students need to fill out an independent study form, have it signed by the instructor, and register in the department office, 510 Space Sciences Building.

## ASTRO 490 Senior Seminar Critical

 ThinkingSpring. 3 credits. Permission of instructor required.

T R 2:55-4:10. C. Sagan. Critical thinking in scientific and nonscientific contexts. Topics will include elements of classical logic and rhetoric, including standards of evidence. Case studies will include examples of competing hypotheses in the history of science, as well as examples from borderline science and medicine, religion, and politics. Stress will be laid on creative generation of alternative hypotheses and their winnowing by critical scrutiny. Discussion will be both qualitative and quantitative. Students from widely diverse fields will be admitted, but are expected to be well-qualified. They will be expected to
assimilate an extensive reading list; the seminar itself will be devoted to the implications of the readings and the interaction of the participants.

## ASTRO 509 General Relativity (also Physics 553)

Fall. 4 credits. Prerequisite: Knowledge of special relativity at the level of, for example Classical Mechanics by Goldstein.

T R 1:25-2:40. S. L. Shapiro. A systematic introduction to Einstein's theory, with emphasis on modern coordinate-free methods of computation. Topics include: review of special relativity, modern differential geometry, foundations of general relativity, laws of physics in the presence of a gravitational field, experimental tests of gravitational theories. At the level of Gravitation by Misner, Thome, and Wheeler.

## ASTRO 510 Applications of General Relativity (also Physics 554)

Spring. 4 credits. Prerequisite: ASTRO 509.
T R 1:25-2:40. S. L. Shapiro.
A continuation of Astronomy 509 with emphasis on applications to astrophysics and cosmology. Topics include: relativistic stars, gravitational collapse and black holes,
gravitational waves, cosmology.

## [ASTRO 511 Physics of Black Holes, White Dwarfs, and Neutron Stars (also Physics 525)

Spring. 4 credits. Not offered 1994-95. The formation of compact objects; neutrino and gravitational radiation from supernova collapse and neutron starts. Equilibrium configurations, equations of state, stability criteria and mass limits: the influence of rotation and magnetic fields. Pulsar phenomena. Mass flow in binary systems; spherical and disk accretion; high-temperature radiation processes. Compact X-ray sources and X-ray bursts. Emphasis will be on the application of fundamental physical principles to compact objects. No astronomy or general relativity prerequisites. Text: Pbysics of Black Holes, White Duarfs, and Neutron Stars, by Shapiro and Teukolsky.]

## ASTRO 516 Galactic Structure and Stellar Dynamics

Fall. 4 credits.
TBA. D. Chernoff.
The kinematics and distribution of stars in the solar neighborhood. The dynamical structure, composition, and evolution of our galaxy. Characteristics and classifications of galaxies, galaxy groups, globular clusters, and clusters of galaxies. Theory of N-body systems, stellar encounters, collisional and violent relaxation, and stellar evaporation rates. Dynamical evolution of star cluster and associations. Theory of spiral structure. Binary and rotating star systems.

## [ASTRO 520 Radio Astronomy

Fall. 4 credits. Not offered 1994-95. Radio astronomy telescopes and electronics; antenna theory; observing procedures and data analysis; concepts of interferometry and aperture synthesis.]

## ASTRO 523 Signal Processing and Data Analysis in Astronomy

Fall. 4 credits.
T R 1:25-2:40. J. Cordes. Topics will include probability theory, Fourier analysis of discrete and continuous time series, digital filtering, spectral analysis, parameter estimation, statistical inference
using Bayesian methods, stochastic and chaotic processes, image formation and analysis, maximum entropy analysis, and cluster analysis. Special topics will include neural networks and genetic algorithms. Examples will be drawn from subject areas in astronomy and astrophysics, geophysics, plasma physics, and electronics.

ASTRO 525 Techniques of Optical/ Infrared and Submillimeter Astronomy
Fall. 4 credits.
M W F 10:10-11:00. T. Herter, G. Stacey. Optical/infrared and submillimeter telescopes and instrumentation will be discussed and related to current research in these fields. Special emphasis will be on detector elements, instrument design and construction, data analysis and observing procedures. Incended for students with a thorough understanding of undergraduate physics.

## [ASTRO 530 Astrophysical Processes

Spring. 4 credits. Not offered 1994-95. Thermal and nonthermal radiation processes encountered in studies of stars, the interstellar and intergalactic media, galaxies and quasars. Fundamentals of radiative transfer,
bremsstrahlung, synchrotron radiation, and Compton scattering will be covered, as well as spectral line transfer and topics in atomic and molecular spectroscopy. These topics will be discussed within the framework of astrophysical situations, such as star formation, interstellar gas and dust clouds, jets, active galactic nuclei, clusters of galaxies and cosmology.]
[ASTRO 555 Theory of the Interstellar Medium (also Physics 665)
Spring. 4 credits. Not offered 1994-95. Global theories of the interstellar mediummass and energy exchange between the different phases. The role of shock waves and energic outflows in the thermal equilibrium and ionization state of gas in the galaxy. Basic astrophysical fluids and plasmas. Galactic dynamics. Observations techiques, current problems and results.]

## [ASTRO 560 Theory of Stellar Structure

 and Evolution (also Physics 667)Fall. 4 credits. Not offered 1994-95.
Summary of observational facts on stars; dimensional analysis; nuclear reactions and energy transport in stellar interiors; models for static and evolving stars. At the level of Principles of Stellar Evolution and Nucleosynthesis, by Clayton.]
[ASTRO 570 Physics of the Planets Fall. 4 credits. Not offered 1994-95. An introductory survey of planetary science with an emphasis on the application of physical principles. Recent observational results, including those of ground-based optical, infrared, radio, and radar astronomy, as well as those made by spacecraft, will also be discussed. Planetary dynamics, including satellite orbits, tidal interactions, resonances, and ring dynamics. An introduction to the theory of planetary interiors, gravitational fields, figures, and heat sources. Physics and chemistry of planetary atmospheres, including radiative transfer, convection, thermal structure, and dynamics. Intended for students in astronomy, physics, and engineering.]
[ASTRO 571 Mechanics of the Solar System (also Theoretical and Applied Mechanics 673)
Spring. 3 credits. Not offered 1994-95. Two 1-1/4 hour lecs. J. Burns. Gravitational potential, planetary gravity fields. Free and forced rotations. Chandler wobble, polar wander, damping of nutation. Equilibrium tidal theory, tidal heating. Orbital evolution of natural satellites, resonances, spin-orbit coupling. Cassini states. Long-term variations in planetary orbits. Orbital and Rotational Chaos. Dust dynamics. Dynamics of ring systems. Physics of interiors, seismic waves, free oscillations. Illustrative examples are drawn from contemporary research.]

## [ASTRO 575 Atmospheric and Ionospheric Physics (also Electrical

 Engineering 585)Fall. 3 credits. Not offered 1994-95. Energy balance and thermal structure of neutral atmospheres. Elements of circulation theory. Waves and instabilities. Coupling of lower atmospheres to upper atmospheres. Observations of the terrestrial atmosphere and of the other planets. Physical processes in the earth's ionosphere and magnetosphere. Production, loss, and transport of charged particles. Electric fields. Coupling of neutral atmosphere dynamics with electric fields and charged-particle transport. Diagnostic techniques, including radar and in situ observations. The equatorial electrojet. Observations of ionospheres on the other planets.]
[ASTRO 576 Solar Terrestrial Physics (also Electrical Engineering 586) Spring. 3 credits. Not offered 1994-95. High-latitude ionosphere; electric fields in the polar cap and auroral zone; particle precipitation and the aurora; magnetic and ionospheric storms; plasma instabilities in the ionosphere and magnetosphere; structure and physical processes in the sun, solar corona, and solar wind; interactions between the solar wind and the earth's magnetosphere; trapping,
acceleration, and drift of energetic particles in the magnetosphere.]

## ASTRO 579 Celestial Mechanics (also <br> Theoretical and Applied Mechanics <br> 672)

Spring. 3 credits.
Two 1-1/4 hour lecs a week, hours TBA.
J. Burns.

Description of orbits. Two-body, 3-body, and n-body problems. Hill curves; libration points and their stability; capture problems; virial theorem. Osculating elements; perturbation equations: effects of gravitational potentials, atmospheric drag, and radiation forces on orbits, secular perturbations, resonance problems. Mechanics of planetary rings.

## ASTRO 590 Galaxies and the Universe

 Spring. 4 credits.M W 1:25-2:40. M. Haynes, R. Giovanelli. The universe, its constituents, its large-scale structure, and its history in the light of the major thrusts of extragalactic research. The morphology, photometry, dynamics, and kinematics of galaxies and their subsystems. Determination of masses, mass-to-light ratios, and the "missing mass." Activity in Seyferts, radio galaxies, and quasars. Binaries, groups, clusters and superclusters. The extragalactic distance scale. Galaxy formation and evolution. Confrontation of cosmological theories with observational results.

## [ASTRO 599 Cosmology

Spring. 4 credits. Prerequisites: statistical physics, quantum mechanics and electromagnetic theory. Not offered 1994-95. This course is intended to provide a detailed theoretical development of current ideas in cosmology. Topics will include observational overview; growth of irregularities, galaxy formation and clustering; big bang cosmology, recombination, nucleosynthesis; very early universe, symmetry breaking, inflationary scenarios. At the level of Peebles, Physical Cosmology and The Large Scale Structure of the Universe.]

## [ASTRO 620 Seminar: Advanced Radio

## Astronomy

Spring, 2 credits. Prerequisites: some background in extragalactic astronomy and/or radio astronomy suggested. Open to advanced undergraduates by permission of instructor. Not offered 1994-95.
Selected topics in observational cosmology at radio wavelengths including: redshift surveys, gas stripping mechanisms, rotation curves and the distributions of mass and light, large scale structure, peculiar motions, atomic and molecular studies at high redshift, the Sunyaev-Zel'dovich effect, evolution of radio luminosity function, and the cosmic microwave background.]

## [ASTRO 621 Seminar: Planetary Radar Astronomy <br> Spring. 3 credits. Not offered 1994-95.]

## ASTRO 640 Advanced Study and

## Research

Fall or spring. Credit to be arranged.
Hours to be arranged. Staff.
Guided reading and seminars on topics not currently covered in regular courses. Students need to register in the department office, 510 Space Sciences Building.

## [ASTRO 660 Cosmic Electrodynamics (also Applied and Engineering Physics 608) <br> Spring. 2 credits. Not offered 1994-95.]

## ASTRO 671 Seminar: Satellites and

 Rings of the Outer Solar System Fall. 3 credits.TBA. P. Nicholson, S. Squyres.
An informal series of lectures on the satellites and rings of the outer solar system: Io, the icy satellites of the giant planets, and the ring systems of the giant planets. Topics to be discussed include the origin, evolution, and current structure of satellites and rings, with particular emphasis on past and future spacecraft exploration of the outer solar system.

## ASTRO 673 Seminar: Planetary Atmospheres

Spring. 2 credits.
TBA. P. Gierasch.
This course will deal with motions in - planetary atmospheres. Among the topics to be discussed are the Venus general circulation, dust and water transports on Mars, alternating jets on the outer planets, and compositional layering in the outer planets.
[ASTRO 680 Seminar: Cosmic Rays and High-Energy Electromagnetic Radiation
Spring. 2 credits. Not offered 1994-95.\}

## [ASTRO 690 Seminar: Computational

Astrophysics (also Physics 680)
Spring. 3 credits. Prerequisites: working knowledge of FORTRAN or C. Not offered 1994-95.

T R 10:10-11:25. S. A. Teukolsky. A course designed to familiarize graduate students with numerical techniques for solving diverse problems in astrophysics. Numerical methods discussed in the course will include solving ordinary and partial differential equations, linear algebra and eigenvalue problems, Monte Carlo techniques, fast Fourier transforms, etc. In contrast to traditional numercial analysis courses, the flavor of the course will be "how-to", rather than theoretical. No theorems will be proved. Students will be allotted computer time to solve, both individually and in small teams, assigned numerical exercises. Text: Numerical Recipes by Press, Teukolsky, Veltading, and Flannery.]

## ASTRO 699 Seminar: Problems in Theoretical Astrophysics (also Physics 665)

Fall. 2 credits.
M 2:30-4. E. Salpeter.
An informal seminar, meeting Mondays (and occasionally Wednesdays), for advanced graduate students in astronomy or physics.
Topics: Radiative transfer and stellar
atmospheres, theories of star formation.

## BIOLOGICAL SCIENCES

P. J. Bruns, director ( 169 Biotechnology Building, 255-5042); H. T. Stinson, associate director and director of undergraduate studies (200 Stimson Hall, 255-5233); R. M. Sparrow, biology center coordinator (Biology Center, 216 Stimson Hall, 255-3358); M. L. Cox, executive staff assistant ( 200 Stimson Hall, 255-6859)
Biology is a popular subject at many universities for a variety of reasons: It is a science that is in an exciting phase of development; it prepares students for careers in challenging and appealing fields such as human and veterinary medicine, environmental sciences, and biotechnology; and it deals with the inherently interesting questions that arise when we try to understand ourselves and the living world around us. Many of the decisions we face today deal with the opportunities and problems that biology has put before us.
The major in biological sciences at Cornell is offered by the Division of Biological Sciences to students enrolled in either the College of Agriculture and Life Sciences or the College of Arts and Sciences. Student services in the division's Office for Academic Affairs and the Behrman Biology Center are available to students from either college.
The biology major is designed to enable students to acquire the foundations in physical and life sciences necessary to understand modern biology and to pursue advanced studies in a specific area of biology. Programs of study include animal physiology; biochemistry; cell biology; ecology and evolutionary biology; general biology; genetics and development; microbiology; neurobiology and behavior; and plant biology. A special program of study is available for qualified students with an interest in nutrition. Students interested in the marine sciences may consult
the Cornell Marine Programs Office (G14 Stimson Hall, 255-3717) for academic advice and career counseling. For more details about the biology curriculum see the section in this catalog on the Division of Biological Sciences.

BIOLOGY AND SOCIETY MAJOR
See Special Programs and Interdisciplinary Studies.

## BURMESE AND CEBUANO (BISAYAN).

See Modern Languages and Linguistics.

## CHEMISTRY

B. Ganem, chair (124 Baker Laboratory, 255-4174); H. D. Abruna, A. C. Albrecht, B. A. Baird, T. P. Begley, J. M. Burlitch, B. K. Carpenter, J. C. Clardy, D. B. Collum, H. F. Davis, F. J. DiSalvo, G. S. Ezra, R. C. Fay, J. M. J. Fréchet, J. H. Freed, M. A. Hines, R. Hoffmann, P. L. Houston, A. Kuki, R. Loring, J. E. McMurry, J. Meinwald, S. O. Russo, H. A. Scheraga, D. Sogah D. A. Usher, B. Widom, J. R. Wiesenfeld, C. F. Wilcox, P. T. Wolczanski, D. B. Zax
J. E. McMurry, director of undergraduate studies
S. T. Marcus, associate director of undergraduate studies
The chemistry department offers a full range of courses in physical, organic, inorganic, analytical, theoretical, bioorganic, and biophysical chemistry. In addition to their teaching interests, chemistry faculty members have active research programs. The link between teaching and research is a vital one in a continuously evolving scientific subject; it ensures that students will be provided with the most advanced information and perspectives, and affords opportunities for students to participate in research.

## The Standard Major

The chemistry major at Cornell provides a great deal of flexibility and prepares students for a large variety of career options. In recent years, chemistry majors have gone on to graduate study in chemistry, medicine, law, and business management, as well as directly into positions with chemical, pharmaceutical, and other industrial companies. A major in chemistry can also provide the basis for work in related areas such as molecular biology, chemical physics, geochemistry, chemical engineering, materials science, solid state physics, and secondary education. The required courses for the major can be completed in three years, leaving the senior year open for advanced and independent work under the supervision of a professor.

The courses are arranged as a progression, with some (including mathematics and physics) prerequisite to those that are more advanced. During the first year, a student should normally register for general chemistry (preferably Chemistry 215-216 although Chemistry 207-208 is acceptable), mathematics, a freshman writing seminar, a foreign
language if necessary, or physics. Chemistry $215-216$ is aimed at those students with good preparation and a strong interest in chemistry. Students who do not know if their preparation is adequate should consult the instructor. In the second year a student should complete calculus and take physics and organic chemistry (Chemistry 359-360 is preferred to Chemistry 357-358). The second-year laboratory courses include 300, Quantitative Chemistry, if needed, and 301, Experimental Chemistry I. Chemistry 389-390, Physical Chemistry I and II, and Chemistry 302-303, Experimental Chemistry II and III, should be completed in the third year. Chemistry 410 should be completed in the third or fourth year. Advanced work in chemistry and related subjects can be pursued in the fourth year and in the earlier years as well. The opportunity for independent research is also available. All students with questions about the major are encouraged to consult the chair of the Department of Chemistry or the chair's representative. Entering students who are exceptionally well prepared in chemistry may receive advanced placement credit for Chemistry 207.

Prerequisites for admission to a major in chemistry are (1) Chemistry 215-216; or 207-208; 300; or 211-208, 300; or 103-104 208, 300; (2) Physics 207or 112; and (3) Mathematics 111 or 191. Students are not encouraged to undertake a major in chemistry unless they have passed those prerequisite courses at a good level of proficiency. Knowledge of simple computer programming is essential. This may be achieved either by self-study (a syllabus is available) or by taking a course such as Computer Science 100. The minimum additional courses that must be completed for the standard major in chemistry are listed below.

1) Chemistry 301-302-303, 359-360 (357-358 may be substituted), 389-390, and 410
2) Mathematics 112,213 ; or $122,221-222$; or 192-293-294
3) Physics 208

Potential majors electing to take Mathematics 213 are strongly urged to do so in their sophomore year to avoid scheduling conflicts with Chemistry 389 in their junior year.
The sequence described above is a basic program in chemistry that students can extend substantially in whatever direction suits their own needs and interests. Those going on to do graduate work in chemistry should recognize that these requirements are minimal and should supplement their programs, where possible, with further courses such as Chemistry $405,605,606,666,668$, and 681 Even students not planning graduate work in chemistry should consider advanced work in physics and mathematics, courses in the biological sciences, and advanced work in chemistry as possible extensions of the basic program.
Honors. The honors program in chemistry offers superior students an opportunity to study independently in seminars and to gain additional experience by engaging in research during the senior year. It is particularly recommended to those who plan graduate work in chemistry. Prospective candidates should complete the introductory organic chemistry and physical chemistry sequences by the end of the junior year, although, failure to have completed those courses in the junior
year does not in itself disqualify a student from the honors program. Completion of the program at a high level of performance leads to the degree of Bachelor of Arts with honors in chemistry. Students will be admitted to the program by invitation of the department, with selection based on a superior cumulative average, including chemistry grades, and good performance in a prior research program.
Prospective candidates should discuss their plans with advisers by March 1 of their junior year; participants are notified by early January of their senior year. To be awarded honors, candidates must show outstanding performance in at least 8 credits of undergraduate research such as is offered in Chemistry 421, 433, 461, or 477. In addition, the writing of a thesis in the honors seminar (Chemistry 498) is expected.

## The Alternative Major

The alternative major is a flexible program that provides core coverage of chemistry around which students can design a program to meet their own career goals. Requirements consist of a core program along with four additional courses chosen by the student. One of the four must be in chemistry at the 300 level or above; the other three may be in another field but should represent a cohesive plan and must be approved by a departmental committee.

## The Core Program for the Alternative Major

1) Chemistry 215-216 (or 207-208, 300; or $211,208,300$; or $103,208,300$ ); 253,251 , 287,289 , and 410 (Chem 357-358 or $359-360$ can be substituted for Chem 253. or Chem 389-390 can be substituted for Chem 287, thereby fulfilling the requirement for an additional chemistry course)
2) Mathematics $111-112$; or 111,122 ; or 191-192
3) Physics 207-208; or 112,213

Addltional Courses for the Alternative Major
Possible plans for the remaining three courses might include programs in Biochemistry; Biology; Physics; Computer Science; Polymers; Materials Science; Science, Technology, and Society; History and Philosophy of Science and Technology; Business and Management; Economics; Education; and others.
Premedical students and those interested in pursuing double majors might find the alternative major particularly attractive. The course requirements for admission to the alternative major are the same as those for the standard major.

## Program for Science Teachers

Chemistry majors who wish to become teachers will be interested to know that Comell University offers a certification program for teachers of secondary (grades 7-12) science. Interested students apply to the program during their sophomore or junior years. If accepted, students integrate some course work in Education with the rest of their undergraduate studies. All chemistry majors who enter this program will remain in the College of Arts and Sciences to complete the major.
After earning the bachelor's degree, certification students enter the Graduate Field of Education to complete a fifth year of study at

Cornell. Following this fifth year, students are eligible for a master's degree from Cornell and a teaching certificate from New York State. Financial support is available for qualified applicants. Additional information is available from Susie Slack, 424 Kennedy Hall, 255-9255 or Prof. Deborah Trumbull, 426 Kennedy Hall, 255-3108.

## Laboratory Course Regulations

Students registered for laboratory courses who do not appear at the first meeting of the laboratory will forfeit their registration in that course.
Students and members of the teaching staff are required to wear safety goggles and lab aprons in all chemistry laboratories. Students are reminded to take their goggles and lab aprons to the first laboratory session. Those who fail to cooperate with the safety program will be asked to leave the laboratories.
Students are required to pay for glassware and any other items broken or missing from their laboratory desks at the close of each semester. Students who fail to inventory their desks at the appointed time in the presence of their instructor are charged a $\$ 10$ fee in addition to charges for any breakage.

## Courses

Preliminary examinations for all courses may be given in the evening.

## CHEM 103 Introduction to General

 ChemistryFall or summer. 4 credits. Enrollment limited. Recommended for students who have not had high school chemistry and for those needing a less intensive course than Chemistry 207-208.

Lecs, M W F 11:15; lab, T R or F
8:00-11:00, or M W or F 1:25-4:25.
Prelims: 7:30-9 p.m., Sept. 29, Oct. 25,
Nov. 17. S. Russo.
An introduction to general chemistry, with emphasis on important principles and facts. Chemistry 103 covers much of the same material as Chemistry 207 and the first third of Chemistry 208, but does so in less depth.

## CHEM 104 Introduction to Organic and Biological Chemistry

Spring or summer. 3 credits. Enrollment limited. Prerequisite: Chemistry 103 or 207.

Lecs, M W 11:15; lab, T R 8:00-11:00, or
F 10:10-1:10, or M W or F 1:25-4:25.
Prelims: 7:30-9 p.m., March 2, April 11.
D. A. Usher.

An introduction to organic and biological chemistry, with emphasis on important reactions of organic compounds and on the applications of those reactions in biological systems.

## CHEM 203 Strategies in Science: The World of Chemistry

Spring. 3 credits. This course plus Chemistry 103, 204, or 207 or 211 satisfies the College of Arts and Sciences physical science distribution requirement. Chemistry 203 also satisfies the C.A.L.S. physical science requirement of one course in chemistry.

Lecs and discs: M W F 12:20. Prelims:
7:30-9 p.m., March 7, April 11. J. Clardy. A general appreciation of chemistry in the everyday world which will highlight for nonscientists the way the scientific method works. Using several case studies, the course will focus not only on what modern chemistry has accomplished, but more generally on the way scientists think, how they function, what
their modus operandi is. Selected topics include (a) the chemistry of food, food additives, and the effect of diet on health; (b) drugs and medicines; (c) air and water pollution, pesticides, herbicides, acid rain, and other environmental chemistry; (d) the chemistry of plastics, polymers, and other modern materials; ( $e$ ) the chemistry of taste and smell, including flavors, perfumes, and cosmetics; and ( $f$ ) biotechnology and genetic chemistry. Other topics to be discussed are the influence of the media on scientific issues, the decision-making process in science, scientific publishing, and fraud in science.

## CHEM 204 The Language of Chemistry

Fall. 3 credits. This course contributes to meeting the College of Arts and Sciences "Physical and Biological Sciences" (Group I) distribution requirement, as well as the C.A.L.S. physical science requirement of one course in chemistry. S-U or letter grades.

Lecs and disc, M W F 12:20.J. Meinwald.
Prelims 12:20 p.m., Sept. 23, Oct. 26. In his autobiography, A. Kornberg (Nobel Laureate in Medicine, 1959) wrote, "much of life can be understood in rational terms if expressed in the language of chemistry. It is an international language. a language for all time, a language that explains where we came from, what we are, and where the physical world will allow us to go." Through careful examination of a few milestone investigations of naturally occurring biologically important compounds (such as the antimalarial quinine, taxol, penicillin, and the sperm attractants of algae), the principles of chemistry to which Kornberg refers will be developed. Methods of analyzing problems will be emphasized, rather than the memorization of specific results or formulas. There will be an opportunity for students, working in small groups, to prepare and present short reports on topics of particular current interest at the interface between chemistry and biology.

## CHEM 207-208 General Chemistry

207 , fall or summer; 208, spring or summer. 4 credits each term. Enrollment limited. Recommended for those students who will take further courses in chemistry. Prerequisite for Clemistry 207: high school chemistry. Prerequisite for Chemistry 208: Chemistry 207 or 103.

Lecs: fall, T R 10:10 or 12:20; spring, T R 9:05, $10: 10$ or 12:20. Lab: fall, T R F 8-12 or M T W R or F 12:20-4:25; spring, T R F 8-12 or M T W R or F 12:20-4:25. Prelims: 7:30-9 p.m., Oct. 4, Nov. 10, Feb. 28, April 13. Fall: B. K. Carpenter; spring: H. D. Abruña.

The fundamental chemical principles and descriptive facts are covered, with considerable attention given to the quantitative aspects and to the techniques important for further work in chemistry. Second-term laboratory includes a systematic study of qualitative analysis.
Note: Entering students exceptionally well prepared in chemistry may receive advanced placement credit for General Chemistry by demonstrating competence in the advanced placement examination of the College Entrance Examination Board or in the departmental examination given at Cornell before classes start in the fall.

## CHEM 211 Chemistry for the Applied

 SciencesFall or spring. 4 credits. Recommended for those students who intend to take only one term of chemistry. Enrollment limited. Prerequisite: high school chemistry or permission of instructor. Corequisite: a calculus course at the level of Mathematics 111 or 191 .

Lecs: fall, M W F 12:20; spring, M W F 10:10. Lab: fall, M T W R F 1:25-4:25; spring, M T W R F 1:25-4:25. Prelims: 7:30-9 p.m., Sept. 20, Oct. 20, Nov. 17. Feb. 16, March 14, April 17. Fall: P. T. W'olczanski; spring: H. F. Davis. The important chemical principles and facts are covered with the objective of understanding the role of chemistry in other fields. Emphasis is on topics such as solid-state materials, periodic trends, and specific classes of compounds, such as polymers.
Note: Entering students exceptionally well prepared in chemistry may receive advanced placement credit for General Chemistry by demonstrating competence in the advanced placement examination of the College Entrance Examination Board or in the departmental examination given at Cornell before classes start in the fall.

## CHEM 215-216 General and Inorganic Chemistry

215, fall; 216, spring. Fall, 4 credits; spring, 5 credits. Recommended for students who intend to specialize in chemistry or in related fields. Enrollment limited. Prerequisites: good performance in high school chemistry and physics and in mathematics SAT. Corequisite: a calculus course at the level of Mathematics 111 or 191 for students who have not taken high school calculus. Prerequisite for Chemistry 216: Chemistry 215.

Fall: lecs, M W F 12:20; lab, M T W R or F 1:25-4:25. Spring: lecs, M W F 12:20; two labs, M W 1:25-4:25, T R 10:10-1:10 or T R 1:25-4:25. Prelims: 7:30-9 p.m., Sept. 27, Oct. 20, Nov. 17, Feb. 16, March 14, April 19. Fall: B. Widom; spring: R. C. Fay. An intensive systematic study of the laws and concepts of chemistry, with considerable emphasis on quantitative aspects. Second term includes systematics of inorganic
chemistry. Laboratory work covers both qualitative and quantitative analysis.

## [CHEM 222 Molecular Messengers in Nature

Spring. 3 credits. Prerequisite: one year of high school chemistry, Chemistry 103 or 207, or permission of instructor. Not offered 1994-95.

Lecs, M W F 11:15. J. Meinwald. Organisms communicate with one another in nature chiefly by means of chemical signals. We will examine this intriguing mode of communication as it applies to a wide variety of species ranging from bacteria to insects and mammals, including humans. Essential concepts of organic chemistry and biology will be introduced and illustrated. Each student will be expected to prepare a term paper, and there will be an opportunity for oral presentation of some of these papers for class discussion.]

## CHEM 251 Introduction to Experimental Organic Chemistry

Fall, spring, or summer. 2 credits. Recommended for non-chemistry majors. Enrollment limited. Prerequisites: coregistration in Chemistry 253 or 357.

Lecs: fall, M or F 8:00; spring, F 8:00 (all students attend first lecture); lah, M T W R or F 1:25-4:25, or T or R 8-11. Prelims: 7:30-9 p.m., Fall: Oct. 4, Nov. 10. Spring 8:00 a.m. Fall: S. Russo; Spring: D. Sogah.

Introduction to the synthesis, separation, and handling of materials, including applications of many types of chromatography, simple and fractional distillation, crystallization, extraction, and others.

## CHEM 252 Elementary Experimental

 Organic ChemistrySpring or summer. 2 credits. Recommended for non-chemistry majors. Prerequisite: Chemistry 251.

Lec, M 8:00; lab, M T W or R 1:25-4:25, or
T or R 8-11. Prelims: 8 a.m. S. Russo.
A continuation of Chemistry 251

## CHEM 253 Elementary Organic

 ChemistryFall or summer. 4 credits. Primarily for students in the biological curricula. Prerequisite: Chemistry 208 or 216.

Lecs, M W F S 11:15. Prelims: 7:30-9
p.m., Sept. 22, Oct. 18, Nov. 15.
D. A. Usher.

The occurrence and properties of organic molecules and the mechanisms of organic reactions, including a brief introduction to the organic chemistry of biological systems.

Note: Because of duplication of material, students are not permitted to earn both 4 credits for Chemistry 253 and 3 credits for Chemistry 357. In special situations (consult instructor for details), students should take Chemistry 255 for 2 credits after having earned 3 credits for Chemistry 357. Students may earn 6 credits by taking Chemistry 251-253 or 8 credits by taking Chemistry 357,358 and 251 or 253,251 , and 252.

## CHEM 255 Elementary Organic Chemistry

Fall or summer. 2 credits.
Same course as Chemistry 253 , but to be taken for reduced credit by students already having 3 credits for Chemistry 357.

## CHEM 287-288 Introductory Physical

 Chemistry287, fall; 288 , spring. 3 credits each term. Prerequisites: Chemistry 208 or 216 and Mathematics 111-112, or permission of instructor. Prerequisite for Chemistry 288: Chemistry 287 or 389.

Lecs, M W F 9:05; 287: rec, M or W 1:25, T 9:05; 288: rec, M or W 1:25. T 9:05. Prelims: 7:30-9 p.m., 287: Sept. 29, Nov. 3, Nov. 29. 288: Feh. 16, March 30, April 27. Fall: A. Kuki; spring: B. A. Baird. A systematic treatment of the fundamental principles of physical chemistry, focusing in the fall on thermodynamics and the quantum mechanics of the periodic table and chemical bonding. In the spring the course will be oriented to the application of physical chemistry to biological systems, including mass transport, kinetics, spectroscopy, and probability. Chemistry 287 satisfies the minimum requirement for physical chemistry in the alternative chemistry major.

## CHEM 289-290 Introductory Physical

 Chemistry Laboratory289, fall; 290, spring. 2 credits each term. Lecs: fall, R 8 a.m.; spring, R 9:05. Lab: fall, M T 1:25-4:25; spring, M T W R F 1:25-4:25. Fall: A. C. Albrecht; spring: J. H. Freed.

Quantitative and qualitative methods basic to the experimental study of physical chemistry.

## CHEM 300 Quantitative Chemistry

Fall. 2 credits. Prerequisite: Chemistry 208 or advanced placement in chemistry.

Lec, W 8:00; lab, M T W R F 12:20-4:25 or
T R 8-12. Prelim: 12:20, Nov. 16. J. M. Burlitch.

Gravimetric, volumetric, spectrophotometric, and potentiometric methods are emphasized. Lectures and problem sets stress the relationship between theory and applications.

CHEM 301 Experimental Chemistry I
Spring. 4 credits. Prerequisites: Chemistry 216 or 300 , and 253 or 357 or 359.

Lecs, M W F 8; 2 labs, M W 1:25-4:25 or TR 8-11 or 1:25-4:25. Prelims: 8 a.m., March 8. C. F. Wilcox.
An introduction to the techniques of synthetic organic chemistry. A representative selection of the most important classes of organic reactions will be explored in the laboratory. The theoretical basis for these reactions and for the separation techniques used will be discussed in the lectures.

## CHEM 302 Experimental Chemistry II

Fall. 4 credits. Enrollment limited; preference given to chemistry majors. Prerequisite: Chemistry 301.

Lecs, M W F 9:05; 2 labs, M W 1:25-4:25, or T R 1:25-4:25. C. F. Wilcox and M. A. Hines.

Instrumental methods of analysis, including optical spectroscopy, atomic absorption, NMR, mass spectrometry, gas chromatography, and electrochemical methods.

## CHEM 303 Experimental Chemistry III

Spring. 4 credits. Each lab limited to 11 students. Prerequisites: Chemistry 302, 389, 390; coregistration in the latter is permissible. Lecs, M W F 9:05; 2 labs, M W 1:25-4:25.
or T R 9:00-12:00 or T R 1:25-4:25.
D. B. Zax.

An introduction to measurement strategies in physical chemistry as applied to kinetics, spectroscopy, the dynamics of photo-excited states, and the dielectric properties of matter. The principles and assembly of electronic, optic, computer, and vacuum line equipment will be studied.

## CHEM 357-358 Introductory Organic Chemistry

357, fall; 358 , spring. 3 credits each term. Prerequisite for Chemistry 357: Chemistry 208 or 216 or advanced placement; recommended; concurrent registration in Chemistry 251 or 300. Prerequisite for Chemistry 358: Chemistry 357 ; recommended: concurrent registration in Chemistry 252 or 301.

Lecs, M W F 9:05 or 10:10, optional rec may be offered. Prelims: $7: 30-9$ p.m.,
Sept. 20, Oct. 18, Nov. 15, Feb. 16, March
16, April 18. Fall: J. M. J. Frechet; spring:
J. E. McMurry.

A systematic study of the more important classes of carbon compounds-reactions of their functional groups, methods of synthesis, relations, and uses.

Note: Because of duplication of material, students are not permitted to earn both 4 credits for Chemistry 253 and 3 credits for Chemistry 357. In special situations (consult instructor for details), students should take Chemistry 255 for 2 credits after having earned 3 credits for Chemistry 357. Students will not be permitted to take Chemistry 358 after completing Chemistry 253.

## CHEM 359-360 Organic Chemistry I

 and II359 , fall; 360 , spring. 4 credits each term. Recommended for students who intend to specialize in chemistry or closely related fields. Enrollment limited. Prerequisites: Chemistry 216 with a grade of $B$ or better, Chemistry 208 with a grade of A or better, or permission of instructor. Prerequisite for Chemistry 360: Chemistry 359. Recommended: coregistration in Chemistry 300-301-302.

Lecs, M W F 9:05; discussion session, W 7:30 p.m. Prelims: 9:05 a.m., Sept. 28,
Oct. 21, Nov. 21, Feh. 22, March 16, April
7. Fall: J. C. Clardy; spring: T. P. Begley. A rigorous and systematic study of organic and organometallic compounds, their structures, the mechanisms of their reactions, and the ways they are synthesized in nature and in the laboratory.

## CHEM 389-390 Physical Chemistry I and II

389, fall; 390, spring. 4 credits each term. Prerequisites: Mathematics 213 or, ideally, 221-222; Physics 208; Chemistry 208 or 216 or permission of instructor. Prerequisite for Chemistry 390: Chemistry 389.

Lecs, M W F 10:10; rec, M or W $1: 25$, or T 9:05. Prelims: 7:30-9 p.m., 389: Sept. 29, Nov. 3, Nov. 29. 390.1: Feb. 16, March 14, April 18. 390.2: Feb. 16, March 14, April 18. Fall: R. F. Loring; spring: 390.1: P. L. Houston, 390.2: M. Duncan. The principles of physical chemistry are studied from the standpoint of the laws of thermodynamics, kinetic theory, statistical mechanics, and quantum chemistry. In the spring, there will be two lectures; lecture 02 will be for engineering students only.

## CHEM 405 Techniques of Modern

 Synthetic ChemistrySpring. 3 or 6 credits. Enrollment limited. Prerequisites: Chemistry 302 and permission of instructor. To receive three credits, students must perform a minimum of three two-week experiments. Six credits will be given for three additional experiments. Completion of five exercises in elementary glass-blowing will count as one experiment. Lab time required: 16 hours each week, including at least two 4-hour sessions in one section (M W $1: 25$ ). First meeting will be at $1: 30$ on first class day of semester. Lec, first week only, at times to be arranged. J. M. Burlitch.
The syntheses of complex organic, organometallic, and inorganic molecules are cearried out with emphasis on the following techniques: vacuum line, high pressure, hightemperature solid state, inert atmosphere, nonaqueous solvents, radioactive labeling, solgel, photochemical and electrochemical methods, solid phase peptide synthesis, and polymer synthesis. Elementary glassblowing.

## CHEM 410 Inorganic Chemiatry

Fall. 4 credits. Prerequisites: Chemistry 253, 358 or 360 , and 287 or 390.

Lecs, M W F 11:15. F. J. DiSalvo. A systematic study of the synthesis, structure, bonding, reactivity and uses of inorganic molecular and solid state compounds.

## CHEM 421 Introduction to Inorganic

 Chemistry ResearchFall or spring. $2-4$ credits. Prerequisites: Chemistry 303 and 389-390, or Chemistry 287-288, and Chemistry 289-290 with an average of B - or better, or permission of instructor. Selected faculty.
Research in inorganic chemistry involving both laboratory and library work, planned in consultation with a faculty member.

CHEM 433 Introduction to Analytical Chemistry Research
Fall or spring. 2-4 credits. Prerequisites: Chemistry 303 and 390 with an average of Bor better or permission of instructor. Selected faculty.
Research in analytical chemistry involving both laboratory and library work, planned in consultation with a faculty member.

## CHEM 461 Introduction to Organic Chemistry Research

Fall or spring. 2-4 credits. Prerequisites: Chemistry 302 and 358 or 360 with a grade of B - or better or permission of instructor Selected faculty.
Research in organic chemistry involving both laboratory and library work, planned in consultation with a faculty member.

## CHEM 477 Introduction to Physical

 Chemistry ResearchFall or spring. 2-4 credits. Prerequisite Chemistry 390 with an average of B - or better or permission of instructor. Selected faculty. Research in physical chemistry involving both laboratory and library work, planned in consultation with a faculty member.

## CHEM 498 Honors Seminar

Spring. No credit. Admission by departmental invitation. Additional prerequisites or corequisites: outstanding performance in either (1) two coherent 4-credit units of research in a course such as Chemistry 421 , 433,461 , or 477 ; or (2) one 4 -credit unit in a course such as Chemistry $421,433,461$, or 477 and summer research equivalent to at least 4 credits in the same subject.

W 2:30-4. J. Meinwald
Informal presentations and discussions of selected topics in which all students participate. Individual research is on advanced problems in chemistry or a related subject under the guidance of a faculty member, culminating in a written report.

## CHEM 600-601 General Chemistry Colloquium

600, fall; 601 , spring. No credit. Required of all graduate students except those majoring in organic or bioorganic chemistry. Juniors and seniors are encouraged to attend.

R 4. Fall: R. Loring; spring: J. H. Freed. A series of talks representative of all fields of current research interest in chemistry other than organic chemistry, given by distinguished visitors and faculty members

## CHEM 605 Advanced Inorganic

 Chemistry I: Symmetry, Structure, and ReactivityFall. 4 credits. Prerequisite: Chemistry 389 390 or equivalent or permission of instructor.

Lecs, M W F 11:15. R. C. Fay
Selected topics in structure, bonding, and reactivity of inorganic compounds with emphasis on main group elements; at the level of Chemistry of the Elements, by Greenwood and Earnshaw. Group theory applications: hybrid orbitals, molecular orbitals, molecular vibrations, and ligand field theory; at the level
of Cotton's Chemical Applications of Group Tbeory.
[CHEM 606 Advanced Inorganic Chemistry II: Synthesis, Structure, and Reactivity of Inorganic and Organotransition Metal Compounds Fall. 4 credits. Not offered 1994-95 Lecs, M W F 10:10. P. T. Wolczanski. Synthesis, structure, and reactivity of coordination compounds and organometallic complexes. Emphasis on bonding models, structure, and reactivity, including the elucidation of mechanisms. Readings at the level of Purcell and Kotz's Inoryanic Chemistry, and Collman, Hegedus, Finke, and Norton's Principles and Applications of Organotransition Metal Chemistry.]

## CHEM 607 Advanced Inorganic

 Chemistry III: Solid-State ChemistrySpring. 4 credits. Prerequisite: Chemistry 605 or permission of instructor.

Lecs, M W F 12:20. F. J. DiSalvo The third of a three-term sequence. Interdisciplinary approach to solids. Topics include solid-state structure and X-ray diffraction, synthesis methods, defects in solids, phase diagrams, electronic structure, and chemical and physical properties of solids. Text: Solid State Chemistry and Its Applications, by West. Readings from inorganic chemistry and solidstate physics texts.

## CHEM 622 Chemical Communication

 (also Biological Sciences 623)Fall. 4 credits. Limited to 30 students. Prerequisites: Chemistry 358 or 360 and Biological Sciences 102. Intended primarily for research-oriented students. Offered alternate years.

Lecs, M W F 1:25. J. Meinwald, T. Eisner, W. RoeLofs and guest lectures.

The production, transmission, and reception of chemical signals in communicative interactions of animals, plants, and microorganisms. Communication involving insects is emphasized. Specific topics are treated, with varying emphasis on chemical, biochemical, neurobiological, ecological, and evolutionary principles.

## [CHEM 625 Advanced Analytical Chemistry I

Fall. 4 credits. Prerequisite: Chemistry 288 or 390 or equivalent. Not offered 1994-95. Lecs, M W F 9:05; occasional prelims T 7:30 p.m. D. B. Zax.
The application of molecular spectroscopy to chemical problems. Topics in infrared, NMR, and mass spectroscopy are discussed.]

## [CHEM 627 Advanced Analytical

 Chemistry IISpring. 3 credits. Primarily for graduate students. Prerequisite: Chemistry 288 or 390 or equivalent. Not offered 1994-95.

Lecs, T R 10:10; problem sessions and exams, T 7:30 p.m
Modern analytical methods for molecular characterizations, including electron, Mossbauer, and Fourier spectroscopy; mass spectrometry; methods applicable to macromolecules; information theory.]

CHEM 628 Advanced Analytical Chemistry III (also Nutritional Sciences 690)
Spring. 3 credits. Primarily for graduate students. Prerequisite: Chemistry 288 or 390, or Chemistry 208 and Mathematics 112, or permission of instructor

Lecs, T R 10:10. J. T. Brenna.

Modern trace, micro, and surface methods of analysis, including atomic spectrometry, solids mass spectrometry, high precision isotope ratio techniques, activation analysis, microscopic, microprobe, and electron spectros copy. Applications to biological and solid state problems.

## [CHEM 629 Electrochemistry

Spring. 4 credits. Primarily for graduate students and upperclass undergraduates. Prerequisite: Chemistry 390 or equivalent (Mathematics 213 helpful). Not offered 1994-95.

Lecs, T R 8:40-9:55. H. D. Abruña. Fundamentals and applications of electrochemistry. Topics will include the fundamentals of electrode kinetics, electron transfer theory, the electrical double layer, and diffusion. A wide range of techniques and their application as well as instrumental aspects will be covered.]

## CHEM 650-651 Organic and

Organometallic Chemistry Seminar 650, fall; 651, spring. No credit. Required of all graduate students majoring in organic or bioorganic chemistry. Juniors and seniors are encouraged to attend.

M 4. D. B. Collum
A series of talks representative of all fields of current research interest in organic and organometallic chemistry, given by research associates, faculty members, and distinguished visitors

CHEM 665 Advanced Organic Chemistry
Fall. 4 credits. Primarily for graduate students and upperclass undergraduates. Prerequisites: Chemistry 253 or 358 or 360 , and 390 or equivalents or permission of instructor

Lecs, M W F 12:20. D. B. Collum.
A survey of reaction mechanisms and reactive intermediates in organic chemistry

CHEM 666 Synthetic Organic Chemistry
Spring. 4 credits. Primarily for graduate students and upperclass undergraduates. Prerequisite: Chemistry 665 or permission of instructor.

Lecs, T R 10:10-11:25. D. B. Collum. Modern techniques of synthesis; applications of organic reaction mechanisms to the problems encountered in rational multistep synthesis, with particular emphasis on modern developments in synthesis design.

## CHEM 668 Chemical Aspects of

 Biological ProcessesFall. 4 credits. Prerequisite: Chemistry 360 or equivalent.

Lecs, T R 10:00-11:30; and occasionally M 8 p.m. T. P. Begley.
A representative selection of the most important classes of enzyme-catalyzed reactions will be examined from a mechanistic perspective. Topics discussed will include the chemical basis of enzymatic catalysis, techniques for the elucidation of enzyme mechanism, cofactor chemistry, and the biosynthesis of selected natural products. The application of chemical principles to understanding biological processes will be emphasized.
[CHEM 671 Synthetic Polymer Chemistry (also Materials Science and Engineering 671 and Chemical Engineering 675)
Spring. 4 credits. Prerequisite: Chemistry 359-360 or equivalent or permission of instructor; recommended: Materials Science and Engineering 620. Not offered 1994-95.

Lecs, T R 8:30-10. D. Sogah.
Modem concepts in synthetic polymer chemistry. The application of organic synthesis to the development of new polymers and copolymers and the control of their architecture. Chain and step-growth polymerizations, reactions of polymers, block and graft copolymers. A broad spectrum of applications from recent literature will also be discussed.]

## CHEM 672 Protein Kinetics

Fall. 4 credits. Primarily for graduate students in Chemistry and Biochemistry. Prerequisite: Chemistry 390, Biological Sciences 331, or equivalents or permission of instructor.

Lecs, M W F 9:05. B. A. Baird
Focus is on protein interactions with ligands and consequent charges in structure and activity. Topics include: protein structure and dynamics; thermodynamics and kinetics of ligand binding; steady state and transient enzyme kinetics; enzyme catalysis and regulation; role of cell membrane receptors in regulating cellular activities.

## [CHEM 677 Chemistry of Nucleic Acids

 Spring. 4 credits. Primarily for graduate students. Prerequisites: Chemistry 358 or 360, and 390 or equivalents. S-U grades only. Not offered 1994-95.Lecs, M W 10-11:10. D. A. Usher. Properties, synthesis, reactions, and biochemical reactions of nucleic acids.]

CHEM 678 Statistical Thermodynamics Fall. 4 credits. Primarily for graduate students. Prerequisite: Chemistry 288 or 390 or equivalents.

Lecs, M W F 9:05-10. J. H. Freed. Principles of statistical thermodynamics. Ensemble averages, Boltzmann distribution, partition functions, and thermodynamic quantities. Ideal gases and crystals. Evaluating thermodynamic properties from spectroscopic and structural data. Chemical equilibrium. Dense gases; the second virial coefficient. Statistical mechanics of solutions Bose-Einstein statistics: photons, phonons Fermi-Dirac Statistics: electrons in metals. At the level of Introduction to Statistical Thermodynamics by Hill.

## [CHEM 681 Physical Chemistry III

Fall. 4 credits. Prerequisites: Chemistry 288 or 390; Mathematics 213 and Physics 208; or equivalents. Not offered 1994-95.

Lecs, M W F 10:10.
An introduction to the principles of quantum theory and statistical mechanics, atomic and molecular spectra, and elementary valence theory. At the level of Quantum Cbemistry, by Levine.]

## CHEM 686 Physical Chemistry of

 ProteinsSpring. 4 credits. Primarily for graduate students. Prerequisite: Chemistry 288 or 390 or equivalents. S-U grades. Letter grades for undergraduates. Offered alternate years.

Lecs, M W F 8, and occasionally W 7:30 p.m. H. A. Scheraga.

Chemical constitution, molecular weight, and structural basis of proteins; thermodynamic, hydrodynamic, optical, spectroscopic, and electrical properties; protein and enzyme reactions; statistical mechanics of helix-coil transition in biopolymers; conformation of biopolymers; protein folding.

CHEM 700 Baker Lectures
Fall, on dates to be announced. No credit. Distinguished scientists who have made significant contributions to chemistry present lectures for periods varying from a few weeks to a full term. This year's lecturer: Prof. Gerhard Wegner, Max Planch Institute for Polymer Research, Mainz, Germany.
[CHEM 701-702 Introductory Graduate Seminar In Analytical, Inorganic, and Physical Chemistry
701, fall; 702, spring. No credit. Required of all first-year graduate students majoring in analytical, inorganic, physical, theoretical, and biophysical chemistry. Not offered 1994-95.

Hours to be arranged.]

## CHEM 716 Special Topics in Advanced

 Inorganic ChemistryFall. 3 credits.
Lecs, M W F 10:10-11:00. D. B. Zax Topic: Applications of nuclear magnetic resonance, and other spectroscopies, to problems of structure and dynamics in solids

CHEM 745 Physical Polymer Science I (also Chemical Engineering 745)
Spring, 3 credits. Prerequisite: a graduatelevel thermodynamics statistical course.

Lecs, to be arranged. C. Cohen. Thermodynamic properties of dilute semidilute, and concentrated solutions from both classical and scaling approaches. Characterization techniques of dilute solutions: osmometry, light scattering, viscometry, and sedimentation. Rubber elasticity; mechanical and thermodynamic properties of gels Polymer melts: equations of state and glass transition phenomenon.
CHEM 762 Special Topics in Organic Chemistry: Fundamentals of Polymer Chemistry
Fall. 4 credits. Prerequisite: Physical Chem 389/390 and Organic Chem 359/360 or equivalent or permission of instructor. Primarily for graduate and advanced undergraduate students.

Lecs, T R 8:30-10:00. D. Y. Sogah. Introduction to polymer physical chemistry Kinetics and mechanisms of Polymerization methods: Ionic, radical, step-growth and group transfer polymerization. Polymer Stereochemistry. Solution properties: Molecular weight characterization and polymer solubility. Mechanical and Thermal Properties. Structure-Property Relations. The discussions will focus on chemistry rather than engineering of polymers and examples will be taken from current literature.

CHEM 765 Physical Organic Chemistry I
Spring. 4 credits. Primarily for graduate students. Prerequisite: Chemistry 665 or permission of instructor.

Lecs, M W F 10:10. B. K. Carpenter. Application of computational and experimental techniques to studies of organic reaction mechanisms and the properties of reactive intermediates

## [CHEM 766 Physical Organic

 Chemistry IISpring. 3 credits. Primarily for graduate students. Prerequisite: Chemistry 765 or permission of instructor. Not offered 1994-95. Quantitative aspects of organic chemistry.]

## [CHEM 774 Chemiatry of Natural

 ProductsFall. 3 credits. Primarily for graduate students. Prerequisites: Chemistry 665-666. Not offered 1994-95

Lecs, T R 12:20.
Particular attention is devoted to methods of structure determination and synthesis as applied to selected terpenes, steroids, alkaloids, and antibiotics.]

## CHEM 780 Principles of Chemical

 KineticsFall. 4 credits. Prerequisite: Chemistry 681 or permission of instructor.

Lecs, T R 10:00-11:15. P. L. Houston Principles and theories of chemical kinetics; special topics such as surface reactions, photochemistry, enzymatic reactions, energy transfer, and molecular beams.

## CHEM 782 Special Topics in Blophysical and Bioorganic Chemistry

Spring. 3 credits.
Lecs, T R 11:15. A. Kuki
Topics vary from year to year
[CHEM 789 X-ray Crystallography Spring. 4 credits. Prerequisite: Chemistry 288 or 390 or permission of instructor. Offered alternate years. Not offered 1994-95

Lecs, M W F 10:10. J. Clardy.
A beginning course in the application of X-ray crystallography to structural chemistry. Topics include symmetry properties of crystals, diffraction of X-rays by crystals, interpretation of diffraction data, and refinement of structures. The chemical information available from a diffraction experiment is stressed, and theoretical aspects are illustrated by conducting an actual structure determination as a classroom exercise.]

## [CHEM 791 Spectroscopy

Spring. 4 credits. Prerequisite: Chemistry 793 or Physics 443 or equivalent. Not offered 1994-95.

Lecs, M W F 10:10-11. G. S. Ezra The course will explore the interaction of light with matter. We will start with the quantum mechanical foundations of spectroscopy and follow with a detailed treatment of a variety of different spectroscopies including the study of rotation, vibration, and electronic spectra of polyatomics. As time and interest allow, we will cover special topics such as non-linear spectroscopies and the molecular symmetry group. At the level of Kroto's Molecular Rotation Spectra.]
[CHEM 792 Molecular Collision Theory Spring. 4 credits. Not offered 1994-95 Lecs, T R 10:10-11:25. G. S. Ezra. The concepts and methods of scattering theory are described with particular emphasis on applications to problems of chemical interest. At the level of Child's Molecular Collision Theory and Taylor's Scattering Theory.]

## CHEM 793 Quantum Mechanics I

Fall. 4 credits. Prerequisites: Chemistry 681, coregistration in Mathematics 421 or equivalents or permission of instructor.

Lecs, M W F 11:15. G. S. Ezra
Schrodinger's equation, wave packets, uncertainty principle, WKB theory, matrix mechanics, orbital and spin angular momentum, exclusion principle, perturbation theory, variational principle. At the level of CohenTannoudji's Quantum Mechantcs

## CHEM 794 Quantum Mechanics II

Spring. 4 credits. Prerequisites: Chemistry 793 or equivalent and the equivalent of or coregistration in Physics 432 and Mathematics 422, or permission of instructor.

Lecs, M W F 9:05. A. C. Albrecht.

Quantum structure of atoms and molecules. Time-dependent phenomona in quantum mechanics and light/matter interaction. Spectroscopies. Group theory. At the level of Weissbluth's Atoms and Molecules, Levine's Quantum Cbemistry, and Sakurai's Modern
Quantum Mechanics.

## CHEM 796 Statistical Mechanics

Fall. 4 credits. Primarily for graduate students. Prerequisite: Chemistry 678 and 793 or equivalent.

Lecs, T R 8:30-9:55. B. Widom. Statistical mechanics of systems of interacting particles. Structure and thermodynamics of classical liquids. Phase transitions and critical phenomena. This course provides a survey of topics in modern statistical mechanics. Students are presumed to have taken a course in statistical thermodynamics at the level of the first ten chapters of Statistical Mechanics, by McQuarrie.

## CHEM 798 Special Topics in Physical Chemistry: Phase Transitions and Phase Equilibrium

Spring. 4 credits. Prerequisite: Chemistry 605 , or 681 , or 793 , or Physics 443 , or the equivalent.

Lecs, T R 10:10-11:25. R. Hoffmann. Bonding in extended materials-solids, surfaces, and polymers-will be discussed, at an intermediate level.

## CHINESE

See Modern Languages and Linguistics.
FALCON Program: 255-6457; C. Shih, 213
Morrill Hall, 255-4230; J. Wheatley, 416 Morrill Hall, 255-9301.

## CLASSICS

J. Rusten, acting chair; L. S. Abel, F. M. Ahl, J. Barrett, K. Clinton, J. E. Coleman, G. Davis, J. R. Ginsburg, I. Hohendahl, P. Keyser, G. M. Kirkwood (emeritus), H. Kolias, P. I. Kuniholm, D. Mankin (director of undergraduate studies), G. M. Messing (emeritus), C. Minkowski, P. T. Mitsis, A. Nussbaum, H. Pelliccia (graduate faculty representative), P. Pucci, D. R. Shanzer

## Timothy D. Barnes, Townsend Lecturer

Cornell University has long recognized the importance of studying the civilizations of ancient Greece and Rome. Particularly in an age of increasing specialization, study of the Classics is widely viewed as an excellent means of acquiring a liberal education; at Cornell, we are deeply interested in the continuing humanistic values contained in the literature of the ancient world and in gaining a fuller understanding of these important cultures and their imprint upon subsequent ages.
The Department of Classics at Cornell is one of the oldest and largest in the country. With nineteen faculty members, together with professors of related interests in the departments of History, Philosophy, Comparative Literature, History of Art, Modern Languages and Linguistics, and Near Eastern Studies and in the Archaeology, Medieval Studies, and Religious Studies programs, the range of instruction available is very large, including not only the traditional study of language,
literature, and ancient history, but also newer developments in the field, such as comparative study of Mediterranean civilizations and modern literary theory.
Although Classics, like other areas of humanistic study, does not aim at providing specific preprofessional training, over the years Classics majors from Cornell have gone on to a wide variety of careers: in law, teaching, medicine, diplomacy, management, educational administration, government, and many others.
The department offers courses in Bronze Age and Classical archaeology and is active in field projects in Classical lands. It sponsors archaeological excavations at Halai in Greece, which serves as a field training school for Cornell undergraduate and graduate students. On campus there are also collections of ancient artifacts, reproductions of ancient sculpture, and one of the few laboratories in the world to concentrate on the tree-ring dating of ancient monuments from Greece, Cyprus, and Turkey. The archaeology courses may be used to satisfy some of the requirements for the Intercollegiate Program in Archaeology or for the major in Classical Civilization. They require no knowledge of either Greek or Latin. Similarly, the department offers a variety of courses and seminars in English on such subjects as Greek mythology, Greek and Roman mystery religions, early Christianity, and Greek and Roman society, as well as ancient epic, tragedy, history, and philosophy. For those whose interest in things Greek and Roman extends no further than a desire to understand the English language a little better, the department offers one course in the Greek and Latin elements that make up a huge proportion of the vocabulary of Modern English, and another that deals more specifically with the Greek and Latin ingredients of bioscientific vocabulary. Programs in Greek and Latin at the elementary level are also offered, of course; and for the more ambitious there are courses involving reading, in the original, of Greek and Latin authors from Homer to St. Augustine and Bede and, periodically, the Latin works of Dante, Petrarch, and Milton. Sanskrit, the classical language of ancient India, is also offered, along with courses in translation on Indic religion, myth, and literature. The department makes every attempt to adapt its program to the needs of each student. If there is a Classical writer you would like to study, the department will do its best to help you do so whether you are a major in the department or not.

## Majors

The Department of Classics offers majors in Classics, Greek, Latin, and Classical Civilization.

## Classics

Those who major in Classics must complete 24 credits in advanced Greek or Latin (numbered 201 or above) and 15 credits in related subjects selected in consultation with the adviser.

## Classical Civilization

Those who major in Classical Civilization must complete (a) qualification in Latin and Greek or proficiency in either; (b) 24 credits selected from the courses listed under Classical
civilization, Classical archaeology, Latin, and Greek; and (c) 15 credits in related subjects selected in consultation with the adviser.

## Greek

Those who major in Greek must complete 24 credits of advanced courses in Greek and 15 credits in related subjects (including Latin).

## Latin

Requirements for the major in Latin parallel those of the major in Greek

## Honors

Candidates for the degree of Bachelor of Arts with honors in Classics, Greek, Latin, or Classical civilization must fulfill the requirements of the appropriate major study as given above and must also successfully complete the special honors courses 370,471 , and 472 . Credit for honors courses may be included in the credits required for the major study. Students who wish to become candidates for honors, who have a cumulative average of B+ or better, and who have demonstrated superior performance in Classical courses (Greek, Latin, and Classical Civilization), submit an outline of their proposed honors work to the honors committee during the first month of their fifth semester. The chair will appoint a committee of three faculty members for each candidate, and the committee will be responsible for evaluating the candidate's proposal and subsequently supervising his or her work. At the completion of the honors thesis, which must demonstrate knowledge of the main bibliographical sources, give promise of scholarly talent, and show creativity, the committee will determine the level of honors to be awarded.

## Study Abroad

Cornell participates in the Intercollegiate Center for Classical Studies in Rome, which offers courses in Latin, Greek, ancient history, art, archaeology, and Italian. Another opportunity for a semester's study abroad is available through Comell Abroad in Greece at the Athens Centre. (Consult Cornell Abroad for details.) In addition, Cornell is a member institution of the American School of Classical Studies at Athens, whose Summer Program is open to graduate students and qualified undergraduates. The American Academy in Rome, of which Cornell is also a member institution, offers full-year and summer programs for qualified graduate students. For graduate students the Deparment of Classics offers a few travel grants each year from the Townsend Memorial Fund. Detailed information on these programs is available in the Department of Classics Office, 120 Goldwin Smith Hall.

## Summer Support for Language Study

The Beatrice R. Kanders Memorial Scholarship (for the summer immediately following the freshman or sophomore year; preference given to dyslexic students) and a certain amount of tuition aid made possible by gifts from the Constantinos C. Polychronis Foundation are normally available to students who want to enroll in Intensive Latin or Greek in the Cornell summer session. These sixweek courses are designed to enable students to enter second-year Latin or Greek the following fall. Preference is given to Classics undergraduate majors, and other students
needing Latin or Greek for completion of their majors. Applications are due to the chair of the Department of Classics by March 31.

## Placement In Latin, Ancient Greek, and Modern Greek

Placement of first-year students in Latin, ancient Greek, and modern Greek courses is determined by an examination given by the Department of Classics during orientation week or by arrangement with the director of undergraduate studies.

## Freshman Writing Seminars

The department offers freshman writing seminars on a variety of topics. Consult John S. Knight Writing Seminar Program brochures for times, instructors, and descriptions.

## Classical Civilization

CLASS 100 Word Power: Greek and Latin Elements in the English Language
Spring. 3 credits.

## I. Hohendahl.

This course gives the student with no knowledge of the Classical languages an understanding of how the Greek and Latin elements that make up over half our English vocabulary operate in both literary and scientific English usage. Attention is paid to how words acquire their meaning and to enlarging each student's working knowledge of vocabulary and grammar.
CLASS 102 Bioscientific Terminology Summer. 3 credits. H. Roisman.
A study of the Greek and Latin word elements that combine to form most of the specialized terms in the biological sciences. The student who learns the meanings of those elements and the rules of word formation usually can recognize the basic meaning of any unfamiliar word in that field. The class also gives attention to misformations and words still in use that reflect outmoded scientific theories.

## CLASS 211 The Greek Experience

## Fall. 3 credits

F. Ahl.

An introduction to the literature and thought of ancient Greece. Topics will include epic and lyric poetry, tragedy and comedy, and historical, political, philosophical, and scientific writings. Some attention will also be given to the daily life of ordinary citizens, supplemented by slides of ancient art and architecture.

## CLASS 212 The Roman Experience

Spring. 3 credits.
D. Mankin.

An introduction to the civilization of the Romans as expressed in their literature, religion, and social and political institutions.

## CLASS 217-218 Initiation to Greek and

 Roman Cultures \#Limited to 18 students. These courses are intended especially for freshmen (a few exceptionally motivated sophomores or upperclass students may be accepted) and may be taken independently of one another. Apply in writing to the chair, Department of Classics, 120 Goldwin Smith Hall. Knowledge of Greek or Latin is not necessary, since all texts are in translation. What is necessary is the willingness to participate in three one-hour seminars each week and also a
supplementary one-hour (occasionally twohour) session, during which the class will participate in workshops with specially invited guests.

## CLASS 217 Initiation to Greek Culture \#

 Fall. 4 credits.J. Barrett and P. Pucci.

This course will examine the development in Greek thought from mythological to philosophical explanations of the world and man's place in it. Readings will include Homer, Aeschylus, Sophocles, Euripides, the preSocratics, Plato, and Aristotle, as well as works by such seminal modern thinkers as Hegel, Nietzsche, Heidegger, and Derrida.

## [CLASS 218 Initiation to Roman

Culture \#
Spring. 4 credits. Not offered spring 1995. Staff.]

CLASS 223 The Comic Theater (also Comparative Literature 223 and Theatre Arts 223) \#
Spring. 3 credits. Students may not obtain credit for both this course and Classics 123. The origins of comic drama in ancient Greece and Rome, and its subsequent incarnations especially in the Italian renaissance (Commedia erudita and Commedia dell'arte), Elizabethan England, seventeenth-century France, the English Restoration, and Hollywood in the thirties and forties. Chief topics will be: the growth of the comic theatrical tradition and conventions; techniques and themes of comic plots (trickster, parody, farce, caricature); and the role of comedy in society. All readings in English.
[CLASS 235 Modern Greek Poetry and Politics (also Comparative Literature 235)

3 credits. Not offered 199495. G. Holst-Warhaft.]

CLASS 236 Greek Mythology (also Comparative Literature 236) \#
Fall or summer. 3 credits. D. Mankin.

A survey of the Greek myths, with emphasis on the content and significance of the myths in Mediterranean society, including the place of myth in Greek life and consciousness; the factors and influences involved in the creation of myths; and the use of myths for our understanding of Greek literature, religion, and moral and political concepts.

## [CLASS 237 Greek Religion and Mystery

Cults (also Religious Studies 237) \#
Spring. 3 credits. Not offered $1994-95$; next offered 1996-97.

> K. Clinton.

Greek religion constitutes one of the essential features of ancient Greek civilization and distinguishes it from later Western civilization. Since religion permeates Greek culture, including the major art forms (epic poetry, tragedy, comedy, architecture, painting, and sculpture), the course will investigate the interaction of religion with these forms-an investigation that is fruitful both for the understanding of Greek religion and the forms themselves, some of which, like tragedy, originated in cult. A representative variety of cults and their history will be studied with special emphasis on mystery cults, such as the Eleusinian mysteries of Demeter and Persephone, the Kabiroi, the Great Gods of Samothrace, and Bacchic rites.]
[CLASS 238 The Ancient Epic and Beyond \#
Fall. 3 credits. Not offered 1994-95; next offered 1995-96
H. Pelliccia.

We will move, Odysseus-like, to the West: beginning with Homer's Iliad (and including the British poet Christopher Logue's "account" of the opening books) and Odyssey, we will continue in the Hellenistic and Augustan eras with Apollonius of Rhodes' Argonautica and Virgil's Aeneid. A violent shift in space and time will have us conclude with two New World maritime epics: Herman Melville's Moby Dick and Derek Walcott's Omeros.]

## [CLASS 245 Greek and Roman

 Historians \#3 credits. Not offered 1994-95.
J. Ginsburg.]

CLASS 285 Art, Archaeology, and Analysis lalso ARCH 285, ENGRG 185, MS\&E 285, PHYS 200, ENGL 285, ART 372, and NS\&E 285)
Spring. 3 credits.
Staff.
An interdepartmental course on how techniques of physical sciences and engineering are being applied to issues in cultural research. For complete description, see ENGRG 185.

## CLASS 291 Classical Indian Narrative

 (also Asian Studies 291)Spring. 3 credits.
C. Minkowski.

For description, see Asian Studies 291.
[CLASS 333 Greek and Roman Mystery Cults and Early Christianity (also Religious Studies 333) \#
4 credits. A previous course in Classics (civilization or language) or Religious Studies 101 is recommended. Not offered 1994-95; next offered 1995-96.
K. Clinton.

A study of the controversial question of religious continuity between paganism and early Christianity. After a brief survey of Classical mystery cults and Hellenistic religion, the course will focus on such Hellenistic cults as the mystery cults of Isis, Bacchus, and Artis and the Great Mother and on the distinctive features that contributed to their success. Discussion of Christian liturgy and beliefs both in the East and the West to determine what Christianity owed to its pagan predecessors and to isolate the factors that contributed to its triumph over the "rival" pagan cults of late antiquity.]
[CLASS 339 Ancient Wit: An Introduction to the Theory and Form of Comic and Satiric Writing in Greece and Rome (also Comparative Literature 339) *
4 credits. Not offered 1994-95; next offered 1995-96.
F. Ahl.J
[CLASS 352 Queen of Cities: Byzantine Constantinople, Ottoman Istanbul (also History 315, Near Eastern Studies 350, and Religious Studies 352) ©

Spring. 4 credits. Not offered 1994-95.
L. Peirce and C. Rapp.

For description, see Near Eastern Studies 350.]

CLASS 357 Greek Sanctuaries and Pausanias (also Archaeology 357, Religious Studies 353, and Classics 457) \#

Fall. 3 credits. Prerequisite: at least one course in classical civilization or archaeology
K. Clinton and J. Coleman.

Many Greek sanctuaries were described by Pausanias, who wrote a guide to Greece in the second century C.E. By comparing his descriptions (and other written sources) with the archaeological remains at the actual sites, the course will examine how these sanctuaries functioned and what they meant to Greeks of his day. No Greek required for 357; for 457 see Greek, Classics 457
CLASS 358 Readings in Ancient Medicine (also Science and Technology Studies 358)
Spring. 3 credits. Prerequisite: Classics 211, Classics 217, or permission of instructor. P. Keyser.

The class will read Hippokrates, Galen, and other ancient authors in translation. We will discuss their philosophical, technical, and cultural context.
[CLASS 363 Representations of Women in Ancient Greece and Rome (also Women's Studies 363) \#
Spring. 4 credits. Not offered 1994-95.
L. S. Abel, J. Ginsburg.]
[CLASS 382 Greeks, Romans, and Victorians (also Comparative Literature 382) \#
Spring. 4 credits. Not offered 1994-95; next offered 1996-97.
F. Ahl.

Modern popular and scholarly views of Greek and Latin literature were shaped in the Victorian years of the nineteenth century, between the years of Republican and Marxist revolution. This course explores some of the ways in which nineteenth-century social and intellectual upheavals, and changes in scholarly techniques and approaches, may have affected how English and Irish writers presented Greco-Roman antiquity and, especially, how they began to discard an idealized past based on a Roman model for one based on a Greek model. The focus will be on poets and dramatists (and a few artists and novelists) rather than on philosophers and scientists. The varied influences of Vergil and Homer, Seneca and Sophocles, Plautus and Aristophanes, Horace, and Greek lyric poetry will be discussed in selected works of writers such as Thomas More, Shelley, Byron, Swinburne, Arnold, Tennyson, W. S. Gilbert, Oscar Wilde, Samuel Butler, and others, including important artists such as Aubrey Beardsley.I
[CLASS 390 Comparative Sanskrit Myth and Epic (also Asian Studies 390) em

Fall. 4 credits. Not offered 1994-95.
C. Minkowski.

Readings in translation from the two Sanskrit epics, the Mababbarata and the Ramayana, and from the main cycles of the Puranas, the Sanskrit mythological literature. Special attention will be given to parallels and comparisons with Greek myth and epic, especially Homer and Hesiod. Classics 236 or 238 would be useful as background, but not presupposed.]

CLASS 395 Classical Indian Philosophical Systems (also Asian Studies 395 and Religious Studies 395) ©

Fall. 4 credits. Prerequisite: some background in philosophy or in classical Indian culture.
C. Minkowski.

For description, see Asian Studies 395.
[CLASS 459 The Language of Myth
4 credits. Not offered 1994-95.
P. Pucci.]

CLAS5 463 Gender and Politics in the Roman World (also History 463 and Women's Studies 464) \#
Fall. 4 credits.
J. Ginsburg.

An undergraduate seminar examining the relationship between gender and politics in the late Roman Republic and early Empire. Among the questions this course will address are: was politics the exclusive domain of men in Roman society (as is generally assumed) or does a broader definition of politics and an understanding of the various forms political activity in ancient Rome might take allow a place for women in Roman political life? what role does gender have in Roman political discourse and ideology? why do issues such as family, marriage, and sexuality become subjects of political debate and legislation?

## CLASS 465-466 Independent Study in

 Classical Civilization, Undergraduate Level465, fall; 466 , spring. Up to 4 credits.
Hours to be arranged. Staff.

## CLASS 480 Roman Society and Politics

 under the Julio-Claudians (also History 473) \#Spring. 4 credits. Prerequisite: Classics 212, History 268, or permission of instructor. J. Ginsburg.

An undergraduate seminar examining several of the important social and political changes in Roman society under Augustus and his successors, the Julio-Claudians. Topics to be investigated include Augustus's consolidation of power through political and social revolution, the Augustan attempt to regulate family life and social relations by legislation, the relation of the emperor Tiberius with the members of the old ruling class, the growth of the imperial bureaucracy and the new opportunities for social mobility, the political opposition to Claudius and Nero, Nero's cultural and provincial policy, and the manipulation of the imperial cult. All readings will be in English.

## CLASS 711-712 Independent Study for

 Graduate Students in Classical Civilization711, fall; 712, spring. Up to 4 credits. Hours to be arranged. Staff.

## Greek

CLASS 101 Greek for Beginners
Fall. 4 credits.
F. Ahl.

Introduction to Attic Greek, Designed to enable the student to read the ancient authors as soon as possible.

## CLASS 103 Attic Greek

Spring. 4 credits. Prerequisite: 101 or equivalent.
H. Pelliccia.

A continuation of Classics 101.

## CLASS 104 Intensive Greek

## Summer. 6 credits.

Staff.
An intensive introduction to the fundamentals of ancient Greek grammar. Prepares students in one term for 200-level Greek.

## CLASS 111-112 Modern Greek

111, fall; 112, spring. 3 credits each term. H. Kolias.

## CLASS 201 Attic Authors \#

Fall. 3 credits. Prerequisite: Classics 103 or 104 or equivalent.
K. Clinton.

Selected readings from Greek prose and poetry.
[CLASS 202 The Greek New Testament (also Near Eastern Studies 220 and Religious Studies 202) \#
Spring. 3 credits. Prerequisite: at least one year of ancient Greek (Classics 101-103) or permission of instructor. Not offered 1994-95. J. Rusten.

Selections in Greek from all four gospels and the letters of Paul, with special attention to Luke, Acts, and Corinthians I-II.]

## CLASS 206 Herodotus

Spring. 3 credits. Prerequisite: Classics 103 or 104 or equivalent.
L. Abel.

Selected readings from Herodotus' Histories.

## [CLASS 209 Greek Composition

Spring. 3 credits. Prerequisite: One term of 200 -level Greek or equivalent. Not offered 1994-95; next offered 1995-96.]
[CLASS 213 Intermediate Modern Greek Fall. 3 credits. Prerequisite: Classics 112 or placement by departmental examination. Not offered 1994-95.
H. Kolias.

This course, designed for students who have completed introductory modern Greek or have a reading knowledge of the language, will give attention to developing facility in conversational and written expression, usually in connection with assigned readings reflecting Greek history and culture.]

## [CLASS 214 Readings in Modern Greek

## Literature

Spring. 3 credits. Prerequisite: Classics 213 or permission of instructor. Not offered 1994-95

## H. Kolias.

A study of modern Greek language, history, and culture as manifested in the works of individual poets, dramatists, and prose writers.]
[CLASS 301 Greek Historians \#
4 credits. Prerequisite: one term of 200 -level Greek. Not offered 1994-95.]
[CLASS 302 Greek Tragedy \#
Spring. 4 credits. Prerequisite: one term of 200 -level Greek or equivalent. Not offered 1994-95.]
[CLASS 305 Attic Comedy \#
4 credits. Prerequisite: one term of 200-level Greek or equivalent. Not offered 1994-95.]
[CLASS 306 Greek Lyric Poetry \#
4 credits. Prerequisite: one term of 200 -level Greek or equivalent. Not offered 1994-95.]

## CLASS 310 Greek Undergraduate

 Seminar \#Spring. 4 credits. Prerequisite: two 200 -level courses in Greek or permission of instructor. P. Pucci.

## CLASS 311 Greek Philosophical Texts

 (also Philosophy 411) \#Fall. Up to 4 credits. Prerequisites: knowledge of Greek and permission of instructor. Hours to be arranged. T. H. Irwin.
Reading of Greek philosophical texts in the original.

CLASS 313 Greek Epic
Fall. 4 credits. Prerequisite: Classics 206 or equivalent.
H. Pelliccia.

Readings from the Odyssey. Emphasis upon the nature of Homeric language and the literary interpretation of the poem.
CLASS 401-402 Independent Study in Greek, Undergraduate Level
401, fall; 402 , spring. Up to 4 credits. Hours to be arranged. Staff.
CLASS 417 Advanced Readings in Greek Fall. 4 credits. Fall topic: Prose.
H. Pelliccia.

Rapid reading of prose works selected from graduate reading list. Emphasis will be on translation skills. Designed to meet the needs of graduate students preparing for " A " exams, and especially for those intending to take Advanced Greek Prose Composition in the spring. Open to advanced undergraduates by permission of the instructor.
Spring. 4 credits. Spring topic: Early and late Euripides.
P. Pucci.

CLASS 419 Advanced Greek Composition
Spring. 3 credits. Prerequisite: Classics 209 or equivalent.
H. Pelliccia.

CLASS 433 Greek Mystery Cults (also Classics 633 and Religious Studies 433)

Spring. 4 credits. Prerequisite: one term of 300 -level Greek or permission of instructor. K. Clinton.

Discussion of the evidence for major Greek nystery cults-the Mysteria at Eleusis, the cult of the Great Gods at Samothrace, and Dionysiac mysteries-with the aim of elucidating the structure and religious purpose of these cults and the nature of the initiates' experience. The evidence includes: the Homeric Hymn to Demeter, Plato's Symposium, works of Christian Fathers, inscriptions, artistic representations, and archaeological data. If time permits, some attention may be given to other mystery cults.

## [CLASS 442 Greek Philosophy \#

Spring. 4 credits. Not offered 1994-95.J

## CLASS 457 Greek Sanctuaries and

 Pausanias (also Classics 357) * Fall. 4 credits.K. Clinton and J. Coleman.

For description, see Classical Civilization, Classics 357. Students in Classics 457 will read relevant sections of Pausanias and other documentation such as inscriptions in Greek.
[CLASS 618 Advanced Readings in Greek Fall. 4 credits. For graduate students, and advanced undergraduates with permission of instructor. Not offered 1994-95.]

CLAS5 633 Greek Mystery Cults (also Classics 433)
Spring. 4 credits.
K. Clinton.

For description, see Classics 433. Students taking the course as 633 will be required to do additional work.

## CLASS 671 Graduate Seminar in Greek: lliad

Fall. 4 credits.
P. Pucci.
[CLASS 672 Graduate Seminar in Greek Spring. 4 credits. Not offered 1994-95.]
CLASS 701-702 Independent Study for Graduate Students in Greek
701 , fall; 702 , spring. Up to 4 credits.
Hours to be arranged. Staff.

## Latin

CLASS 105 Latin for Beginners
Fall. 4 credits.
A. Nussbaum and staff.

An introductory course in the essentials of Latin, designed for rapid progress toward reading the principal Latin writers.

## CLASS 106 Elementary Latin

Spring. 4 credits. Prerequisite: 105 or equivalent.

Staff.
A continuation of Classics 105, using readings from various authors.

## CLASS 107 Intensive Latin

Fall or summer. 6 credits.
Fall: I. Hohendahl.
Prepares students in one term for 200 -level Latin.

## CLASS 205 Intermediate Latin \#

Fall or summer. Prerequisite: Classics 106,
107 , or placement by departmental examination.

Fall: D. Mankin; J. Barrett.
Readings in Latin prose.

## CLASS 207 Catullus *

Spring. 3 credits. Prerequisite: Classics 106, 107 , or one term of 200 -level Latin.
D. Mankin.

## [CLASS 208 Roman Drama \#

Spring. 3 credits. Prerequisite: Classics 106, 107 , or one term of 200 -level Latin. Not offered 1994-95.
J. Rusten.]

## CLASS 216 Vergil \#

Spring. 3 credits. Prerequisite: Classics 106, 107 , or one term of 200 -level Latin.
K. Clinton.

## CLASS 241 Latin Composition

Spring. 3 credits. Prerequisite: Classics 106, 107, or equivalent.
J. Ginsburg.

## CLASS 312 Latin Undergraduate

 Seminar: Cicero: Murder TrialsFall. 4 credits. Prerequisite: two terms of 200 -level Latin or permission of instructor. J. Ginsburg.

Among the most famous of Cicero's speeches are those undertaken for the defense of men charged with murder or attempted murder. In this course we will read and examine two of the speeches written for murder trials, those in defense of Marcus Caelius Rufus and Titus
Annius Milo. Our focus will be the rhetorical strategies employed by Cicero to pursuade his audience of his clients' innocence; we will
also examine these speeches within the historical context of the Late Republic, a time of political turmoil and of changed social mores and attitudes.
[CLASS 314 The Augustan Age \#
4 credits. Prerequisite: two terms of 200-level Latin or permission of instructor. Not offered 1994-95.]
[CLASS 315 Roman Satire \#
4 credits. Prerequisite: two terms of 200-level Latin or permission of instructor. Not offered 1994-95.]
[CLASS 316 Roman Philosophical Writers \#
Fall. 4 credits. Prerequisite: two terms of 200-level Latin. Not offered 1994-95.]

## [CLASS 317 Roman Historiography: Suetonius and Tacitus \#

Spring. 4 credits. Prerequisite: one term of 300 -level Latin or permission of instructor. Not offered 1994-95; next offered 1995-96.
J. Ginsburg.

Readings from Suetonius' Lives of the Caesars and Tacitus' Annals, with particular emphasis on the different aims and literary methods of biography and history. Should Suetonius' work be taken less seriously as a historical source than the narrative of his contemporary, Tacitus? Our understanding and appreciation of both writers will be enhanced if we attempt to place Suetonius and his work in the intellectual and cultural currents of his day rather than to see him as a failed narrative historian.]
[CLASS 318 Roman Elegy: Tibullus, Propertius, Ovid \#
Fall. 4 credits. Prerequisite: two terms of 200-level Latin. Not offered 1994-95.]

## CLASS 338 Latin Undergraduate

 Seminar: ElegySpring. 4 credits. Prerequisite: two terms of 200-level Latin or permission of instructor. J. Barrett.

## [CLASS 366 Late Latin: Epic after Vergil \#

4 credits. Prerequisite: two terms of 200 -level Latin or permission of instructor. Not offered 1994-95.
F. Ahl.]
[CLASS 368 Medieval Latin Literature \# 4 credits. Prerequisite: two terms of 200 -level Latin or permission of instructor. Not offered 1994-95.1

CLASS 411 Advanced Readings in Latin Literature: Seneca's Natural Philosophy
Fall. 4 credits. For advanced undergraduates, and graduate students. Prerequisite: two terms of 300 -level Latin or permission of instructor.

> P. Keyser.

Students will read one of the eight books of the Quaestiones Naturales, and the others will be covered by distributing them to students one-by-one. Books not read in Latin will be covered in English. We will study Seneca's Latin and his science. Grading to be based on a paper and tests/quizzes on the Latin.
CLASS 412 Advanced Readings in Latin Literature: Apuleius \#
Spring. 4 credits.
D. Shanzer.

CLASS 439 Ammianus Marcellinus and the 4th Century A.D. (also Classics 639)

Fall. 4 credits. Prerequisite: permission of instructor.
D. Shanzer.

Readings from Ammianus Marcellinus and other related historical texts.
[CLASS 441 Advanced Latin Composition 3 credits. For undergraduates who have completed Latin 241 and for graduate students. Not offered 1994-95; next offered 1995-96.
D. Shanzer.]

## CLASS 451-452 Independent Study in

 Latin, Undergraduate Level451, fall; 452 , spring. Up to 4 credits. Hours to be arranged. Staff.

## [CLASS 468 Augustine's Confessions

 (also Religious Studies 468) \#4 credits. Prerequisite: two terms of 200 -level Latin or permission of instructor. Not offered 1994-95.

> D. Shanzer.]
[CLASS 603-604 Topics in Late Antique and Medieval Latin Literature
4 credits each term. Not offered 1994-95; next offered 1995-96
D. Shanzer.]
[CLASS 611 Advanced Readings in Latin Literature
Fall. 4 credits. Not offered 1994-95.]
CLASS 639 Ammianus Marcellinus and the 4th Century A.D. (also Classics 439)

Fall. 4 credits. Prerequisite: permission of instructor.
D. Shanzer.

For description, see Classics 439. Students who wish to enroll in Classics 639 will be required to write a research paper and do additional work.
CLASS 679 Graduate Seminar in Latin: Early Latin Hagiography
Fall. 4 credits.
T. D. Barnes.

The course will comprise two main elements. The first is an introduction to hagiographical method based on the scholarly writings of Hippolyte Delehaye and illustrated from the texts of the period of the persecutions that are normally regarded as authentic and are printed in the standard modern collections. In the second (and larger) part of the course, the principles of hagiographical method will be applied to Latin texts of the fourth and fifth centuries. These may include Jerome's lives of Paul and Hilarion, some of Prudentius' poems on martyrs, and the lives of the bishops Martin of Tours, Ambrose of Milan, and Germanus of Auxerre.

## CLASS 680 Graduate Seminar in Latin

 Spring. 4 credits.D. Mankin.

CLASS 751-752 Independent Study for Graduate Students in Latin
751, fall; 752 , spring. Up to 4 credits.
Hours to be arranged. Staff.

## Classical Art and Archaeology

CLASS 219 Mediterranean Archaeology (also Near Eastern Studies 267) "
Fall. 3 credits.
J. Coleman.

An examination of the archaeological bases of ancient Mediterranean civilization with special focus on contacts and interrelationships in the Bronze Age (ca. 3500-1100 B.C.). Topics include the Neolithic of Anatolia, Greece, and the Near East; the rise of civilization in Egypt; the Bronze Age states of Syro-Palestine (Ebla, Ugarit, Byblos, etc.); Cyprus, copper, and the Alasia question; the Hittites and Bronze Age Anatolia; the early Bronze Age in Greece;
Minorans. Mycenaeans, and their eastern and western contacts; the Bronze Age in the western Mediterranean; and ancient ships and trade in the late Bronze Age.
CLASS 220 Introduction to Classical Archaeology (also History of Art 220) \#
Spring. 3 credits.
J. Coleman.

The archaeology of the ancient Greeks and Romans as seen from a critical perspective. Major developments in Classical archaeology will be traced from treasure hunting to modern scientific research. Examples illustrating various approaches will be chosen: the sculpture, vase painting, and architecture of the ancient Greeks from the Geometric period through the Hellenistic, and the ant of the Romans from the early republic to the late empire.
[CLASS 221 Minoan-Mycenaean Art and Archaeology (also Archaeology 221 and History of Art 221) \#
Fall. 3 credits. Students may not obtain credit for both this course and Classics 319. Not offered 1994-95.]
[CLASS 232 Archaeology in Action I (also Archaeology 232 and History of Art 224) \#
Fall. 3 credits. Prerequisite: permission of instructor. Not offered fall 1994.

## P. I. Kuniholm.]

[CLASS 233 Archaeology in Action II (also Archaeology 233 and History of Art 225) \#
Spring. 3 credits. Prerequisite: permission of instructor. Not offered spring 1995. l. I. Kuniholm.]

CLASS 249 Introduction to Jewish Art and Archaeology from the Hellenistic to the Rabbinic Period (also Archaeology 247, Jewish Studies 247, Near Eastern Studies 247, and Religious Studies 247)
Fall. 3 credits.
L. Kant.

For description, see Near Eastern Studies 247.
CLASS 309 Dendrochronology of the Aegean (also Archaeology 308 and History of Art 309)
Fall and spring. 4 credits. Limited to 10 students. Prerequisite: permission of instructor
P. I. Kuniholm.

Participation in a research project of dating modern and ancient tree-ring samples from the Aegean and Mediterranean. Supervised reading and laboratory work. A possibility exists for summer fieldwork in Greece or Turkey.
[CLASS 320 The Archaeology of Classical Greece (also History of Art 320) \#

Fall. 4 credits. Prerequisite: Classics 220 or History of Art 220 or permission of instructor. Not offered 1994-95.
A. Ramage.]

CLASS 322 Greeks and Their Neighbors (also History of Art 328) "
Spring. 4 credits. Prerequisite: Classics 220 or 221, or permission of instructor.
A. Ramage.

For description, see History of Art 328.
[CLASS 323 Painting in the Greek and Roman World (also History of Art 323) "

4 credits. Not offered 1994-95.
A. Ramage.)

CLASS 325 Greek Vase Painting (also History of Art 325) \#
Fall. 4 credits. Prerequisite: previous enrollment in a History of Art or Classics course or permission of instructor.
A. Ramage.

For description, see History of Art 325
CLASS 326 Greek Cities and Towns (also History of Art 326) "
Spring. 4 credits. Prerequisite: Classics 220 or History of Art 220.
J. Coleman

Ancient Greek cities and towns from an archaeological perspective. Topics include the city in its geographical setting, the development of the fortified city, town planning, the Classical house and household, official and religious life versus private life, the territory and boundaries of cities and towns, regional states and leagues, warfare between cities and regions, and roads and sea routes. Examples will mostly be drawn from Athens/ Attica and central Greece. Two short oral presentations, presented afier consultation in written form, and a final examination.

## [CLASS 327 Greek and Roman Coins (also History of Art 327) \#

Spring. 4 credits. Prerequisite: History of Art 220 or Classics 220 or permission of instructor. Not offered 1994-95.

## A. Ramage.]

## [CLASS 329 Greek Sculpture (also History of Art 329) \#

4 credits. Not offered 1994-95.]
[CLASS 350 Arts of the Roman Empire (also History of Art 322) \#
Fall. 4 credits. Prerequisite: Classics 220 or permission of instructor. Not offered 1994-95. A. Ramage.]
[CLASS 356 Practical Archaeology (also Archaeology 356)
4 credits. Prerequisite: one course in archaeology. Not offered 1994-95.

> J. Coleman.]

## CLASS 360 Field Archaeology in Greece

 (also Archaeology 360) \#Summer. 6 credits.
J. Coleman.

A six-week archaeological field training program in conjunction with the Comell Halai and East Lokris Project. For information and application forms, contact Professor John E. Coleman, Department of Classics, 120
Goldwin Smith Hall.

## [CLASS 423 Ceramics (also Archaeology

 423 and History of Art 423)Fall. 4 credits. Prerequisite: Classics 220 or History of Art 220 or permission of instructor. Not offered 1994-95.
A. Ramage.]
[CLASS 432 Sardis and the Cities of Asia Minor (also Archaeology 432 and History of Art 424) ©\#
4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
A. Ramage.]
[CLASS 434 The Rise of Classical Greece (also Archaeology 434 and Mistory of Art 434) \#
Spring. 4 credits. Recommended: Classics
220 or 221 , History of Art 220 or 221 , or permission of instructor. Not offered 1994-95 P. I. Kuniholm.]

CLASS 435 Seminar on Roman Art and Archaeology (also History of Art 427) \#

Spring. 4 credits. Prerequisite: permission of instructor. A. Ramage

For description, see History of Art 427.
CLASS 475-476 Independent Study in Classical Archaeology, Undergraduate Level
475, fall; 476 , spring. Up to 4 credits. Hours to be arranged. Staff.
[CLASS 629 The Prehistoric Aegean and Cyprus (also Archaeology 629) \#
Fall. 4 credits. For graduate students, and advanced undergraduates with permission of instructor. Not offered 1994-95.
J. Coleman.]

CLASS 630 Selected Topics in Classical Archaeology (also History of Art 520)
Spring. 4 credits
P. Kuniholm.

For description, see History of Art 520
CLASS 721-722 Independent Study for Graduate Students in Classical Archaeology
721, fall; 722 , spring. Up to 4 credits.
Hours to be arranged. Staff.

## Greek and Latin Linguistics

[CLASS 405 Vulgar Latin \#
4 credits. Not offered 1994-95.]
[CLASS 421 Greek Comparative Grammar (also Linguistics 609) *
Fall. 4 credits. Prerequisite: thorough familiarity with the morphology of classical Greek. Not offered 1994-95; next offered 1996-97.
A. Nussbaum.

The prehistory and evolution of the sounds and forms of ancient Greek as reconstructed by comparison with the other Indo-European languages.]
[CLASS 422 Latin Comparative Grammar (also Linguistics 610) *
4 credits. Prerequisite: thorough familiarity with the morphology of classical Latin. Not offered 1994-95; next offered 1995-96.
A. Nussbaum.

The prehistory and evolution of the sounds and forms of Classical Latin as reconstructed by comparison with the other Indo-European languages.]

## CLASS 424 Italic Dialects (also Linguistics 612) \#

Fall. 4 credits.
A. Nussbaum.
[CLASS 425 Greek Dialects (also
Linguistics 611) \#
4 credits. Not offered 1994-95.
A. Nussbaum.]
[CLASS 426 Archaic Latin (also Linguistics 614) \#
4 credits. Prerequisite: reading knowledge of Latin. Not offered 1994-95.
A. Nussbaum.]
[CLASS 427 Homeric Philology (also Linguistics 613) \#
4 credits. Prerequisite: ability to read Homeric Greek. Not offered 1994 95; next offered 1995-96.
A. Nusshaum.]

## [CLASS 429 Mycenaean Greek (also

 Linguistics 615) \#4 credits. Prerequisite: thorough familiarity with the morphology of Classical Greek. Not offered 1994-95. A. Nussbaum.]

## Sanskrit

[CLASS 131-132 Elementary Sanskrit (also Sanskrit 131-132)
131, fall; 132, spring. 4 credits each term. Not offered 1994-95; next offered 1995-96. Staff.
An introduction to the essentials of Sanskrit grammar. Designed to enable the student to read classical and epic Sanskrit as quickly as possible.]

## CLASS 251-252 Intermediate Sanskrit

 (also Sanskrit 251-252) © \#251, fall; 252, spring. 3 credits each term.
Prerequisite: Classics 132 or equivalent. C. Minkowski.

Readings from the literature of Classical Sanskrit. Fall: selections from the two Sanskrit epics, the Mababharata and the Ramayana. Spring: more selections from the epics, and from either Sanskrit story literature or from Sanskrit dramas.

CLASS 403-404 Independent Study in Sanskrit, Undergraduate Level (also Language 300)
403, fall; 404 , spring. Up to 4 credits C. Minkowski

CLASS 703-704 Independent Study for Graduate Students in Sanskrit (also Language 300)
703, fall; 704, spring. Up to 4 credits. Hours to be arranged. C. Minkowski.
Also see Classics 291, 390, and 395 (Classical Civilization listings).

## Honors Courses

CLass 370 Honors Course
Spring, 4 credits. To be taken in the junior year.
A program of reading and conferences centered on an author or topic chosen in accordance with the special interests of the student and instructor.

## CLASS 471 Honors Course

Fall. 4 credits. To be taken in the senior year.
A continuation of Classics 370 , with change of author or topic.

CLASS 472 Honors Course: Senior Essay Spring. 4 credits. For students who have successfully completed Classics 471 . Topics must be approved by the student's honors committee at the end of the first term of the senior year.

## Related Courses in Other Departments and Programs

See listings under
Archaeology
Comparative Literature
English
History
History of Art
Medieval Studies
Modern Languages and Linguistics
Near Eastern Studies
Philosophy
Religious Studies
Society for the Humanities
Women's Studies

## COMPARATIVE LITERATURE

G. Davis, W. Cohen, W. Kennedy, graduate faculty representative, fall ( 163 Goldwin Smith Hall, 255-3398); C. Arroyo, A. Caputi (Emeritus), C. Carmichael, director of undergraduate studies ( 139 Goldwin Smith, 255-8265); D. Castillo, J. Culler, chair and grad fac rep, spring only ( 141 Goldwin Smith Hall, 255-5798); B. deBary, H. Foster, G. Gibian, S. Gilman, D. Grossvogel, P. Hohendahl, W. Holdheim (Emeritus), N. Melas, J. Monroe, J. Porte, E. Rosenberg, L. Waugh,
W. Wetherbee

Also cooperating: F. Ahl, J. Bishop, R. Brann, S. Buck-Morss, R. D. E. Burton, C. Chase,
M. Condé, J. Devenyi, W. Goehner, A. Groos,
M. Hays, D. Mankin, B. Martin, C. Martin, B. Maxwell, M. Migiel, L. Olschner,
B. Polvinelli, N. Saccamano, M. Scammell, M. Steinberg, G. Waite, A. Wood

The Department of Comparative Literature provides a broad range of courses in European as well as non-European literatures. Courses variously stress significant authors, themes, problems, styles, genres, historical periods, and theoretical perspectives. The departmental offerings reflect current interdisciplinary approaches to literary study, hermeneutics, rhetorical analysis, semiotics, deconstruction, Marxism, reception aesthetics, feminism, formalism, and psychoanalysis.

## The Major

The major enables students to develop an integrated knowledge of Western literature, to strengthen their reading and writing abilities, and to prepare for careers demanding analytical, interpretive, and evaluative skills. Prospective majors should consult with the director of undergraduate studies. After declaring a major, a student chooses an adviser from the department's faculty. The requirements for the major are designed to allow each student to follow a course of study that combines intellectual rigor with the pursuit of personal interests. The specific contours of such a program are worked out in consultation with the student's adviser.

## Requirements for the Major

1) Five courses in Comparative Literature at the 200 level and above, including the core course listed below. A student may include up to two literature courses from other departments.
2) One core course in Comparative Literature (for 1994-95 the core course is Compara-
tive Literature 415 [fall], to be taken by all majors either in the spring term of their junior year or the fall term of their senior year. Students may enroll in both core courses.
3) Five courses in literature or other areas of the humanities at the 200 or higher level, to be taken in one or more foreign literature departments. Texts must be read in the original language. A student may offer one language course (conversation, composition, etc.).
4) A senior essay (Comparative Literature 493) of roughly fifty pages, to be written during the senior year under the direction of the student's adviser.
The department also encourages:
5) a program that includes broad historical coverage (e.g., Comparative Literature 201-202: Great Books, Comparative Literature 210: Ancients and Moderns); intensive study of a single genre, (e.g., Comparative Literature 320: Introduction to Caribbean Poetry, Comparative Literature 363-364: The European Novel); Comparative Literature 365: Contemporary Fiction; analysis of problems in literary theory (e.g., Comparative Literature 302: Literature and Theory, Comparative Literature 381: Marxist Cultural Theory, and Comparative Literature 402: Theories of Rhetoric)
6) a second foreign language, especially for students interested in graduate work in literature.

## Honors

A student who completes the requirements for the major is eligible for the degree of Bachelor of Arts with honors in comparative literature. The department bases its decision on the student's achieving grades of at least B+ in the senior essay and in course work for the major, and on overall academic performance at Comell.

## Freshman Writing Seminars

Most 100-level courses may be used toward satisfying the freshman writing seminar requirements. See "John S. Knight Writing Program" for a full description of the freshman writing seminar program.

## Courses

[COM L 150 Introduction to Cultural Studies (also Society for the Humanities 150)
4 credits. Does not satisfy the freshman writing seminar requirement, but will satisfy the distribution requirement. Not offered 1994-95.
W. Cohen.I

COM L 201-202 Great Books (201 by petition for breadth requirement)
201, fall; 202, spring. 4 credits. Comparative Literature 201 and 202 may be taken independently of each other.

Fall: M W F 11:15-12:05. W. J. Kennedy. Spring: M W F 10:10-11. N. Melas. A reading each semester of seminal texts that represent and have shaped Western culture and hence form an essential part of the student's intellectual equipment. By analyzing, interpreting, and evaluating, students will develop critical reading abilities. 201:
selections from the Bible, Homer, Dante, Rabelais, Shakespeare, and others.
202: World literature of the last 300 years, emphasizing the response to European worldwide expansion first in the colonizing countries, then in the colonized. A central concern will be the globalization of European literary forms. Probable authors: Camoens, Shakespeare, Behn, Voltaire, Melville, Conrad, Tagore, Lu Hsun, Borges, Césaire, Mahfouz, Soyinka, Enichi, Erdrich. and selected lyric poets.

## COM L 205 Comparative American Literatures

## Spring. 4 credits.

T R 1:25-2:40. B. Maxwell.
Twentieth-century writing from Canada, the United States, Mexico, Cuba, Central America, and South America. A hemispheric perspective will encourage thinking about and across cultural, linguistic, and national demarcations. Points for discussion will include the family chronicle as an encounter with or an evasion of history; revolution and quiescence; political and/or psychological repressions; the presence of indigenous peoples and of myth in fiction and historiography; realism and experimentalism; writing in the zone of United States' plants abroad; and the pains of love. Authors and works will include Hubert Aquin, The Antiphonary, Sheila Watson, The Double Hook; Joy Kogawa, Obasan, Michael Ondaatje, In the Skin of a Lion; Jean Toomer, Cane, William Faulkner, Absalom, Absalom!: Paule Marshall, The Cbosen Place, The Timeless People, Mariano Azuela, The Underdogs; Julio Cortazar, Hopscotch; Gabriel García Märquez, One Hundred Years of Solitude, Clarice Lispector, An Apprenticeship, or, The Book of Delights, and Eduardo Galleano, Memory of Fire.

## [COM L 210 Ancients and Moderns

4 credits. Not offered 1994-95.
W. J. Kennedy.]

COM L 213 Existentialism and Literature (also Philosophy 213)
Fall. 4 credits.
T R 10:10-11:25. A. Wood.
For description, please see Philosophy 213.
COM L 223 The Comic Theater (also Classics 223 and Theatre Arts 223)

Spring. 3 credits.
To be arranged. J. Rusten.
For description, please see Classics 223.
[COM L 231 Classics of Hebrew
Literature: A Survey of the Hebrew Literary Tradition (also Near Eastern Studies 231 and Jewish Studies 231)
3 credits. Not offered 1994-95.
R. Brann.]
[COM L 233 The Lyrics of Love and Death: Medieval Hebrew Poetry in Translation (also Near Eastern Studies 233 and Jewish Studies 283) ©

3 credits. Not offered 1994-95. R. Brann.

COM L 236 Greek Mythology (also Classics 236) \#
Fall. 3 credits. Limited to 200.
T R 11:40-12:55. D. Mankin.
For description, see Classics 236.

COM L 302 Literature and Theory (also Comparative Literature 702 and English 302/702)

## Fall. 4 credits.

M W F 10:10-11. J. Culler.
Study of issues in contemporary theoretical debates, with particular attention to structuralism, deconstruction, psychoanalysis, and feminism. Readings by Barthes, Derrida, Foucault, B. Johnson, J. Rose, and others. No previous knowledge of literary theory is assumed.

COM L 304 Colonialism and Narrative Spring. 4 credits.

M W F 1:25-2:15. N. Melas.
Through an examination of selected works from the late nineteenth century to the modern period, mainly written in English and French, the course will explore the problems and possibilities imperialism presented for narration, both in the literature of imperialism and the literature against imperialism. Topics will include transcultural (de)formation of identity, exoticism and internalism, racial romance, cultural pressures on reading and interpretation, and the powers and pitfalls of writing back. Probable authors: Hagard, Stevenson, Conrad, Ngugi, Camus, Condé, Achebe, Duras, Saleh. All readings available in English.
COM L 313 Japanese and Asian Film (also Asian Studies 313, Theatre Arts 313)
Spring. 4 credits.
M W 11:15-12:20. B. DeBary.
For description, please see Asian Studies 313.
[COM L 320 Introduction to Caribbean Poetry
4 credits. Not offered 1994-95. G. Davis.!

COM L 328 Literature of the Old Testament (also Religious Studies 328)

Fall. 4 credits. Not open to freshmen.
T R 8:40-9:55. C. Carmichael.
Analysis of selected material in translation.
COM L 330 Political Theory and Cinema (also German Studies 330, Theatre Arts 330 \& Government 370)
Fall. 4 credits.
T R 11:40-12:55. G. Waite.
For description, please see German Studies 330.

COM L 334 Muslims, Christians and Jews in Islamic Spain: Literature and Society (also Near Eastern Studies 339, Jewish Studies 339, Religious Studies 334 and Spanish Literature 339) ©
Fall. 4 credits. S-U or letter option. Taught every other year.

M W F 12:20-1:10. R. Brann.
For description, please see Near Eastern Studjes 339.
COM L 339 Ancient Wit: An introduction to the Theory and Form of Comic and Satiric Writing in Greece and Rome (also Classics 339)
Spring. 4 credits.
To be arranged. F. Ahl.
For description, please see Classics 339.
COML 356 Renaissance Literature Fall. 4 credits.

M W F 1:25-2:15. W. J. Kennedy.
An introduction to Renaissance literary texts with some attention to cultural backgrounds
and intellectual history. Readings from Machiavelli, Erasmus, Rabelais, Shakespeare, Cervantes, and others.
[COM L 358 Literature and Religion: The Nature of the Mystic Text (also Religious Studies 358 and Romance Studies 358) \#
4 credits. Not offered 1994-95. C. M. Arroyo.]
[COM L 361 The Culture of the Renaissance I (also History 361 and Art History 350)
4 credits. Not offered 1994-95. J. Najemy, C. Lazzaro.]

## [COM L 362 The Culture of the

 Renaissance II (aiso English 325 and History 364)4 credits. Not offered 1994-95.
C. Kaske, W. Kennedy.]

COM L 363-364 The European Novel (363\#)
363 , fall; 364 , spring. 4 credits. Comparative Literature 363 and 364 may be taken independently of each other.

Fall: T R 10:10-11:25. N. Saccamano.
Spring: M W F 11:15-12:05. G. Gibian.
363: This course will survey the history of the novel until the mid-nineteenth century, focusing on the social, literary, and philosophical significance of its narrative forms. Topics to be discussed: the novel as a site of conflict between "high" and "low" culture; the relation of fictional narrative to historical and autobiographical narrative; the gender politics and class ideology of romance. Texts may include Lazarillo de Tormes or Cervantes' Don Quixote, Fielding's Tom Jones, Laclos's Dangerous Liaisons, Goethe's The Sorrows of Young Werther, Bronte's Wuthering Heights.
364: Flaubert's Madame Bovary, Dostoevsky's Crime and Punisbment, Turgenev's Fathers and Sons, George Eliot's Middlemarch, Joyce's Portrait of the Artist as a Young Man, Kafka's stories, Malraux's Man's Fate. Close attention will be paid to the texts of the novels considered as creations of literary art as well as documents of the achievements of the human mind in a fascinating period of change in European history. We shall briefly examine the historical and cultural background of novels written in France, Russia, England, Ireland, and Central Europe, and the artistic and psychological assumptions discemible in them as well as historical perceptions of Romanticism, Realism, and Modernism. No knowledge of foreign languages required. Mixture of lectures and class discussion.

## COM L 365 Contemporary Fiction (also French Literature 365) 숭

Fall. 4 credits.
M W F 10:10-11:00. D. Grossvogel. A continuation of Comparative Literature 363-364 (The European Novel). Probable authors: Barthes, Boll, Calvino, Camus, Cardinal, García Marquez, Hemingway, Kerouac, Kundera, Modiano, Nabokov, Robbe-Grillet, Sartre. An attempt to interpret these authors through questions like those raised by Roland Barthes on writing, structuralism, criticism, the role of the reader, the death of the author, etc. Lecture and seminar discussions.
[COM L 366 Problems in Modernism: "High" and "Low" Culture (also Art History 367)
4 credits. Not offered 1994-95.
H. Foster.]

## COM L 367 The Russian Novel (also

 Russian Literature 367)Fall. 4 credits. Also open to graduate students. Special discussion section for students who read Russian.

M W F 11:15-12:05. G. Gibian.
For description, please see Russian Literature 367.

## COM L 368 Visual Culture and Social Theory (also Art History 370 and Government 375)

Spring. 4 credits.
To be arranged. H. Foster, S. Buck-Morss. This course is designed as an introduction to some of the key concepts at work in the most innovative analyses of visual culture todayfrom new art histories through feminist critiques to cultural studies. Among other topics we will consider modern ideas of the aesthetic, Marxian and Freudian notions of the fetish, psychoanalytic accounts of the gaze, and feminist definitions of spectatorship in relation to sexuality. Lectures will include general expositions of such concepts as well as specific applications of them; there will also be section discussions.

## COM L 369 Modern Japanese Literature: From Meiji through the Pacific War (also Asian Studies 376)

Fall. 4 credits.
TBA. D. deBary
We will read Japanese works of fiction, poetry, and critical theory written from the Meiji Restoration into the Showa Period. The course will take up such issues as modernization and the narrative of discovery, imperialism and the non-Western novel, the politics of visibility, gender and representation, and Japanese colonialism. We will consider how writings of critics like Karatani, Fujii, and Layoun have complicated modernizationist schemas of literary development. We will also attempt to explore what Nagahara Yutaka has called the "phenomenology of discrimination" in relation to Japanese literary texts, pursuing contradictions between egalitarianism and discrimination in the legacy of Meiji Enlightenment thought. Reading of non-Japanese (other Asian, as well as African, American, and European) texts raising pertinent theoretical perspectives will be integrated into the coursework.

## [COM L 381 Marxist Cultural Theory (also German Studies 381 and Government 372)

Spring. 4 credits. Not offered 1994-95. W. Cohen, P. Hohendahi.]

COM L 383 Faust in Legend, Literature, and the Arts (also German Studies 383) \#

Fall. 4 credits. Readings in English translation; students with knowledge of German and/or French will be encouraged to read the texts in the original languages.

M W F 12:20-1:10. L. M. Olschner.
For description, please see German Studies 383.

COM L 385 Reading Nabokov (also Russian Literature 385 and English 379)

Fall. 4 credits. Limited to 25.
T R 2:55-4:10. M. Scammell.
For description, see Russian Literature 385.
[COM L 389 Contemporary Literature in Central and East Europe (also Russian Literature 389)
4 credits. Not offered 1994-95.
G. Gibian.]

COM L 393 The Challenge of Contemporary Fiction (also Italian Literature 393/693)
Spring. 4 credits.
T R 1:25-2:40. M Migiel.
Topic for 1995: This course will focus on selected twentieth-century writers who offer unexpected models for reading. In particular, we will examine these writers' conception of the reader as notary to a silenced witness; as traveller on an interrupted joumey; as surprised detective; as victim of a plot; as player in an elusive game. Authors will include P. Levi, Banti, Calvino, Eco, Tabucchi, Borges, Cortazar. All works to be read in English; students who command the pertinent foreign languages may choose to read the books in the original.
[COM L 403 History of Literary Criticism 4 credits. Not offered 1994-95.
W. J. Kennedy.]

COML 404 History into Fiction: Naxis and the Literary Imagination (also English 404 and German Studies 414)

Fall. 4 credits. Permission of instructor needed. Limited to 25 . T R 11:40-12:55. E. Rosenberg. The twelve years of Hitler's rule remain the most critical, "longest" years of the century. We shall red some seven or eight texts by Anglophone and Continental novelists (and a few playwrights and poets) that explore salient features of the regime: Weimar and Hitler's rise to power (e.g., Mann's "Mario and the Magician" and "Disorder and Early Suffering," Brecht's Arturo Ui, Faulkner's "Percy Grimm," Isherwood's Goodbye to Berlin); civilian life in Nazi Germany (Brecht's "Jewish Wife" and other one-acters, Grass's Tin Drum); World War II and the Occupation of Europe (Camus's The Plague, Böell's short fiction, Anne Frank's Diary); the persecution of European Jews and the genocide (e.g., Sartre's "Childhood of a Leader," Weiss' The Investigation, Borowski's This Way for the Gas, Spiegelman's Maus I or Maus II, lyrics by Celan, Nelly Sachs, Anthony Hecht). Brief ancillary selections by historians and memorialists (Arendt, Primo, Levi, Bettelheim); uses of documentary materials. Two papers; no exam.
[COML 405 Satan and Les Fleurs du Mah: Constructing Context (also Society for the Humanities 404)
4 credits. Not offered 1994-95.
J. Culler.]

COM L 410 Semiotics and Language (also French Romance Studies 400 and Linguistics 400)
Spring. 4 credits. Prerequisite: some background in an area relevant to semiotics: e.g., linguistics, philosophy, psychology, anthropology, or literature; or permission of instructor.

To be arranged. L. Waugh
For description, please see Linguistics 400.
COM L 411 Culture and Subjectivity (also Society for the Humanities 411 and History 483)
Fall. 4 credits. Limited to 17 students.
W 2:30-4:25. M. Steinberg.
This seminar will explore whether and how a history and theory of subjectivity can mediate between a modernist account of the subject and a postmodernist account of its fragmentation. The possibility of an open and coherent subjectivity will be discussed with reference to
religion, gender, psychoanalysis, and the creative arts (especially music). Principal texts will be by George Eliot (Daniel Deronda), Felix Mendelssohn, Robert Schumann, Wittgenstein (Culture and Value), Benjamin (essays on language), Heidegger ("Origin of the Work of Art"), Charles Taylor (Sources of the Self). Foucault (History of Sexuality), James Glass (Sbattered Seltes), and others.

## COML 412 Women around Freud (also German Studies 413 and Women's Studies 413)

Spring. 4 credits
W) 12:20-2:15. B. Martin.

For description, please see German Studies 413.

## COML 414 Heidegger: A Reading of

 Being and Time (also Comparative Literature 614 and Romance Studies 414/614) 앙Fall. 4 credits.
W 2:30-4:25. C. M. Arroyo.
Heidegger's redefinition of phenomenology in response to Husserl and Scheler:
hermeneutics vs. intuition, Being-in-the-world vs. intentionality, etc. Hermeneutics and the reading of literature: language and difference, Ab-bauen and deconstruction. Time and literary history. Author and text: Heidegger's membership in the Nazi party and the thrust of his philosophy.

## COM L 415 The Theory and Analysis of Narrative (a)

Fall. 3 credits. Limited to 17 students. Core course for majors. Priority given to Comparative Literature majors.

M 1:25-3:20. J. Culler.
Study of major theoretical approaches to narrative, with readings from Aristotle, Barthes, Bakhtin. Booth, Genette, Pratt, Shklovsky, and others. Attention to problems of plot structure, relations between plot and narrative discourse, the discrimination of narrators, questions of gender, and interpretive frameworks for narrative. Narratives by Balzac, Borges, Barth, and others (including stories selected by the students themselves) will be studied for the light they can cast on problems of narrative structure.

## [COM L 416 Literary Translation in the

 West (also German Studies 416)4 credits. Not offered 1994-95
L. M. Olschner.]

## COM L 419-420 Independent Study

419, fall; 420, spring. Variable credit Comparative Literature 419 and 420 may be taken independently of each other.

Hours to be arranged. Staff.
COM L 421 Old Testament Seminar (also Religious Studies 422) @\#
Fall. 4 credits. Limited to 20 students.
T 2:30-4:25. C. M. Carmichael.
Identification and discussion of problems in selected material from the Pentateuch.

COM L 426 New Testament Seminar (also Religious Studies 426) \#
Spring. 4 credits. Limited to 20 students.
Т 2:30-4:25. С. M. Carmichael.
Identification and discussion of problems in the New Testament.

COML 429 Readings in the New Testament (Near Eastern Studies 429, Religious Studies 429, and English 429) \#
Fall. 4 credits. Limited to 25 students. M W F 12:20-1:10. J. P. Bishop. Close readings of representative texts from the New Testament in modern scholarly editions, with the help of appropriate commentary, introductory and specialized. The focus for 1994 will be on Acts and the letters of Paul. All readings will be in English, but repeated reference to the Greek original will be made Graduate students and undergraduates from other colleges who are interested in the material should not feel inhibited from enrolling. The approach will be primarily exegetical; that is, we will try to find out what the texts say and what they mean by what they say. Thus we can hope to stay open to scholarly and religious issues alike.
COM L 435 Exoticism, Literatures, and Counter-Literatures (also Society for the Humanities 405)
Fall. 1 credit. Limited to 17 students. All reading must be completed before first class. Contact Society for the Humanities (5-4086) for the reading list.

T R 10:10-12:05 on Oct. 18, 20, 25 and 27
only. M. Condé.
Africa and the Caribbean Region have always been defined with regard to the viewpoint of the colonizers. Ever since Christopher Columbus described the islands as "marvellous," they have been considered to be of unparalleled beauty. Africa has not enjoyed the same reputation. It has been "the White man's grave" or the "Dark Continent.
Ilowever contradictory it may seem, both discourses have the same function: to cover up the discourse of the indigenous peoples concerning their own reality. Using a few selected texts, the course will attempt to identify the conflicting discourses of the colonized and the colonizer as well as the languages in which they are formulated.

## COM L 436 Special Topics: Theories of Contemporary Performance (also Theatre Arts 435)

Fall. 4 credits. Permission of instructor needed. Limited to 15 .

T R 2:55-4:10. J. Devenyi.
This course will provide an introduction to performance studies. After a review of the major performance traditions of the late 20th century, the class will examine the theoretical and practical work of contemporary international and American directors, performance groups and artists who, in their mise-en-scene, combine various media.
COM L 437 The Christian Epic: Dante, Tasso, Milton (also Comparative Literature 637 and Italian Literature 425/625)
Fall. 4 credits
M W F 11:15-12:05. M. Migiel.
In the course of reading the Christian epics of Dante Alighieri (Divine Comedy [13211), Tasso (Jerusalem Delivered [1581]), and John Milton (Paradise Lost [1667]), we shall focus on the following issues: how the Christian epic revises classical conceptions of the heroic individual. of community, of fate; how it uses poetry for theological aims; how it makes woman both central and marginal to the epic enterprise; how it reflects on the relation between secular politics and religious institutions. Reading knowledge of Italian is desirable, but the course will be conducted in

English and students will be able to read Dante and Tasso in translation.

## COM L 443 Dramaturgy: Play and Period (also Theatre Arts 433)

## Spring. 4 credits.

To be arranged. M. Hays.
Inventing the Modern Drama. European theatre between 1870 and 1900.
COM L 447 Cultural Transformation and Conflict in the Caribbean from Slavery to the Present (also Society for the Humanities 417)
Spring. 3 credits. Limited to 17 students. To be arranged. R. D. E. Burton. Using historical, anthropological, sociological, and literary materials, this course is intended to introduce students to the main issues in contemporary Caribbean studies. Taking the study of slavery as its starting-point, it will examine the processes of cultural creation, transformation, and conflict in the Caribbean with particular emphasis on the following areas and issues: slavery and the culture of resistance; language in the Caribbean; AfroCaribbean religions (principally vodun and Rastafarianism); male and female culture 'spheres' in the Caribbean; the place of 'East Indians' in the Caribbean; 'Africanist' and 'creolization' theories of Caribbean culture; theories of identity in the contemporary Caribbean (Négritude, Antillanité, Créolité, etc.); literature and identity in the Caribbean (Brathwaite, Walcott, Cesaire, Glissant). The course will focus on the Anglophone and Francophone Caribbean with reference, where appropriate, to the Hispanophone Caribbean.
COM L 449 Misogyny and Its Readers (also Comparative Literature 649 and Italian Literature 409/609)
Spring. 4 credits.
T R 10:10-12:00. M. Migiel.
How do we know misogyny when we see it? Is it limited to the denunciation and denigration of women? Can the praise of women be misogynistic? Is it misogyny if the author places anti-woman statements "in quotation marks"? Might some misogynistic works be just harmless literary jokes? How does awareness of historical context affect our reading of misogyny? How persuasive have women been in the defense of their sex? These are among the questions we will ask as we analyze Western discourses about women and identify the extent to which misogyny can be exposed as a form of misreading. Our readings will include classical, ecclesiastical, and medieval/Renaissance literary works as well as writings by contemporary feminist scholars of literature, history, and law. All works to be read in English: students who command the pertinent foreign languages may choose to read the texts in the original.
[COM L 452 Renaissance Mumanism (also Comparative Literature 652) 4 credits. Not offered 1994-95. W. J. Kennedy.]

COM L 472 Poetry of the 1990s (also English 408 and German Studies 472)

Fall. 4 credits. Limited to 25. W 10:10-12:05. J. Monroe
Where is poetry now? Where is it heading as we move toward the twenty-first century? What is its current situation in light of the historic changes that have occurred over the past several years? Exploring how contemporary poetry is responding to a new era of altered expectations and redrawn boundaries,
a time of renewal and redefinition, we'll track the principal issues, directions, figures, and forces shaping the process of poetry's unfolding in the twentieth century's final decade. Materials will be drawn from a wide variety of forms and contexts, including literary journals, general circulation magazines, anthologies, and nonprint media, as well as individual poetry collections
[COM L 474 Postmodernist Art and Criticism (also Art History 470)
4 credits. Not offered 1994-95.
H. Foster.]
[COM L 482 Latin American Women Writers (also Spanish Literature 492 and Women's Studies 481) (a)
4 credits. Not offered 1994-95.
D. Castillo.]

COM L 492 The Advance of Humanism: Aspects of the European Enlightenment (also German Studies 492) @ \#

Spring. 4 credits.
T 2:30-4:25. P. Hohendahl.
This seminar is designed for advanced undergraduates with a good background in European literature and/or intellectual history. The course will emphasize questions of secularization and modernization against the backdrop of recent theory (Horkheimer/ Adorno, Foucault, Blumenberg, and Habermas). The discussion will focus on concepts such as enlightenment, reason/ rationality, tolerance, criticism/critique, humanity, and progress. The readings will be taken from English, French, and German literature. The reading list will include Locke, Johnson, Fielding, Hume, Voltaire, Rousseau, Diderot, Lessing, Kant, Herder, and Goethe. Knowledge of French and/or German is recommended. German and French texts will be available in English translation. The class will be conducted in English.

## COML493 Senior Essay

Fall and spring. 8 credits.
To be announced. Staff
Hours to be arranged individually in consultation with the Director of Undergraduate Studies. Approximately fifty pages to be written over the course of two semesters in the student's senior year under the direction of the student's adviser. An " R " grade will be assigned on the basis of research and a preliminary draft completed in the first semester. A letter grade will be awarded on completion of the second semester.
[COM L 496 Theorizing the Public Sphere (also German Studies 496 and History 496)
4 credits. Not offered 1994-95.
P. Hohendahl.]

COM L 600 Special Topics in Feminist Theory: An Interdisciplinary Graduate Course in Women's Studies (also Women's Studies 600, German Studies 600, Anthropology 600)
Fall. 4 credits. Seminar is for graduate students and undergraduate students with permission of instructor.

W 2:30-4:25. C. A. Martin and B. Povinelli. For description, please see Women's Studies 600.

COML 601 Writing the Literary History of Malay (also Asian Studies 601)
Fall. 4 credits
H. M. J. Maier.

The course is primarily meant to explore issues and problems that come up when an effort is made to write some kind of survey of a discursive formation, in this case 'Malay', the term that is used for a wide variety of discursive forms. How to gain control, how to organize, how to prsent the materials available? How to account for questions of influence, source, genealogy translation. How to create borders within that formation? How to discuss the tensions and interferences between 'oral' and 'written' texts? How to explore the sudden rise of concepts like 'literature' as a distinct genre in Malay discourse? How to make a plausible narrative
[COM L 603 History of Literary Criticism 4 credits. Not offered 1994-95.
W. J. Kennedy.]

COM L 608 Modern/Postmodern (also German Studies 608, French Literature 606, English 652)
Fall. 4 credits
R 10:10-12:00. J. Monroe.
What does the "post" of postmodernism represent? Is the relation between modernism and postmodernism one of fundamental continuity? expanding difference? radical rupture? Addressing these and related questions through readings in a range of materials drawn from twentieth-century fiction, poetry, drama, film, theory, and philosophy, we will explore the explanatory power and limits of the terms "modern" and "postmodern" for attempts to understand our current cultural situation in the century's final decade. Exploring as well the way these terms may play themselves out as we move into the twenty-first century, we will consider the extent to which we may be said to be entering a new period, neither modern nor postmodern, that calls for new articulations, modes of action, and individual and collective self-definitions. All texts will be available in English.

## COM L 609 Comparison and Difference

 Fall. 4 credits.T 10:10-12:00. N. Melas.
This course will be a wide-ranging investigation of comparison as a foundation for disciplines (e.g., comparative literature), a measurement of value, a means of understanding, and an act. Can comparison make links between things or cultures without subordinating differences to a common standard? What are the literary and cultural grounds of comparability? Roving from theories of metaphor and metonymy to magic, assimilation, and various forms of colonial doubling, we will seek answers and refine questions that might help us discern what exactly the limitations on comparing apples and oranges are. Authors may include: Aristotle, Ricoeur, Derrida, Foucault, Fanon, Genette, Frazer, Bhabha, Nancy, Glissant, Clifford, Homer.

COM L 614 Heidegger: A Reading of Being and Time lalso Comparative Literature 414 and Romance Studies 414/614)
Fall. 4 credits.
T 2:30-4:25. C. M. Arroyo.
For description, please see Comparative Literature 414.

COM L 619-620 Independent Study
619, fall; 620, spring. Variable credit. Comparative Literature 619 and 620 may be taken independently of each other.

Hours to be arranged. Staff.

COM L 632 Special Topics: Los Angeles as Cultural Performance (also Theatre Arts 630)
Spring, 4 credits.
To be announced. J. Devenyi
For description, please see Theatre Arts 630.
COM L 634 Seminar in Theatre History: The Director's Theatre (also Theatre Arts 633)
Fall. 4 credits.
W 2:00-4:00. M. Hays.
Modern dramaturgy and the rise of the director, with special emphasis on Pirandello, Brecht, and Artaud.

COM L 637 The Christian Epic: Dante, Tasso, Milton (also Comparative Literature 437 and Italian Literature 425/625)
Spring. 4 credits.
M W F 11:15-12:05. M. Migiel
For description, please see Comparative
Literature 437.
COM L 638 Seminar in Dramatic Theory (also Theatre Arts 637)
Spring. 4 credits
To be announced. M. Hays.
Disciplining the Spectator. The transformation of Republic world and the rise of the literary in eighteenth- and nineteenth-century Europe
COM L 647 Romantic Narrative and Ideology (also English 647)
Spring. 4 credits.
R 1:25-3:20. C. Chase.
An examination of the ways in which narrative fictions of the Romantic period are definitions (denominations) of "man," "the self," "the subject," and "society," and why attempts to define those concepts would take narrative forms. These questions will be approached via the reading and interpretation of several important narrative texts in all their details and peculiarities. Works will include Rousseau, Emile and La Nouvelle Heloise, Holderlin, Hyperion; Godwin, Caleb Williams; Kleist, "Michael Kohlhaas"; and Shelley, Frankenstein, and other novels in English. Reading knowledge of French necessary.

COM L 649 Misogyny and Its Readers (also Comparative Literature 449 and Italian Literature 409/609)
Spring. 4 credits.
R 10:10-12:00. M. Migiel.
For description, please see Comparative Literature 449.
[COM L 652 Renaissance Humanism (also Comparative Literature 452)
4 credits. Not offered 1994-95. W. J. Kennedy.]

COM L 655 Opera (also German Studies 653 and Music 679)
Spring. 4 credits.
W 1:25-4:25. A. Groos.
For description, please see German Studies 653.

COM L 661 After the City: From Metropolis to Electropolis (also German Studies 661 and Architecture 338/637)
Fall. 4 credits.
T 4:00-6:00. G. Waite and W. Goehner. For description, please see German Studies 661.
[COM L 672 Theories of Modernism (also Art History 570)
4 credits. Not offered 1994-95.
H. Foster.]

## [COM L 674 Contemporary Poetry and

 Culture: 1968-19934 credits. Not offered 1994-95. J. Monroe.]

## COM L 702 Literature and Theory (also

 COM L 302 and ENGL 302/702)Fall. 4 credits.
M W F 10:10-11:00. J. Culler.
For description, see COM L 302.
COM L 721 Baroque Porspectives: Theory's Return to the Seventeonth Century (also English 721)
Spring. 4 credits.
To be arranged. T. Murray.

## COMPUTER SCIENCE

R. L. Constable, chair; K. Birman, B. Bloom, C. Cardie, T. Coleman, B. Donald, D. Gries, J. Hartmanis, T. Henzinger, J. E. Hopcroft, D. Huttenlocher, D. Kozen, P. Pedersen,
K. Pingali, M. Rauch, R. A. Rubinfeld,
G. Salton, F. B. Schneider, B. Smith,
D. Subramanian, R. Teitelbaum, S. Toueg,
N. Trefethen, C. Van Loan, S. Vavasis,
T. vonEicken, R. Zabih

The Department of Computer Science is in both the College of Arts and Sciences and the College of Engineering. A student in either college can major in computer science. The following describes the College of Arts and Sciences major.

## The Major

The major has three components: a core (a minimum of 42 credits), a group of electives in computer science and related fields (a minimum of 10 credits), and a concentration outside computer science (a minimum of 14 credits). The core focuses on the central topics within computer science: the logical design of programs, data structures, and algorithms. The remaining components of the major-the related electives and the outside concentration-provide a flexible extension to the core program. In consultation with their advisers, students are expected to choose electives and an outside concentration that best suit their graduate and career plans.
Students interested in pursuing an advanced degree in theoretical computer science should concentrate in mathematics. Students preparing for advanced work in scientific computation should take Computer Science 621 (instead of Computer Science 222) and Computer Science 622 (as a related elective) and concentrate in some branch of applied mathematics. Qualified students are encouraged to concurrently major in mathematics.

## Admission

The prerequisites for admission to the major are:

1) Completion of Computer Science 100-211 (or 212)-280 (or equivalent)
2) Completion of Mathematics 111-122-221 or Mathematics 191-192-293
3) A 2.75 grade-point average in all computer science and mathematics courses
4) Acceptance by the department's admissions committee

After admission, students are expected to maintain at least a 2.75 grade-point average in their major courses. Any grade below C - in a core course or related elective is not acceptable.

## Care

The core consists of the following courses:

1) Calculus and linear algebra: Mathematics 111-122-221-222 or 191-192-293-294
2) Programming and systems: Computer Science 100, 211 (or 212), 314, 410 and 414
3) Theory of computation: Computer Science 280,381 (or 481 ), and 482. (One of the following may be substituted for Computer Science 280: Mathematics 332, 432,434 , or 481 .)
4) Numerical analysis: Computer Science 222 or 421

## Related Electives

The related electives requirement consists of three courses. One must be a computer science course or course/laboratory combination numbered above 400 that includes a substantial programming project, for example, Computer Science 412/413, 414/415, 417/418, $432 / 433,462 / 463$, or $472 / 473$; the other two are to be selected from the following:

Electrical engineering courses numbered 301 or higher
Operations research courses numbered 260 or higher
Mathematics courses numbered 411 or higher
Computer Science courses numbered 400 or above (except Computer Science 413 , $415,418,433,463,473,600,601$, and seminar courses)
Students are expected to select related
electives that complement their concentration.

## Concentration

This component encourages the student to study some discipline outside of computer science in reasonable depth. The concentration consists of an approved sequence of four courses (at least 14 credits) numbered 200 or higher in some field related to the theoretical or practical aspects of computing. A list of approved concentrations is available in the Computer Science Undergraduate Office, 303 Upson Hall. Students may also design their own concentrations, subject to the approval of their adviser.

## Other Requirements

Computer science majors must also satisfy the College of Arts and Sciences and university requirements. In particular, the spirit of the 15-credit electives requirement will be strictly followed. This requirement helps ensure breadth of education, and consequently no computer- or mathematics-related course can be used toward its fulfillment. In general, no courses may be used to fulfill more than one requirement. There are two exceptions: first, appropriate core courses may be used to satisty the group IV distribution requirement, and second, in the case of a double major, the same course may be applied to both majors.

Probability and statistics courses. Computer science majors are encouraged to include at least one course in the field of probability and statistics in their program of study. Although there is no formal department of statistics at Cornell, the Department of Mathematics and the School of Operations Research and Industrial Engineering offer a wide range of probability and statistics courses suitable for computer science majors, including the following introductory two-course sequences:

Math 471, Basic Probability
Math 472, Statistics
OR\&IE 260, Introductory Engineering Probability
OR\&IE 370, Introduction to Statistical
Theory with Engineering Applications
A less rigorous but satisfactory one-semester introduction to probability and statistics is given in either of:

Math 370, Elementary Statistics
OR\&IE 270, Basic Engineering Statistics
Honors. A student may be granted honors in computer science on the recommendation of the Computer Science Undergraduate
Committee. The committee guidelines will generally be the following:

1) An overall grade-point average of not less than 3.25
2) A grade-point average for all computer science courses of not less than 3.5
3) Satisfactory completion of at least two computer science courses numbered above 600 or satisfactory completion of a significant special investigation (Computer Science 490 ).

## Courses

For complete course descriptions, see the computer science listing in the College of Engineering section.
COM 5099 Fundamental Programming Concepts
Fall. 2 credits. S-U grades only. No prerequisites.

1 lec, 1 lab.

## COM S 100 Introduction to Computer

 ProgrammingFall, spring, or summer. 4 credits. Students who plan to take both COM S 101 and 100 must take 101 first.

2 lecs, 1 rec (optional). 3 evening exams. During most semesters, two versions of COM S 100 (COM S 100a and COM S 100b) are available as described in the computer science listing in the College of Engineering.

## COM 5101 The Computer Age (also

 ENGRE 101)Fall or summer. 3 credits. Not offered every year. Credit is granted for both Computer Science 100 and 101 only if 101 is taken first. 2 lecs, 1 rec. 1 evening exam.

## COM S 107 An Introduction to SCHEME

Spring. 1 credit. Prerequisite: Introductory course in PASCAL, or equivalent programming experience.

3 lecs.

COM S 172 An Introduction to Artifical Intelligence (also ENGRI 172)
Spring. 3 credits. Prerequisites: Computer Science 100 or 101 ; or equivalent computer experience. Enrollment may be limited. Not offered every year.

3 lecs. 2 evening exams.
COM S 211 Computers and Programming (also ENGRD 211)
Fall, spring, or summer. 3 credits. Prerequisite: Computer Science 100 or equivalent programming experience. Credit will not be granted for both Computer Science 211 and Computer Science 212.

2 lecs, 1 rec. 2 evening exams.
COM S 212 Modes of Algorithmic Expression
Fall, spring. 4 credits. Prerequisite: Computer Science 100 or equivalent programming experience. Credit will not be granted for both Computer Science 211 and Computer Science 212

2 lecs, 2 recs. 2 evening exams.
COM S 214 A Taste of UNIX and C
Fall, spring. $1-2$ credits. Prerequisite: Computer Science 211, or equivalent programming experience. S-U grades only. 3 lecs; 3 weeks ( 1 credit), 6 weeks ( 2 credits).

COM S 222 Introduction to Scientific Computation (also ENGRD 222)
Spring. 3 credits. Prerequisites: Computer Science 100 and pre/corequisite of Math 221 or Math 293

2 lecs, 1 rec. 2 evening exams.

## COM S 280 Discrete Structures

Fall or spring. 4 credits. Prerequisite: Computer Science 211 or 212 or permission of instructor.

3 lecs.

## COM 5314 Introduction to Digital

 Systems and Computer OrganizationFall, spring, or summer. 4 credits. Prerequisite: Computer Science 211 or 212 or equivalent

2 lecs, 1 sec. 2 evening exams.

## COM S 381 Introduction to Theory of Computing

Fall. 4 credits. Prerequisite: Computer Science 280 or permission of instructor. 3 lecs.

COM $\mathbf{S} 400$ The Science of Programming Spring. 4 credits. Prerequisite: Computer Science 280 or equivalent. Not offered every year.

3 lecs
COM S 401 Software Engineering: Technology and Technique
Fall. 4 credits. Prerequisite; COM S 410 and knowledge of the $C$ programming language.

## COM S 410 Data Structures

Fall, spring, summer. 4 credits. Prerequisite: Computer Science 280 or permission of instructor.

2 lecs. 2 evening exams.
COM S 411 Programming Languages and Logics
Fall. 4 credits. Prerequisites: Computer Science 410 or permission of instructor. Not offered every year.

2 lecs.

COM 5412 Introduction to Compilers and Translators
Spring. 3 credits. Prerequisites: Computer Science 314, 381, and 410. Corequisite: CS413.

$$
2 \text { lecs, } 1 \text { lab. }
$$

COM $\mathbf{S} \mathbf{4 1 3}$ Practicum in Compilers and Translators
Spring. 2 credits. Prerequisites: Computer Science 314, 381, 410. Corequisite: Computer Science 412. 1 lab.
A compiler implementation project related to Computer Science 412.

COM S 414 Systems Programming and Operating Systems
Fall. 3 credits. Prerequisite: Computer
Science 314 or permission of instructor.
2 lecs. 2 evening exams.
COM S 415 Practicum in Operating Systems
Fall. 2 credits. Prerequisite: Computer Science 410. Corequisite: Computer Science 414.

1 lec .
COM S 417 Computer Graphics and Visualization (also ARCH 374)
Spring. 3 credits. Prerequisite: Computer Science 211 or 212.

2 lecs.
COM 5418 Practicum in Computer Graphics (also ARCH 375)
Spring. 2 credits. Enrollment limited.
Permission of instructor. Prerequisite:
Computer Science 211 or 212 . Recommended: Computer Science 314. Corequisite: Computer Science 417.

1 lab.

## COM S 421 Numerical Analysis

Fall. 4 credits. Prerequisites: Mathematics 294 or equivalent, one additional mathematics course numbered 300 or above, and knowledge of programming.

3 lecs.
COM 5422 Parallel Computing for Scientific Problems
Spring. 4 credits. Enrollment limited. Permission of instructor. Prerequisites: Math 294 and COM S 222 or COM S 421, knowledge of $C$ and Fortran.

3 lecs.
COM S 432 Introduction To Database Systems
Spring. 3 credits. Prerequisites: Computer Science 211 or 212 and Computer Science 410, or permission of instructor. Recommended Computer Science 314. Not offered every year.

2 lecs. 1 rec.
COM S 433 Practicum in Database Systems
Spring. 2 credits. Corequisite: Computer Science 432. Not offered every year. 1 lab.

## COM S 444 Distributed Systems and

 AlgorithmsFall. 4 credits. Co-requisite: COM S 414 or permission of instructor. Not offered every year.

2 lecs.

COM S 462 Robotics and Machine Vision
Spring. 3 credits. Prerequisite: Permission of instructor, Computer Science 410 and
Computer Science 381. Co-requisite:
Computer Science 463. Not offered every year.

3 lecs.
COM 5463 Robotics and Machine Vision Lab
Spring. 2 credits. Prerequisites: Permission of instructor, Computer Science 410 and Computer Science 381. Co-requisite: Computer Science 462. Not offered every year.

1 lab.
COM S 472 Foundations of Artificial Intelligence
Fall. 3 credits. Prerequisites: Computer Science 107 or 212 , Computer Science 280 and Computer Science 410. Open to juniors, seniors, and graduate students.

3 lecs.
COM S 473 Practicum in Artificial Intelligence
Fall. 2 credits. Prerequisites: Computer Science 107 or 212, Computer Science 280 and 410. Corequisite: Computer Science 472. 1 lab.

COM S 481 Introduction to Theory of Computing
Fall. 4 credits. Prerequisite: Computer Science 280 or permission of instructor. Credit will not be granted for both Computer Science 381 and Computer Science 481.

3 lecs.
A faster-moving and deeper version of Computer Science 381. Corrective transfers between Computer Science 481 and 381 (in either direction) are encouraged during the first few weeks of instruction.
COM S 482 Introduction to Analysis of Algorithms
Spring. 4 credits. Prerequisites: Computer Science 410 and Computer Science 381 or 481, or permission of instructor.

3 lecs.
COM S 486 Applied Logic (also Mathematics 486)
Fall or spring. 4 credits. Prerequisites: Mathematics 222 or 294 , Computer Science 100 , and some course in mathematics or theoretical computer science. Not offered every year.

2 lecs, 1 lab to be arranged.
COM 5490 Independent Reading and Research
Fall or spring. $1-4$ credits.
COM S 501 Software Engineering: Technology and Technique
Fall. 4 credits. Prerequisite: COM S 410 and knowledge of the C programming language.

## COM S 511 Modern Programming

 LanguagesFall. 4 credits. Prerequisites: Computer Science 410 and a project course or permission of instructor. Not offered every year.

2 lecs.
COM S 514 Practical Distributed Computing
Fall or spring. 4 credits. Prerequisites; Computer Science 414 or permission of instructor. Not offered every year.

COM 5515 Practicum in Distributed Systems
Fall or spring. $1-2$ credits. Co-rerequisite: COM S 514.

1 lec.
COM S 516 High-Performance Computer Architecture
Spring. 4 credits. Prerequisite: COM S 314 required; COMS 412 or 414 highly recommended.

2 lecs.
COM S 522 Parallel Computing for Scientific Problems
Spring. 4 credits. Enrollment limited Permission of instructor. Prerequisites: Math 294 , COM S 222 or COM S 421, knowledge of $C$ and FORTRAN.

3 lecs.
COM S 572 Artificial Intelligence Programming
Fall. 4 credits. Prerequisite: Computer Science 472 or permission of instructor. Not offered every year.

3 lecs.
COM S 600 Computer Science and Programming
Fall. 1 credit. Prerequisite: graduate standing in computer science or permission of instructor. Not offered every year. 1 lec
COM S 610 Multimedia Systems Fall. 4 credits. Prerequisite: COM S 314 or permission of instructor.

## 3 lecs.

COM S 611 Advanced Programming Languages
Fall. 4 credits. Prerequisites: Computer Science 410 , and 381 or 481 , or permission of instructor.

3 lecs.
COM 5612 Compiler Design for HighPerformance Architectures
Spring. 4 credits. Prerequisites: Computer Science 314 and 412, or permission of instructor

3 lecs.
COM S 613 Concurrent Programming
Spring. 4 credits. Prerequisites: Computer Science 414 or permission of instructor. Not offered every year.

2 lecs.

## COM S 614 Advanced Systems

Spring. 4 credits. l'rerequisite: Computer Science 414 or permission of instructor. 2 lecs.
COM S 615 Theory of Concurrent Systems
Spring. 4 credits. Prerequisites: COM S 611 or permission of instructor. Not offered every year.

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3 \text { lecs. }
$$

COM 5617 Frontiers of Parallel Computer Systems
Fall. 4 credits. Prerequisites: COM S 314 or 516 required, COM S 411, 412, or 414. 3 lecs.

## COM $\mathbf{S} 618$ Topics in the Theory of

 Distributed SystemsFall. 4 credits. I'rerequisites: COM S 444 or COM S 614 or permission of instructor.

2 lecs.

## COM 5621 Matrix Computations

Fall. 4 credits. Prerequisites: COM S 444 or COM S 614 or permission of instructor.

2 lecs.
COM S 622 Numerical Optimization and Nonlinear Algebraic Equations
Spring. 4 credits. Prerequisite: COM S 621. 3 lecs.

## COM S 624 Numerical Solution of

 Differential EquationsSpring. 4 credits. Prerequisite: Previous exposure to numerical analysis, mathematical analysis including Fourier methods, and differential equations. Not offered every year.

## COM S 635 Automatic Text Processing

 and Information RetrievalSpring. 4 credits. Prerequisite: Computer Science 410 or equivalent or permission of instructor. Letter grade only.

2 lecs.

## COM S 661 Robotics

Fall. 4 credits. Prerequisites: Computer Science 482 and permission of instructor. Not offered every year.

3 lecs.

## COM 5662 Robotics Laboratory

Fall. 4 credits. Prerequisite: graduate standing or permission of instructor. Not offered every year.

1 lab.

## COM 5664 Machine Vision

Spring. 4 credits. Prerequisites: undergradu-ate-level understanding of algorithms and Mathematics 221 or equivalent.

2 lecs.
COM S 671 Introduction to Automated Reasoning
Fall. 4 credits. Prerequisites: Computer
Science 611 and 681 and Mathematics 581
Not offered every year.
3 lecs.

## COM S 672 Advanced Artificial

 IntelligenceSpring. 4 credits. Prerequisites: Computer Science 472 or permission of instructor. 2 lecs.

## COM S 681 Analysis of Algorithms

Fall. 4 credits. Prerequisite: Computer Science 381 or 481 , or permission of instructor.

$$
3 \text { lecs. }
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## COM S 682 Theory of Computing

Spring. 4 credits. Prerequisite: Computer Science 381 or 481 , or permission of instructor.

3 lecs.

## COM S 683 Parallel Algorithms

lall. 4 credits. Prerequisite: COM S 681. 1 lec.
COM 5684 Introduction to Symbolic Computation
4 credits. Prerequisites: Computer Science 381 or 481 , or permission of instructor. Not offered every year.

3 lecs.
COM S 685 Computational Geometry
Fall. 4 credits. Prerequisites: COM S 681, or permission of instructor.

COM S 709 Computer Science Graduate Seminar
Fall or spring. 1 credit. S-U grades only. For staff, visitors, and graduate students interested in computer science.
COM S 711 Topics in Programming Languages and Systems
Spring. 4 credits. Prerequisites: Computer Science 381 or 481 and Computer Science 611, or permission of instructor. Not offered every year.

2 lecs.
COM S 712 Topics in Programming Languages and Systems
Spring. 4 credits. Prerequisite: Computer Science 612 or permission of instructor. Not offered every year.

2 lecs.
COM S 713 Seminar in Systems and Methodology
Fall, spring. 4 credits. Prerequisites: a graduate course employing formal reasoning, such as COM S $600,611,613,615,671$, a logic course, or permission of instructor. Not offered every year.

## COM S 714 Distributed Computing

Spring. 4 credits. Prerequisites: Computer
Science 414 and an advanced systems course
(e.g., Computer Science 613, 614, 632, or 643)
or permission of instructor. Not offered every year.

$$
2 \text { lecs. }
$$

COM S 715 Seminar in Programming Refinement Logics
Fall or spring. 4 credits. Prerequisite: permission of instructor

## COM S 717 Topics in Parallel

 ArchitecturesFall. 4 credits. Prerequisite: Computer Science 612 or permission of instructor. Not offered every year.

2 lecs.
COM 5718 Topics in Computer Graphics
Fall or spring. 4 credits. Prerequisites: COM S 417 or permission of instructor. Not offered every year.

1 lec .
COM S 719 Seminar in Programming Languages
Fall or spring. 4 credits. Prerequisite:
Computer Science 611 or permission of
instructor. S-U grades only.
COM S 721 Topics in Numerical Analysis
Fall. 4 credits. Prerequisite: Computer
Science 621 or 622 , or permission of instruc-
tor. Not offered every year.
2 lecs.
COM S 722 Topics in Numerical Analysis Spring. 4 credits. Prerequisite: Computer Science 621 or 622 or permission of instructor. Not offered every year.

2 lecs.
COM S 729 Seminar in Numerical Analysis/ACRI
Fall or spring. $1-4$ credits (to be arranged).
Prerequisite: permission of instructor. S-U grades only.

COM 5733 Selected Topics in Information Processing
Not offered every year.
2 lecs.

COM S 739 Seminar in Text Processing and Information Retrieval
Fall or spring. 4 credits. Prerequisite:
Computer Science 635 or permission of instructor. S-U grades only.

## COM S 743 Topics in Fault-Tolerant Distributed Computing

Prerequisite: Computer Science 614, 643, or 714. Not offered every year.

1 lec .

## COM 5747 Seminar in Program Logic

 and Semantics4 credits. Prerequisite: permission of instructor. S-U grades only. Not offered every year.
COM 5753 Seminar on Work in Progress in Distributed Systems
Fall and spring. 1 credit. Prerequisite: permission of the instructor.

COM S 754 Seminar in Work in ProgressDistributed Systems
Fall. 1 credit.
1 sec .

## COM S 761 Dynamic Manipulation and

 Scientific ComputationSpring. 4 credits. Prerequisites: COM S 462 or COM S 661, a strong background in robotics and algorithms (e.g. COM S 481), and permission of the instructor.

1 lec.
COM S 762 Robot Cafe
Spring. 4 credits. Prerequisite: CS661. Not offered every year.
Advanced seminar on varying topics.

## COM S 763 Topics in Geometric

 MatchingSpring. 4 credits. Prerequisites: COM S 685. 1 lec.

## COM S 771 Topics in Artificial

 Intelligence4 credits. Prerequisite: permission of instructor. Not offered every year

COM S 772 Seminar in Advanced Robotics
4 credits. Prerequisite: permission of instructor. Not offered every year.
COM S 773 Proseminar in Cognitive Studies I |also Cognitive Studies, Philosophy, Linguistics, and Psychgology 773)
Fall. 2 credits.
COM S 779 Seminar in Machine Learning
Fall or spring. Credit to be arranged.
Prerequisite: permission of instructor. S-U grades only.
COM S 781 Topics in Analysis of Algorithms and Theory of Computing Fall. 4 credits. Prerequisites: Computer Science 681 and 682 or permission of instructor. S-U grades only. Not offered every year.

$$
2 \text { lecs. }
$$

COM 5782 Topics in Analysis of Algorithms and Theory of Computing Spring. 4 credits. Prerequisites: Computer Science 681 and 682 or permission of instructor. S-U grades only. Not offered every year.

2 lecs.

## COM S 784 Seminar in Computational Algebra

Fall or spring. Informal weekly seminar in which current topics in computational algebra and symbolic mathematics are discussed.

## COM $\mathbf{S} 789$ Seminar in Theory of Algorithms and Computing

Fall, spring. 2-4 credits. Prerequisite permission of instrictor. S-U grades only
COM \$ 790 Special Investigations in Computer Science
Fall, spring. Prerequisite: permission of a computer science adviser. Letter grade only. Independent research or Master of Engineering project.

## COM $\mathbf{5} 890$ Special Investigations in Computer Science

Fall, spring. Prerequisite: permission of a computer science adviser. S-U grades only Master of Science degree research.
COM $\mathbf{S} \mathbf{9 9 0}$ Special Investigations in Computer Science
Fall, spring. Prerequisite: permission of a computer science adviser. S-U grades only. Doctoral research.

## DANCE

See listings under Department of Theatre Arts.

## DUTCH

See Modern Languages and Linguistics.

## ECONOMICS

T. Mitra, chair; R. Masson, graduate field representative; $T$. Lyons, director of undergraduate studies; K. Basu, V. Bencivenga, L. Blume, T. E. Davis, D. Easley, R. Ehrenberg, G. Fields, R. Frank, G. Hay, Y. Hong, M. Kelly, N. Kiefer, P. Legros, P. D. McClelland,
M. Majumdar, J. Mitchell, U. Possen,
R. E. Schuler, K. Shell, B. Smith, G. J. Staller, S. Subramanian, E. Thorbecke, J. Vanek, M. Veracierto, T. Vogelsang, H. Y. Wan, Jr., J. Wissink. Emeritus: W. Isard, A. Kahn, P. O'Leary, S. Tsiang

The study of economics provides an understanding of the way economies operate and an insight into public issues. The department offers a broad range of undergraduate courses in such fields as money and banking international and comparative economics; econometrics; theory; history; growth and development; and the organization, performance, and control of industry.

## Social Science Distribution Requirement

The microeconomics distribution requirement can be fulfilled with any of the following:

Economics 101, Economics 201, Economics 203, or Economics 313.
The macroeconomics distribution requirement can be satisfied with any of the following:

Economics 102, Economics 202, Economics 204, or Economics 314.

## The Major

Students who wish to major in economics must have completed Economics 101 or Economics 203 and Economics 102 or Economics 204 or equivalent courses, and Mathematics 111, or its equivalent. A grade below a $C$ will not be accepted for any of the above. Economics 203 (with a grade of B or better) satisfies both the introductory micro (Economics 101) and the intermediate micro (Economics 313) requirement. Similarly Economics 204 (with a grade of B or better) satisfies both the introductory macro (Economics 102) and intermediate macro (Economics 314) requirement.
Prospective majors should apply at the department office.

The requirements for the major beyond the introductory courses and Math 111 are:
(1) Economics 313 (or Economics 203 with grade of $B$ or better)
(2) Economics 314 (or Economics 204 with grade of B or better)
(3) Economics 319 or Economics 321, and
(4) 20 credits of other economics courses listed by the Department of Economics, except that Economics 399 (independent study) and/or Economics, 499 (honors program) will not count toward the 20 -credit requirement. With the permission of the major adviser, one or (in exceptional cases) two economics courses offered outside the College of Arts and Sciences may be applied to fulfill this requirement. Only courses in which a student receives a grade of C - or better will be counted towards satisfying the major requirements.
An honors program is currently being offered. Students should consult the director of undergraduate studies before May of their junior year for more information.
Students planning graduate work in economics or business are strongly encouraged to prepare themselves well in mathematics and econometrics. These students are strongly encouraged to enroll in Economics 319-320 rather than Economics 321.

## Courses

ECON 101 Introductory Microeconomics
Fall, spring, or summer. 3 credits. Economics 101 is not a prerequisite for 102.

Lecs and disc.
Explanation and evaluation of how the price system operates in determining what goods are produced, how goods are produced, and who receives income, and how the price system is modified and influenced by private organizations and government policy
ECON 102 Introductory Macroeconomics Fall, spring, or summer. 3 credits. Economics 101 is not a prerequisite for 102.

Lecs and disc.
Analysis of aggregate economic activity in relation to the level, stability, and growth of national income. Topics discussed may include the determination and effects of unemployment, inflation, balance of payments, deficits, and economic development, and how these may be influenced by monetary, fiscal, and other policies.

## ECON 103 Introduction to Economic Analysis

Spring. 4 credits
This course will introduce the student to the basic tools of microeconomic and macroeconomic theory necessary to understand and analyze contemporary economic problems and their proposed solutions. In particular, the allocative role of the price system in determining production, consumption, and the distribution of income will be analyzed. The course will also focus on aggregate economic activity in relation to the level, stability, and growth of national income and other measures like unemployment, inflation, the deficit, and balance of payments. We will also develop an awareness of the strengths and weaknesses of markets and how the price system and aggregate economy are modified and influenced by private organizations and government policy at both the micro and macro levels of analysis. (Cannot be applied to the economics major.)

## ECON 203 Microeconomics

Fall. 4 credits. Prerequisite: calculus. Intended for students with strong analytical skills who have not taken Economics 101, 102, 201, or 202. Can be used to replace both Economics 101 and 313. (Can replace 313 only with grade of H or better). This course covers the topics taught in Economics 101 and 313. An introduction to the theory of consumer and producer behavior and to the functioning of the price system.

## ECON 204 Macroeconomics

Spring. 4 credits. Prerequisite: Economics 203.

Intended for students with strong analytical skills who have not taken Economics 101, 102, 201, or 202. Can be used to replace both Economics 102 and 314. This course covers the topics taught in Economics 102 and 314. (Can replace 314 only with grade of B or better). An introduction to the theory of national income determination, unemployment, growth, and inflation.
ECON 301 Economics of Market Failure Spring. 4 credits. Prerequisites: Economics 101-102.
The course will review briefly the welfare properties of the perfectly competitive market model and will then consider a range of situations in which these properties are modified and where there may be a case for some form of government intervention. The cases to be considered will include (a) the presence of externalities, pollution, and the economics of the environment; (b) the provision of public goods, the free-rider problem; (c) uncertainty and imperfect information, an analysis in the context of labor and insurance markets, and the market for medical care; $(\mathrm{d})$ the regulation of natural monopoly and public utility pricing; (e) the failure of the market to achieve desired redistributional objectives; (f) direct and indirect taxation as instruments of redistribution.

## [ECON 303 Positive and Normative

 Theories of Income Distribution Spring. 4 credits. Cannot be applied to the major. Not offered 1994-95After examining the distinction between the terms positive and normative as used in economics, this course will explore three main questions: (1) Why is income distributed the way it is? (2) How should income be distributed? (3) What is the relationship
between 1 and 2? Particular emphasis will be given to those theories of income distribution, both positive and normative, that tend to dominate discussion of these topics in America.]

## ECON 304 Economics and the Law

Fall. 4 credits. Prerequisite: Economics 101. An examination, through the lens of economic analysis, of legal principles drawn from various branches of law, including contracts, torts, and property. Cases are assigned for class discussion; in addition, there are several writing assignments.

## [ECON 306 Economics of Defense Spending

Spring. 4 credits. Prerequisites: Economics 101-102. Not offered 1994-95.
The economic aspects of defense spending are analyzed. Emphasis is on the procurement of weapons systems. Topics covered include an overview of the defense budget, special characteristics of the defense market, the structure of the defense industry, and the economic behavior of defense firms.]

## [ECON 308 Economic Analysis of Government (also Civil and Environmental Engineering 322)

Spring. 4 credits. Prerequisites: calculus plus Economics 313 or equivalent or Civil and Environmental Engineering 321. Not offered 1994-95.
Analysis of economic bases for government intervention in a market economy. Topics include public goods, cost-benefit analysis, public finance, environment regulation and risk management, and macroeconomic topics.]
[ECON 309 Environmental Economics Spring. 4 credits. Prerequisites: Economics 101-102. Not offered 1994-95.
This course examines the economic aspects of environmental issues. We will look at theoretical and analytical tools of economics as they apply to environmental issues, as well as related philosophical and ethical issues. We will then apply the various economic and ethical paradigms to current environmental issues.]

## ECON 313 Intermediate Microeconomic

 TheoryFall, spring, or summer. 4 credits. Prerequisites: Economics 101-102 and calculus The pricing process in a private enterprise economy are analyzed under varying competitive conditions, and their role in the allocation of resources and the functional distribution of national income is considered.

ECON 314 Intermediate Macroeconomic Theory
Fall, spring, or summer. 4 credits. Prerequisites: Economics 101-102 and calculus.
The theory of national income and determination and economic growth in alternative models of the national economy is introduced. The interaction and relation of these models to empirical aggregate economic data is examined.

ECON 315 History of Economic Analysis Fall. 4 credits. Prerequisites: Economics 101-102 or permission of instructor. Early writings in economics and their relationship to current economic analysis and policy issues, for example, ancient and medieval philosophers on justice in exchange; mercantilist arguments for trade protection; early theories about the effect of monetary expansion (D. Hume); the role of the
entrepreneur (Cantillon); and general competitive equilibrium (the Physiocrats). The most recent reading assignment in this course is Adam Smith's Wealth of Nations but the emphasis is on the relationship between the precursors of Adam Smith and his Wealth of Nations to modern economics analysis and current efforts to answer some of the questions raised in the early writing on economics.

## [ECON 317 Intermediate Mathematical Economics I

Fall. 4 credits. Prerequisites: Economics 101-102 and Math 111-112. Not offered 1994-95.
Introduction of calculus and matrix algebra; problems of maximization of a function of several variables. Economic examples are used to illustrate and teach the mathematical concepts.]

## [ECON 318 Intermediate Mathematical

 Economics IISpring. 4 credits. Prerequisites: Economics 101-102 and Math 111-112. Not offered 1994-95.
Advanced techniques of optimization and application to economic theory.]

## ECON 319 Introduction to Statistics and Probability

Fall. 4 credits. Prerequisites: Economics 101-102 and Mathematics 111-112.
This course provides an introduction to statistical inference and to principles of probability. It includes descriptive statistics, principles of probability, discrete and continuous distributions, and hypothesis testing (of sample means, proportions, variance). Regression analysis and correlation are introduced.

ECON 320 Introduction to Econometrics Spring. 4 credits. Prerequisites: Economics $101-102,319$, or equivalent
Introduction to the theory and application of econometric techniques. How econometric models are formulated, estimated, used to test hypotheses, and used to forecast; understanding economists' results in studies using regression model, multiple regression model, and introduction to simultaneous equation models.

ECON 321 Applied Econometrics
Fall or spring. 4 credits. Prerequisites: Economics 101-102 and calculus.
This course provides an introduction to statistical methods and principles of probability. Topics to be covered include analysis of data, probability concepts and distributions, estimation and hypothesis testing, regression correlation and time series analysis. Applications from economics are used to illustrate the methods covered in the course.

ECON 323 American Economic History
Fall. 4 credits. Prerequisites: Economics 101-102 or equivalent.
Problems in American economic history from the first settlements to early industrialization are surveyed.

ECON 324 American Economic History Spring. 4 credits. Prerequisites: Economics 101-102 or equivalent.
A survey of problems in American economic history from the Civil War to World War I.

## ECON 325 Economic History of Latin

 America (a)Fall. 4 credits. A survey of changing economic institutions and policies from preColumbian to modern times

## ECON 326 History of American Enterprise

Spring. 4 credits. Prerequisites: Economics 101-102 or equivalent.
History of the changing structure of American business from 1800 to the present, with major emphasis upon developments after the Civil War. The focus of the course will be the changing structure of challenges (for example, the rise of unions, development of a national capital market, changing role of government) and the various responses of business organizations and entrepreneurs to those chatlenges.

## ECON 331 Money and Credit

Spring. 4 credits. Prerequisites: Economics 101-102 and 314.
A systematic treatment of the determinants of the money supply and the volume of credit. Economic analysis of credit markets and financial institutions in the United States.

## ECON 333 Financial Economics

Fall. 4 credits. Prerequisites: Economics 313 and 314.
The theory and decision making in the presence of uncertainty and the practical aspects of particular asset markets are examined

## ECON 335 Public Finance: The

 Microeconomics of Government Fall. 4 credits. Prerequisites: Economics 101-102 and 313, or their equivalent, and one semester of calculus.The role of government in a free market economy is analyzed. Topics covered include public goods, market failures, allocation mechanisms, optimal taxation, effects of taxation, and benefit-cost analysis. Current topics of an applied nature will vary from term to term.

## ECON 336 Public Finance: Resource Allocation and Fiscal Policy

Spring. 4 credits. Prerequisites: Economics 101-102, 313 or their equivalent and one semester of calculus.
This course covers the revenue side of public finance and special topics. Subjects covered include the federal debt, the budget, and government regulation and transfers, as well as problems tike local public goods, health care, education, the hierarchy of governmental structure, plus a variety of applied problems.

## ECON 338 Macroeconomic Policy

Spring. 4 credits. Prerequisite: Economics 314 or equivalent.
The use of fiscal and monetary policies for achieving full employment, price-level stability, and appropriate economic growth are studied.

## ECON 341 Labor Economics

Fall. 4 credits. Prerequisites: Economics 101-102.

## [ECON 342 Economic Analysis of the University <br> Spring. 4 credits. Prerequisite: ILR 240 or

 313 or their equivalent. Not offered 1994-95. This course seeks to illustrate the complexity of decision making in a nonprofit organization and to show how microeconomic analysis in general, and labor market analysis in particular, can be usefully applied to analyzeresource allocation decisions at universities Among the topics covered are financial aid, tuition, and admissions policies, endowment policies, faculty salary determination, the tenure system, mandatory retirement policies, merit pay, affirmative action, comparable worth, collective bargaining, resource allocation across and within departments, undergraduate versus graduate education, research costs, libraries, athletics, and "socially responsible" policies.]

## ECON 351 Industrial Organization

Fall. 4 credits. Prerequisite: Economics 313 or its equivalent.
A study of markets that differ from the ideal of perfect competition (e.g., monopoly and oligopoly) and the efforts of our legal system through the antitrust laws to deal with the kinds of problems that arise in such markets. Specific topics covered include mergers, price fixing, price discrimination, predatory pricing, and vertical restraints such as resale price maintenance.

## ECON 352 Advanced Topics in Industrial Organization <br> Spring. 4 credits. Prerequisites: Economics 351.

This course is an extension of 351 and will emphasize (a) more-advanced topics in the theory of industrial organization with special attention to recent developments in the literature; and (b) empirical analysis of numerous issues relating to the structure of markets and their performance.
[ECON 354 Economics of Regulation Fall or spring. 4 credits. Prerequisite: Economics 313 or equivalent or Civil and Environmental Engineering 321. Not offered $1994-95$.
Explores technological bases for government intervention in the private market economy, which include decreasing cost industries (natural monopolies) and technical externalities (pollution and risk). The economic implications of regulating electric, gas, and communications and transportation utilities, including pricing, service quality, efficiency incentives, and long-range planning issues, are examined in detail. Topics on environmental protection and societal risk management are also explored.]

## ECON 355 Departures from Rational

 ChoiceFall. 4 credits. Prerequisites: Economics 313 and 314 , or their equivalents. Not offered 1994-95.
This course examines behaviors that appear inconsistent with the traditional theory of rational choice. These behaviors fall under two broad categories: (1) irrational behavior with regret, and (2) irrational behavior without regret. The first category includes, but is not limited to, behaviors that result from cognitive errors. Once people are made aware of these errors, they typically express a desire to modify their behavior in the directions called for by rational choice theory. The second category represents a deeper challenge to the traditional model. It consists of behaviors that people generally express no desire to modify despite their inconsistency with rational choice theory.]

## [ECON 357 Game Theory

Spring. 4 credits. Prerequisites: Economics 313 and 319. Not offered 1994-95.
This course studies mathematical models of conflict and cooperation in situations of
uncertainty (about nature and about decision makers).]

## ECON 361 International Trade Theory and Policy

Fall. 4 credits. Prerequisites: Economics 101-102 and 313.
This course surveys the sources of comparative advantage. It studies commerical policy and analyzes the welfare economics of trade between countries. Some attention is paid to the institutional aspects of the world trading system.

## ECON 362 International Monetary Theory and Policy <br> Spring. 4 credits. Prerequisites: Economics

 101-102 and 314This course surveys the determination of exchange rates and theories of balance of payments adjustments. It also explores open economy macroeconomics, and it analyzes some of the institutional details of foreign exchange markets, balance of payments accounting, and the international monetary system.
ECON 363 International Economics
Fall. 4 credits. Prerequisite: Economics 101-102 or equivalent
This course surveys international economics in one semester. First, it surveys the sources of comparative advantage, and it analyzes commercial policy and the institutional aspects of the world trading system. Second, it discusses exchange rates, and it studies theories of balance of payments adjustments. This course is intended primarily for government majors who are comfortable with a less technical approach to international economics. (Cannot be applied to the economics major.)

## ECON 365 Economic Problems of Latin

 America (Spring. 4 credits. Prerequisites: Economics 101-102.
Current topics include, international debt, capital flight, economic integration, stabilization programs, etc.

## [ECON 366 The Economies of the Former Soviet Union and of Central Europe: From Central Planning to Markets

Fall. 4 credits. Prerequisites: Economics 101-102. Not offered 1994-95.
The course will introduce first the basic features of a centraily planned economy and proceed to consider the most important example: the rise and fall of the Soviet Union. Secondly, the analysis will be extended to what used to be known as "Eastern Europe" (e.g., Czechoslovakia, Hungary, Poland). From this necessary historical background, the course will proceed to current attempts to move away from Socialist central planning and its legacies to market economy,
privatization, and independence of the "successor states" of the Soviet Empire as well as their attempts to join, or re-join, Western Europe. Current developments will be addressed.]

## [ECON 367 Comparative Economic

 Systems: East and WestFall or spring. 4 credits. Prerequisites: Economics 101-102. Not offered 1994-95 The course will develop first a framework for studying economic systems and national economies and present three simple stylized systemic models: capitalist market, socialist market, and central planning. Secondly, the course will consider economic goals to be
achieved (such as growth, stability, and productivity) and introduce quantitative measures used in the evaluation of the performance. Thirdly, comparative studies of selected national economies representing the models will be carried out.]
ECON 369 The Economy of China © Spring. 4 credits. Prerequisites: Economics 101-102 or permission of instructor Examines the development of the Chinese economy and the evolution of China's economic system since 1949.

## ECON 370 Socialist Economies in Transition

Fall. 4 credits. Prerequisites: Economics 101-102 and 313-314.
This course studies the economic aspects of the transition of centrally planned, socialist economies to capitalist, market economies. It begins with an overview of the functioning of centrally planned economies, the arguments for reform, and experience with reform of these economies prior to 1989. This background section provides an understanding of the issues relating to reform. The focus then shifts to the current transitions in the reforming economies. We examine the key elements of the reform process, including macroeconomic stabilization and price liberalization, tax reform, development of capital markets, and privatization of firms. We study the economic arguments relating to each of these aspects of reform and compare experiences with reform in different countries.

## ECON 371 Economic Development

Fall. 4 credits. Prerequisites: Economics 313 or equivalent.
Study of the problem of sustaining accelerated economic growth in less-developed countries. Trade-offs between growth, welfare, and equity; the legacy of colonialism; relevance of history and economic theory; problems of capital formation, economic planning and international specialization; and the interaction of industrialization, agricultural development, and population change are emphasized.

## [ECON 372 Applied Economic Davelopment

Fall or spring. 4 credits. Prerequisite: Economics 313. Not offered 1994-95.]

## [ECON 374 National and International Food Economics (also Nutritional Sciences 457)

Spring. 4 credits. Prerequisites: a college course in economics and junior standing or permission of instructor. Not offered 1994-95 Examination of individual components essential for an understanding of the U.S. and world food economies. Analysis of the world food economy. Review and analysis of (a) the major economic factors determining the demand for food, the composition of food consumption, and nutritional intake; and (b) the major economic factors affecting food production and supply. Examination and evaluation of the effectiveness of various food policies and programs in altering food consumption patterns. Principles of nutritional planning in developing countries within the context of the process of economic and social development.]

## [ECON 381 Economics of Participation and Workers' Management

Spring. 4 credits. Prerequisites: Economics 313-314 or permission of instructor. Not offered 1994-95.

The theory of labor-management economies is developed systematically, and literature on that and related subjects surveyed. Theories of the participatory firm, industry, and general equilibrium are covered together with a microeconomic theory and analysis of special dimensions of the system. Efficient decisionmaking processes within the firm are also studied. Illustrative references to Yugoslavia and other real instances of labor participation are made throughout.]

## [ECON 382 The Practice and

 Implementation of Self-Management Fall. 4 credits. Prerequisites: Economics 101-102. Not offered 1994-95.A broad introduction to the subject of workers' self-management intended for both economists and non-economists. It contains no technical tools nor does it require prior professional knowledge: thus there are no prerequisites. The course objective is to answer 5 broad questions: (1) What is selfmanagement? (2) Where and in what form does it occur? (3) What is its history? (4) How does it work? and (5) How is a cooperative enterprise/economy started/ operated?]

## ECON 399 Readings in Economics

Fall or spring. Variable credit.
Independent study
ECON 416 Intertemporal Economics Spring. 4 credits. Prerequisites: Economics 313.

This course is intended for advanced economics majors who are especially interested in economic theory. Topics to be covered: (a) review of the one good Ramsey model of optimal savings and accumulation; conditions for intertemporal efficiency in production; comparative dynamics and sensitivity analysis; (b) some earlier models of capital accumulation; the roles of present value and internal rate of retum in guiding investment decisions; (c) growth, exhaustible resources; pollution and conservation: discussion of the trade-offs facing a society.
[ECON 419 Economic Decisions under Uncertainty
Fall. 4 credits. Prerequisites: Economics 313 and 319. Not offered 1994-95.
This course provides an introduction to the theory of decision making under uncertainty with emphasis on economic applications of the theory.]

## ECON 422 The Economics of

 Infrastructure and a Sustainable Environment (also CEE 422)Fall. 4 credits. Prerequisite: Mathematical version of intermediate microeconomics (ECON 203 or 313 or CEE 321).
An analysis of the economic physical and ecological environments in which products, projects, and/or engineered systems are implemented. Market failures that must be corrected to sustain a modern industrial economy are studied, including problems of the environment, public goods, renewable resources, scale economies, urbanization, demographics, and economic development. Important planning tools presented include methods for assessing project demand, costbenefit analysis, choosing the proper discount rate, dealing with uncertainty, financial constraints, and when and how to price. Also discussed are problems of sustainability, global climate change, the allocation of scarce and previously nonmarketed resources, and
the planning and management of activities with uncertain environmental consequences.

## [ECON 445 Topics in Microeconomic

 Analysis-Markets and Planning Fall or spring. 4 credits. Prerequisites Economics 313. Not offered 1994-95. This is a course of economic theory designed for upperclass undergraduates. Course contents may vary from year to year. Issues that may be examined include (1) How can economic activities be efficiently organized through the market mechanism? Why is the presence of many traders essential to efficiency? (2) What can be done if the indivisibility in production processes becomes an important hindrance to competitive pricing? (3) How can economic planning be decentralized efficiently? This course serves two purposes: (1) to introduce concepts that are novel to undergraduates and relevant to public policy but require only a modicum of analytic tooling up, and (2) to illustrate the deductive approach of modern economic analysis-how to define concepts unambiguously, how to form propositions in clear-cut fashion, and how to follow up logical implications sequentially to the conclusion.][ECON 446 Topics in Macroeconomic Analysis-ls Keynesianism Dead?
Fall or spring. 4 credits. Prerequisites: Economics 314. Not offered 1994-95. The coverage of this course may vary from term to term. Presently the content of the course deals with the range of criticisms against Keynesian theory by the New Classical Economics, alias the Equilibrium School, alias the Rational Expectations School. Despite the fact that almost all intermediate macroeconomic textbooks are Keynesian in perspective, clearly Keynesian economics is currently at bay. We shall review critically, critiques to Keynesian theory.]

## ECON 473 Economics of Export-Ied

 Development ©Fall. 4 credits. Prerequisites: Economics 313, 314, or their equivalent.
This course will examine the phenomenon of expor-led development from both the theoretical and empirical points of view Concentration will he on experiences within the West Pacific Rim.

## [ECON 481 Economic Effects of

 Participation and Labor-Managed SystemsFall or spring. 4 credits. Prerequisites: Economics 381 and 382. Not offered 1994-95. This course applies microeconomic theory to analyzing the performance of firms in which employees either participate in the decisionmaking process or make all the important decisions. If a specialist in the area is lacking, Prof. Vanek may give the course as a seminar where primarily grad students will discuss topics in the literature selected through consensus of the participants.]
[ECON 482 Practical Aspects of Business Management of Worker Enterprises
Fall or spring. 4 credits. Prerequisite: should be taken concurrently with or following Economics 382/582, and permission of instructor. Not offered 1994-95.
This course is designed to further and deepen undergraduate and graduate students knowledge of workers' self-management democratic enterprises. It will be based primarily on dialogue and participants' own presentations of their research in relevant
areas such as cooperative business law, finance, accounting, or internal work organization. The instructor will act primarily as a coordinator and resource person. Whenever possible an attempt is made to form and incorporate a self-managing cooperative enterprise. Students who have taken all three courses, Economics 381/681, $382 / 682$, and 482, both graduate and undergraduate, are welcome to participate as teacher-student interns. They may receive additional independent study credit for this work.]
[ECON 483 The Technological and Product Base of Worker Enterprises, with Special Emphasis on Ecology and Solar Energy Applications
Fall or spring. 4 credits. Prerequisite: may be taken concurrently with or following Economics $382 / 582$, and permission of instructor. Not offered 1994-95.
This course is designed to deepen undergraduate and graduate students' knowledge of workers' self-management and cooperation, through learning about and construction of simple energy-related technologies, to be produced in workers' enterprises. Size of the class is limited by technical, space, and instruction resources. Some of the technologies may serve as a basis for projects to be undertaken in Economics 482.]

## ECON 499 Honors Program

Fall and spring. 8 credits.
Consult the Director of Undergraduate Studies for details. Interested students should apply to the program in the spring semester of their junior year.

## Graduate Courses and Seminars

ECON 509 Microeconomic Theory I
Fall. 4 credits.
Topics in consumer and producer theory.
ECON 510 Microeconomic Theory II Spring. 4 credits.
Topics in consumer and producer theory, equilibrium models and their application, externalities and public goods, intertemporal choice, simple dynamic models and resource depletion, choice under uncertainty.

ECON 513 Macroeconomic Theory: Static Income Determination
Fall. 4 credits.
ECON 514 Macroeconomic Theory: Dynamic Models, Growth, and Inflation
Spring. 4 credits.

## ECON 516 Applied Price Theory

## Spring, 4 credits.

The course emphasizes the applications of the principles of price theory to a variety of problems taken from concrete, practical settings.
ECON 517 Intermediate Mathematical Economics I
Fall. 4 credits.

## ECON 518 Intermediate Mathematical Economics II <br> Spring. 4 credits.

ECON 519 Econometrics I
Fall. 4 credits. Prerequisites: Economics 319-320 or permission of instructor. This course gives the probabilistic and statistical background for meaningful application of econometric techniques.

Topics to be covered are (1) probability theory: probability spaces, random variables, distributions, moments, transformations, conditional distributions, distribution theory and the multivariate normal distribution, convergence concepts, laws of large numbers, central limit theorems, Monte Carlo simulation; (2) statistics: sample statistics, sufficiency, exponential families of distributions. Further topics in statistics will be considered in Economics 520.

## ECON 520 Econometrics II

Spring. 4 credits. Prerequisite: Economics 519.

This course is a continuation of Economics 519 (Econometrics I) covering (1) statistics: estimation theory, least squares methods, method of maximum likelihood, generalized method of moments, theory of hypothesis testing, asymptotic test theory, and nonnested hypothesis testing and (2) econometrics: the general linear model, generalized least squares, specification tests, instrumental variables, dynamic regression models, linear simultaneous equation models, nonlinear models, and applications.

## ECON 537 Economics of Financial

 Market RegulationFall. 4 credits. Prerequisites: ECON 313 and 314 and the consent of the instructor. The decade of the 90 s has seen a revolution in financial regulation. The FDICIA, the Basel agreements, and the various European Community directives are changing the rules of the financial game. What are the possible impacts on financial markets and institutions? What is the likely structure of financial intermediation after these regulatory shocks? Specific topics to be covered: financial markets, intermediaries and instruments; quantitative analysis of financial assets and flows; economics of financial intermediation; financial regulation in the U.S. and Europe and harmonization; costs and benefits of the current regulatory environment.

## ECON 565 Economic Problems of Latin

 AmericaSpring. 4 credits.
For description see Economics 365.
[ECON 581 Economics of Participation and Worker Management
Spring. 4 credits. Not offered 1994-95.
For description see Economics 381.]

## [ECON 582 The Practice and

 Implementation of Self-Management Fall. 4 credits. Not offered 1994-95.For description see Economics 382.]

## ECON 599 Readings in Economics

Fall or spring. Variable credit.
Independent study.
[ECON 603 Seminar in Peace Science
Fall. 4 credits. Not offered 1994-95.
Among topics to be covered at an advanced level are game theory, coalition theory, bargaining and negotiation processes, cooperative procedures, microbehavior models, macrosocial processes, and general systems analysis.]

## [ECON 605 Advanced Social Theory for

 Peace ScientlstsSpring. 4 credits. Prerequisites: Economics 505 and knowledge of microeconomic theory. Not offered 1994-95.
Study of diverse social science hypotheses and theories as they relate to, and can be
synthesized within, multiregional, multinational, and generally multigroup conflict and cooperative frameworks. Particular attention will be given to developments stemming from microeconomics and general systems theory. Dynamic analyses will be emphasized.]

## ECON 610 Stochastic Economics:

Concepts and Techniques
Spring. 4 credits. Prerequisites: Economics $509,510,513,514,519$, and 520.
This course will review a number of techniques that have been useful in developing stochastic models of economic behavior. Among these are (a) discrete-time Markov processes, (b) dynamic programming under uncertainty, and (c) continuous-time diffusion processes. Examples of economic models will be drawn from recent literature on optimal capital accumulation and optimal savings and portfolio selection problems; permanent income hypothesis; dynamic models of price adjustment, etc. Advanced graduate students contemplating work in economic theory and econometric theory will be able to get some exposure to current research.

## ECON 611 Advanced Microeconomic Theory <br> Fall. 4 credits.

## ECON 612 Advanced Macroeconomic Theory

## Fall. 4 credits.

ECON 617 Mathematical Economics Spring. 4 credits.

## ECON 618 Mathematical Economics

## Fall. 4 credits.

## ECON 619 Advanced Topics in

 Econometrics IFall. 4 credits. Prerequisites: Economics 519-520 or permission of instructor. Advanced topics in econometrics, such as asymptotic estimation and test theory, robust estimation, Bayesian inference, advanced topics in time-series analysis, errors in variable and latent variable models, qualitative and limited dependent variables, aggregation, panel data, and duration models.
ECON 620 Advanced Topics in Econometrics II
Spring. 4 credits. Prerequisites: Economics 519-520 or permission of instructor. For description see Economics 619.
ECON 623 American Economic History Fall or spring. 4 credits.

ECON 624 American Economic History Fall or spring. 4 credits.
ECON 626 Methods in Economic History Fall or spring. 4 credits.
ECON 631 Monetary Theory and Policy Spring. 4 credits.

ECON 632 Monetary Theory and Policy Fall. 4 credits.
ECON 635 Public Finance: Resource Allocation and Fiscal Policy
Fall. 4 credits.
ECON 636 Public Finance: Resource Allocation and Fiscal Policy Spring. 4 credits.

## ARTS AND SCIENCES - 1994-1995

[ECON 637 Location Theory and Regional Analysis
Fall. 4 credits. Prerequisites: Economics 509 and 517 and Econometrics. Not offered 1994-95.
Economic principles influencing the location of economic activity, its spatial equilibrium structure, and dynamic forces. Topics include spatial pricing policies, price competition, and relocation by firms; residential location patterns; patterns of regional growth and decline; and patterns of urbanization.]

## ECON 638 Public Finance: Local

 Government and Urban Structure Fall or spring. 4 credits.An integration of urban economics and location theory with local public goods and state and local public finance topics. Both equilibrium models and dynamic analyses are explored.
ECON 641 Seminar in Labor Economics Spring. 4 credits.
ECON 642 Seminar in Labor Economics Fall. 4 credits.

ECON 644 The Labor Market and Public Policy: A Comparative Vlew
Fall or spring. 4 credits.
ECON 647 Economics of Evaluation (also Industrial and Labor Relations 647)
Spring. 4 credits
For description see Industrial and Labor Relations 647.

ECON 648 Issues in Latin America Fall. 4 credits

ECON 651 Industrial Organization and Regulation
Fall. 4 credits
ECON 652 Industrial Organization and Regulation
Spring. 4 credits.
[ECON 653 Public Policy Issues for Industrial Organizations
Spring. 4 credits. Prerequisites: Economics 509,510 , and 651. Not offered 1994-95. The course takes an in-depth view of the interaction between the government and business. Methods of business control, including antitrust, price regulation, entry regulation, and safety regulation. Emphasis will be not only on the economic effects on business, but on the economics of selecting and evolving the method of control.]

## [ECON 655 Rivalry and Cooperation

Fall. 4 credits. Prerequisites: Economics Graduate Core or instructor's permission. Not offered 1994-95.
In standard models, economic interaction is impersonal. Agents respond to price signals and measure their own welfare not in relative but in absolute terms; and cooperative behavior emerges only when it coincides with narrow self-interest. This course will explore the details of rivalry and cooperation in an effort to synthesize broader views of economic interaction. Topics will include the effect of concerns about relative income on wage rates, consumption, savings, and regulation; the effect of concerns about fairness on prices and wages; the conditions that foster trust and cooperation; and the role of positional competition in the distribution of economic rewards.]

ECON 656 Noncooperative Game Theory Fall. 4 credits. Prerequisites: Economics $509-510$ and 519.
This course surveys equilibrium concepts for non-cooperative games. We will cover Nash equilibrium and a variety of equilibrium refinements, including perfect equilibrium, proper equilibrium, sequential equilibrium and more! We will pay attention to important special classes of games, including bargaining games, signalling games, and games of incomplete information. Most of our analysis will be from the strict decision-theoretic point of view, but we will also survey some models of bounded rationality in games, including games played by automata

## ECON 657 Economics of Imperfect

 InformationSpring. 4 credits. Prerequisites: Economics 509-510 and 519.
The purpose of this course is to consider some major topics in the economics of uncertain information. Although the precise topics considered will vary from year to year, subjects such as markets with asymmetric information, signalling theory, sequential choice theory, and record theory will be discussed

## ECON 661 International Economics: Trade Theory and Policy

Fall. 4 credits
This course surveys the sources of comparative advantage. It analyzes simple general equilibrium models to illustrate the direction, volume, and welfare effects of trade. Topics in game theory and econometrics as applied to international economics may be covered.

## ECON 662 International Economics: International Finance and Open Economy Macroeconomics

Spring. 4 credits.
This course surveys the determination of exchange rates and theories of balance of payment adjustments. It explores open economy macroeconomics by analyzing models of monetary economies. Topics in monetary economics and econometrics as applied to international economics will be covered.
[ECON 664 International Economics: Balance of Payments and International Finance
Fall or spring. 4 credits. Not offered 1994-95.]
[ECON 670 Economic Demography and Development
Fall or spring. 4 credits. Not offered 1994-95.]

ECON 671 Economic Development and Development Planning
Spring. 4 credits.
Reviews the existing literature on the determinants of economic growth and the interrelationship between growth and income distribution through the process of economic development. A general equilibrium approach to development is taken. Computable general equilibrium models, based on social accounting matrices, are used to explore the performance of a variety of developing countries. Among the topics explored are: impact of structural adjustment and stabilization policies on growth, equity and internal and external equilibrium; sectoral interrelationship and interdependence through the growth process. Critical review and evaluation of national, sectoral and regional
development models built for such developing countries as India, Brazil, Indonesia and Ecuador

ECON 672 Economics of Development
Fall. 4 credits. Prerequisites: first-year graduate economic theory and econometrics. Analytical approaches to the economic problems of developing nations. Topics to be covered include: some old and new directions in development economics thinking, the welfare economics of poverty and inequality, empirical evidence on who benefits from economic development, labor market models, project analysis with application to the economics of education, and development policy.
[ECON 673 Economic Development Fall or spring. 4 credits. Prerequisites: Economics 509 and 520. Not offered 1994-95. The course is concerned with theoretical and applied works that seek to explain economic development, or lack thereof, in countries at low-income levels. Specific topics vary each semester.]
ECON 674 Economic Systems
Fall. 4 credits

## [ECON 675 Comparative Economic Organization and Institutions

Spring. 4 credits. Prerequisites: Economics 314 and 351-352 or equivalent. Not offered 1994-95.
This course addresses problems of coordination, management, finance, and organizational structure in firms and, to some extent, economies. It covers topics such as coordination mechanisms for production activity, problems arising in the control of subordinate agents' behavior, decision making within firms, internal firm organization, financial institutions and loan contracts, and the market for firm control. Course material draws from literature on mechanism design and from the fields of industrial organization, finance, and comparative systems.]

## [ECON 678 Economic Growth in Southeast Asia <br> Fall or spring. 4 credits. Not offered

 1994-95.][ECON 681 Economics of Participation and Self-Management
Fall. 4 credits. Prerequisites: Economics 101-102, or permission of instructor. Not offered 1994-95.
For description see Economics 381. Economics 681 is given on a more advanced graduate level.]
[ECON 682 Seminar on Economics of Participation and Labor-managed Systems
Fall. 4 credits. Not offered 1994-95.)

## ECON 684 Seminars in Advanced

 EconomicsFall and spring. 4 credits

## ENGLISH

W. Wetherbee, chair; R. Gilbert, director of undergraduate studies (255-3492); T. Murray, graduate faculty representative (255-7989); S. McMillin, director of honors program; B. B. Adams, A. R. Ammons, J. P. Bishop, A. Boehm, F. V. Bogel, L. Bogel, Laura Brown, Lois Brown, C. Chase, B. Correll, J. Culler, S. Davis, D. Eddy, L. Fakundiny, R. T. Farrell, D. Fried, A. Galloway, K. Gottschalk,
L. Herrin, T. D. Hill, M. Hite, M. Jacobus,
P. Janowitz, B. Jeyifo, C. V. Kaske, M. Koch,
C. S. Levy, A. Lurie, D. E. McCall,
K. A. McClane, M. McCoy, P. Marcus,
B. Maxwell, D. Mermin, S. P. Mohanty,
D. Moore, R. Morgan, H. Mullen, B. V. Olguín,
R. Parker, J. Porte, E. Rosenberg,
N. Saccamano, S. Samuels, P. Sawyer,
D. R. Schwarz, M. Seltzer, K. Shanley,
H. E. Shaw, S. Siegel, H. Spillers, G. Teskey,
S. Vaughn, S. Wong. Emeriti: M. H. Abrams,
J. F. Blackall, A. Caputi, S. Elledge, R. Elias,
J. R. McConkey, S. Parrish, M. A. Radzinowicz, S. C. Strout

The Department of English offers a wide range of courses in English, American, and Anglophone literature as well as in creative writing, expository writing, and film. Literature courses focus variously on the close reading of texts, the study of particular authors and genres, questions of critical theory and method, and the relationship of literary works to their historical periods and to other disciplines. The department seeks not only to foster analytical reading and lucid writing but also, through the study of literary texts, to teach students to think about the nature of language, and to be alert to the rigors and pleasures of that ordinary and peculiar activity, reading.
Students who major in English develop their own programs of study in consultation with their advisers. Some focus on a particular historical period or literary genre; others combine sustained work in creative writing with the study of literature. Others pursue special interests in such areas as women's literature, Afro-American literature, literature and the visual arts, or critical theory.

There are also many ways for students informally to supplement their course work in English, by attending the frequent lectures and poetry readings sponsored by the department, or by writing for campus literary magazines.

## The Major

Any student considering a major in English should meet with the department's director of undergraduate studies to discuss the major and be assigned a major adviser. Copies of a brochure containing suggestions for English majors and prospective English majors are available in the department office, 250 Goldwin Smith Hall.
The Department of English recommends that its students ready themselves for the major by taking at least one preparatory course. Freshmen interested in majoring in English are encouraged to take one of the following freshman seminars: The Reading of Fiction (English 270), The Reading of Poetry (English 271), or Introduction to Drama (English 272). First-term freshmen with a score of 700 or above on the CEEB College Placement Tests in English composition or literature or 4 or 5 on the CEEB Advanced Placement Examination in English may enroll in English 270, 271,

272 as space permits (all students who have taken one freshman seminar are permitted to enroll in these courses as space permits).
English 201 and 202, overviews of major British writers, though not required for the major, are strongly recommended for majors and prospective majors, since they afford an overview of the history of English literature, providing an introduction to periods, authors, and genres that allows students to make a more informed choice of advanced courses.
In addition, The American Literary Tradition (English 275) and the Essay in English (English 295) are especially suitable in preparation for the major.

## Requirements

Each English major must complete with passing letter grades at least 36 credits in courses approved for the major. Students may count up to four courses for the major from the category entitled "200-level Courses Approved for the Major." All English courses numbered 300 or above count toward the major. Of the 36 credits required for the major, 12 (three courses) must be taken in literature before 1800. (Courses taken for the English major may also be used to satisfy the arts college humanities distribution requirement or, in the case of creative writing courses, the expressive arts distribution requirement.)
A major, then, might normally consist of three or four courses at the 200 level, three or four at the 300 level, and a couple of 400 -level seminars. A student's selection of courses will ideally display some historical breadth (as is reflected in the requirement of three courses in literature before 1800) and training in the reading of several kinds of literature (such as drama, poetry, and fiction). In their final semesters, English majors should be ready for advanced seminars in a more focused field of interest.

## Foreign Language

English majors also are required to complete six credits of foreign language study (preferably in literature) in courses for which qualification is a prerequisite. Advanced placement credit does not fulfill this requirement, nor does the study of foreign literature in translation. Majors are urged to complete this requirement by the end of their sophomore year, and those who enter Comell without sufficient preparation should begin their language study at once.
With the permission of their advisers, students may count toward the English major a maximum of 12 credits in literature or creative writing courses at the 300 level or above given by such departments and programs as Comparative Literature, Theatre Arts, Romance Studies, the Africana Studies and Research Center, and the Society for the Humanities. Double majors may count toward these 12 credits any courses, 300 level or above, taken in their other major if such courses are approved by their English department adviser as relevant to the study of literature.

## Honors

Prospective candidates for the degree of Bachelor of Arts with honors in English should read the handout "English Department Honors Program," available in the English office.

These students should discuss their qualifications with the chair of the Honors Committee during the spring term of their sophomore year, when they will be admitted provisionally to the program. During their junior year, honors candidates must take one honors seminar (English 491 or 492), which will reflect a dominant area of interest, address methods of scholarly research, and require the composition of a long end-of-term essay. Honors students are strongly encouraged to take an additional 400-level course in the field in which they plan to concentrate. On the basis of their performance, students will be officially admitted to the program at the end of the junior year. Seniors in honors enroll in a year-long tutorial (English 493 and 494) in which they work closely with a faculty member especially qualified to supervise the topic of the candidate's choosing; the year's work culminates in the writing of a scholarly honors thesis. (All seniors in the program are expected to attend informal sessions in which they discuss their work-in-progress.) More information about the program may be found in the department's brochure for honors candidates.

## Courses for Nonmajors

For students not majoring in English, the department makes available a variety of courses at all levels. Some courses at the 200 level are open to qualified freshmen, and all of them are open to sophomores. Courses at the 300 level are open to juniors and seniors and to underclass students with permission of the instructor. The suitability of courses at the 400 level for nonmajors will vary from topic to topic, and permission of the instructor is required.

## Freshman Writing Seminars

As part of the Freshman Writing Program, the Department of English offers many onesemester courses concerned with various forms of writing (narrative, biographical, expository), with the study of specific areas in English and American literature, and with the relation of literature to culture. Students may elect any two of these courses during their first year to satisfy the Freshman Seminar requirement. Descriptions of Freshman Writing Program offerings may be found in the Freshman Writing Program listings, available from college registrars in August for the fall term and in November for the spring term.
Especially well-qualified students who are considering a major in English are encouraged to enroll in English 270, 271, or 272.
Students who have scored 4 or 5 on the Princeton exam or 700 or better on the English Composition or CEEB test or 6 or 7 on the International Baccalaurate (IB) Higher Level Examination are eligible to enroll in the fall semester (space permitting) in any one of these courses. English 270, 271, and 272 will be open to all freshmen in the spring semester who have satisfactorily completed one freshman seminar. Registration is handled by the Freshman Writing Program during freshman registration.

ENGL 270 The Reading of Fiction
Fall, spring, each summer. 3 credits. Each section limited to 17 students. Freshman Seminar. Recommended for prospective majors in English. Forms of modern fiction,
with emphasis on the short story and novella. Critical study of works by English, American, and Continental writers from 1880 to the present.

## ENGL 271 The Reading of Poetry

Fall, spring. 3 credits. Each section limited to 17 students. Freshman Seminar. Recommended for prospective majors in English. Designed to sharpen the student's ability to understand and respond to poetry, through readings in the major periods, modes, and genres of poetry written in English.

ENGL 272 Introduction to Drama
Fall, spring. 3 credits. Each section limited to 17 students. Freshman Seminar. Recommended for prospective majors in English. Selected works by such playwrights as Sophocles, Shakespeare, Ibsen, and Brecht introduce the chief idioms and styles of drama. The course work may include a special project related to the plays being produced by the Department of Theatre Arts.

## Courses Primarily for Nonmajors

[ENGL 205-206 Readings in English and American Literature "
205, fall; 206, spring. 3 credits each term. Open to all undergraduates. English 205 is not a prerequisite for 206. Not offered 1994-95.]

## ENGL 227 Shakespeare \#

Spring. 3 credits. Each section limited to 25 students.

Spring: Section 1. TBA. B. Adams.
Section 2. TBA. D. Eddy
A critical study of representative plays from the principal periods of Shakespeare's career.

## ENGL 288-289 Expository Writing

288, fall; 289, spring. 3 credits each term. Each section limited to 16 students. Prerequisites: Students must have completed the freshman writing requirements of their individual colleges before they may enroll in this course.
English 288-89 offers guidance and an audience for students who wish to gain skill in expository writing. Each section provides a context for writing defined by a form or use of exposition, a disciplinary area, a practice, or a topic intimately related to the written medium. Course members will read regularly in relevant published material and do a substantial amount of new writing of their own each week, while reviewing and responding to each other's work. Since these seminar-sized courses depend on members' full participation, regular attendance and submission of written work are required. Students and instructors will confer individually throughout the term.

## Fall 1994:

Section 1. -The Essay: Personal to PublicB. Bart

Section 2.-Politics, Rights, and the Constitu-tion-L. Laufenberg
Section 3.-Writing in the HumanitiesS. Davis

Section 4.-Body Politics: Medical Issues and Social Debate-D. Luciano
Section 5.-Subversive Films, Scandalous Fictions-R. Egger
Section 6.-Understanding the MediaD. A. Williams

Section 7.-Reviewing Women: Women Reviewed-H. White

Section 8.-Issues and AudiencesB. LeGendre

Section 9.-Nature, "Nature," and Human Values-D. Takacs
Spring 1995: To be announced.
See English Department Guide to Course Scheduling for full fall and spring section descriptions.

## Creative Writing

Students usually begin their work in Creative Writing with English 280 or 281, and only after completion of the Freshman Seminar requirement. Please note that either English 280 or English 281 is the recommended prerequisite for 300 -level creative writing courses. English 280 and 281 may satisfy a distribution requirement in your college (please check with your college adviser). English 382-383, 384-385. and 480-481 are approved for the English major.

## ENGL 280-281 Creative Writing

Fall, spring, summer, and winter session. 3 credits. Prerequisites: completion of the Freshman Seminar requirement. Limited to 18 students. Please pre-register for 280-281-the courses are no longer using the ballot system for enrollment.

An introductory course in the theory, the practice, and the reading of prose, poetry, and allied forms. Students are given the opportunity to try both prose and verse writing and may specialize in one or the other. Many of the class meetings are conducted as workshops. English 280 is not a prerequisite for English 281.

## ENGL 382-383 Narrative Writing

See complete course description in section headed Courses for Sophomores, Juniors, and Seniors.

## ENGL 384-385 Verse Writing

See complete course description in section headed Courses for Sophomores, Juniors, and Seniors.

## ENGL 480-481 Seminar in Writing

See complete course description in section headed Courses for Advanced Undergraduates.

## ENGL 481 Script Writing

See complete course description in section headed Courses for Advanced Undergraduates.

## Expository Writing

## ENGL 381 Reading as Writing

See complete course description in section headed Courses for Sophomores, Juniors, and Seniors.

## ENGL 386 Philosophic Fictions

See complete course description in section headed Courses for Sophomores, Juniors, and Seniors.

## ENGL 387 Autobiography: Theory and

 PracticeSee complete course description in section headed Courses for Sophomores, Juniors, and Seniors.

ENGL 388-389 The Art of the Essay
See complete course description in section headed Courses for Sophomores, Juniors, and Seniors.

## 200-Level Courses Approved for the Major

Students may take up to four of the following 200 -level courses for credit toward the English major. Although courses numbered in the 200s are primarily for sophomores, some of them are open to qualified freshmen.

## ENGL 201-202 The English Literary

 Tradition \#Fall and spring. 4 credits. Open to undergraduates who have completed the freshman writing requirement. English 201 is not a prerequisite for 202.

## 201: Fall. M W F 11:15-12:05.

W. Weatherbee.

Interpretation of major works ranging from Beourulf through Milton. Surveys Old English poetry, Chaucer, medieval romances, Spenser, Shakespeare, Renaissance lyric poetry, and Milton.

202: Spring. TBA. P. Sawyer.
Includes Dryden, Swift, Pope, Johnson, Blake, the major Romantic and Victorian poets, and Yeats. The course will be conducted by a combination of lectures and seminars.

## [ENGL 203 Major Poets

Fall. 3 credits. Not offered 1994-95.]

## ENGL 204 Close Reading: An Intensive Introduction

Fall. 4 credits. Limited to 20 students.
T R 10:10-11:25. F. Bogel.
This course is designed to introduce students to the ways language operates in written texts and to the various acts we perform when we read those texts. The aim is to prepare students for advanced work in literary studies and for a more imaginative relation to their entire verbal environment. The course will explore poems, plays, stories, and nonfictional prose, along with a variety of everyday writings: advertisements, billboards, political slogans, bumper stickers, sweatshirts, and more.
We will explore such questions as: How do literary critics interpret texts, and how do their interpretations differ from other kinds of reading? Is literary criticism appropriate to all sorts of text, or just those designated as "literature"? Can the same text be literature at some time but not at others? Do readers create or discover the meanings of texts, and how can we distinguish between legitimate and illegitimate-or convincing and uncon-vincing-interpretations? Writing assignments will be exploratory, focusing on details of the language of texts and taking forms other than that of the standard critical essay. Class will be conducted as a discussion.
[ENGL 207 Introduction to TwentiethCentury Poetry (also Comparative

## Literature 207)

3 credits. Not offered 1994-95.]
ENGL 240 Introduction to U.S. Latino Literature (also Mispanic American Studies 240 and Spanish Llterature 242)

Fall. 3 credits.
M W F 12:20-1:10. B. V. Olguín
It is estimated that by the year 2030, the Latino/a population in the United States will be the largest "minority group" in the country. This course seeks to introduce students to the
growing body of literature across time, space, and genre being produced by the various Latino/a communities that have established a presence in the United States. Of particular interest are the manner and degree to which the literatures converge and diverge as they explore issues of "race," ethnicity, gender, sexuality, class, nationality, and identity in general at a time when the American profile is increasingly becoming "latinized." Authors examined include Juan Seguín, Alurista, Gloria Anzaldúa, Cherrie Moraga, Bernardo Vega, Miguel Piñero, Nicolasa Mohr, Christina Garcia, Oscar Hijuelos, Julia Alverez, Ruben Martinez and several others.

## ENGL 241 Introduction to Chicano/a Poetry and Poetics (also Mispanic American Studies 241 and Spanish Literature 241)

Spring. 3 credits.
TBA. B. V. Olguín.
This survey course will introduce students to Chicano and Chicana poetry across time, space, and format. We will examine verse at different periods in Chicano/a literature from the pre-Aztlán, Aztlán, and post-Azlán generations. The course places special emphasis on exploring the links between poetics and politics. Some of the poets examined include Teresa Acosta, Fray Angélico Châvez, Ricarclo Sánchez, José Montoya, Rodolfo "Corky" Gonzalez, Alurista, Raúl Salinas, Judy A. Lucero, Evangelina VivilPiñon, Lorna Dee Cervantes, Gloria Anzaldủa, Ana Castillo, Gary Soto, Alicia Gaspar de Alba, and Francisco X. Alarcón.

## [ENGL 251 Twentieth-Century Women Novelists (also Women's Studies

 251)4 credits. Not offered 1994-95.]
ENGL 255 African Literature ©
Spring. 4 credits.
TBA. B. Jeyifo.
An introduction to major African writers and literary traditions. Authors studied may include Achebe, Soyinka, Clark, Armah, Ngugi, and Aidoo.

## ENGL 260 Topics in American Indian Literature <br> Fall. 3 credits.

T R 8:40-9:55. D. Moore.
In an introduction to Native American
literatures, we read a variety of genresnovels, short fiction, autobiography, poetry, oral traditions-spanning Indian publications through the last two centuries. Issues arising from the texts include aesthetics of orality and literacy; cultural change and survival; colonial identity politics; mythic histories; world views and ideologies; and contemporary tribal sovereignty. A goal of the course is to read historical American contexts through the eyes of Native American texts.

## ENGL 261 History of the American Indian Novel

Spring. 3 credits
T R 8:40-9:55. D. Moore.
From the early nineteenth century through the late twentieth, American Indian novelists have been shaping their stories to the forms of the novel and reshaping novel forms in the process. The course explores autobiographic, ethnographic, and historical roots of American Indian novels and traces the major cultural and political themes on which these writers focus their narratives.

ENGL 262 Asian American Literature (also Asian American Studies 262 and American Studies 262)
Fall. 3 credits.
T R 1:25-2:40. S. Wong.
This course will introduce students to the wide range of writing by Asian Americans and to some critical issues concerning the production and the reception of Asian American texts. In reading through selected works of prose, poetry, and drama, we will be asking questions about the historical formation of Asian American identities and the problems of defining an Asian American literary tradition.

## ENGL 263 Studies in Film Analysis

Fall and spring. 4 credits. Enrollment limited to 20 students. Preference given to English majors

Fall: Sec 01 T R 10:10-11:25 and Sec 02
T R 1:25-2:40. L. Bogel.
Special topic: Interpreting Hitchcock. Through detailed analysis of about fifteen of Hitchcock's major films-from British silents such as The Lodger and the British talkies of the 30s (The Thirty-Nine Steps) to the early 40s work in Hollywood (Spellbound, Notorious), and major American films of his later period (Rear Window, The Birds)-we will consider Hitchcock as a major technical and stylistic innovator in the history of cinema. As texts for psychoanalytic and feminist approaches to study, his films invite questions about film language, the ethics of spectatorship, and the nature of desire and sexuality. Frequent short essays and viewing exercises encourage students to engage through their writing the course's critical concerns. Students must be free to attend regular evening screenings and video showings of the films once or twice a week. Lab fee.

Spring: TBA. L. Bogel.
Special topic: Interpreting Melodrama and the Women's Film of the 30 s and 40 s . With some attention to melodrama's roots in nineteenth-century fiction and theatre and in twentieth-century women's fiction and popular Freudianism, we will work to define Hollywood's melodrama as both a genre and a way of viewing the world. Psychoanalytic and feminist analyses of melodrama will help us pose larger questions about gender and culture, about gendered spectatorship, about the relation of these films to American culture about Hollywood's changing constructions of "woman," the "maternal," and the "feminine," and questions about desire, pleasure, fantasy, and ideology in relation to the melodramatic heroine. Required weekly, evening screenings of such films as: Stella Dallas; Now, Voyager; Rebecca; Mildred Pierce; The Women, Imitation of Life; Secret Beyond the Door; All This and Heaven, Too; So Big; Gaslight. Regular critical readings, frequent viewing questions, two longer essays, no exam.
Students must be free to attend regular evening screenings and video showings of the films once or twice a week. Lab fee.
[ENGL 264 Ethnic Literature: Bridges and Boundaries
4 credits. Not offered 1994-95.]
[ENGL 265 Contemporary African American Literature
3 credits. Not offered 1994-95.]

ENGL 267 The Many Voices of the American Renaissance

## Fall. 3 credits.

T R 11:40-12:55. D. Moore
The antebellum emergence of a distinctive American literature can be understood as more than an American dialogue with or against European masters. It was also an internal dialogue, toward defining "America," among and between African Americans, Native Americans, and American women, in dialogue with more canonical figures such as Emerson, Whitman, Thoreau, Melville, and Hawthorne. Through selections from a variery of such voices, the course explores how those multiple dialogues shaped social terms for descendants of those groups in our contemporary context.
ENGL 268 The Culture of the 1960 s

## Spring. 4 credits

TBA. P. Sawyer
The 1960 s survive today as a quasi-mythical period and as an ongoing debate. Was it a time of dangerous experimentation with drugs, sex, and alternative "lifestyles" on the part of a pampered generation that gradually learned to straighten up and join the mainstream? Or was it a time of revolutionary hopefulness, when the Civil Rights movement and the Vietnam War stimulated a passionate critique of the racist and imperialist structure of American society? The course addresses these and other questions about that turbulent decade through a reading of novels, poems, plays, films, journalism, and historical works. Throughout, we will be attentive to ways the 1960s have been converted into nostalgia and otherwise revised by the media. Texts will include Catch 22, The Autobiography of Malcolm X, The Armies of the Night, and Tbe Electric Kool-Aid Acid Test, as well as films, music, speeches, and manifestoes.

## ENGL 274 Scottish Literature and

 CultureSpring. 4 credits. Enrollment limited to 20 students.

T R 10:10-11:25. T. Hill and H. Shaw. Scotland was an independent kingdom during most of its history. Although it is now politically united with England, it preserves its cultural distinctiveness. This course provides an introduction to Scottish literature and its cultural context. We will focus on important Scottish literary texts, with special emphasis on the medieval period and the eighteenth and nineteenth centuries. In addition, we will provide something of an introduction to Scottish history and to nonliterary expressions of Scottish culture (such as music and painting). The course should appeal to those who wish to learn more about their Scottish heritage, to those who wish to view in a new perspective works normally considered monuments of "English" literature, and to those who simply wish to know more about a remarkable culture and the literature it produced. Some of the texts will be read in Scots, but no familiarity with Scots or earlier English is presumed. Authors studied will include Henryson, Dunbar, Anonymous (the Scottish Ballads), Hume, Burns, Scott, Hogg, Stevenson, and Grassic Gibbon.
The course may be counted toward the English major, but nonmajors are welcome.

ENGL 275 The American Literary Tradition (also American Studies 275)

Fall, spring. 3 credits. Recommended for prospective majors in American Studies. This is not a Freshman Seminar.

Fall: TR 1:25-2:40. J. Porte. Spring:
T13A. B. Maxwell.
The problem of an American national literature is explored through the reading, discussion, and close analysis of texts across the range of American literary history. Not a survey, this course focuses on the relations of the rexts to each other, the shaping of national identities in those relationships, and the assumptions about history, language, and the self that underlie them.

## ENGL 276 Literature in Cold War Culture 1945-1960 (also American Studies 276)

Fall. 3 credits.
T R 10:10-11:25. B. Maxwell.
A study of literature in the period of "perpetual crisis and the garrison-prison state" (Harold Lasswell). Themes will include fear, glamour, domestic life, integration, the "white negro," addiction, loyalty, bureaucracy, and the disposition in the United States of the legacies of the Depression and of World War II. Fiction by Nelson Algren, Ann Petry, Saul Bellow, Ralph Ellison, and Jack Kerouac (among others); collateral readings in memoir (Hellman), sociology (Mills), social psychology (Adomo, Erikson), history (Hofstadter), aesthetics (Greenberg), politics (Kennan, Arendt) and self-advertisement (Mailer). Some attention to bop, poetry, painting, film noir, political speeches, stand-up comedy, and magazine culture.
[ENGL 277 Folklore and Literature 4 credits. Not offered 1994-95.]

ENGL 285 Art, Archaeology, and Analysis (also Engineering 185, MS\&E 285, Physics 200, Archaeology 285, Art 372 and NS\&E 285)

3 credits.
See ENGRG 185 for description.
ENGL 294 Feminist Literary Criticism (also Women's Studies 294)
Fall. 4 credits. Enrollment limited to 20 students; preference given to English and Women's Studies majors.

T R 10:10-11:25. M. Jacobus. In this course we will explore the history and contemporary inflections of feminist literary criticism and theory, with an emphasis on close reading of major or classic articles, essays, books, and controversies. We will start by reading Virginia Woolfs A Room of One's Own and look at feminist re-readings of Woolf. We will explore notions of a female literary tradition and questions of canonicity, along with tensions between feministmaterialist and psychoanalytic readings. We will look at theories about the role of the body and desire in women's writing drawn from French feminist theory, and psychoanalytic feminist criticism. We will also consider questions involving ethnicity, including recent African-American feminist criticism, and recent gay and lesbian feminist criticism. Texts will include (among others) essays by Judith Butler, Donna Harraway, Julia Kristeva, Shoshana Felman, and Alice Walker, and novels by Maxine Hong Kingston (Woman Warrior), Radcliffe Hall (The Well of Loneliness), Nella Larsen (Quicksand), and Virginia Woolf (Mrs. Dalloway). The emphasis will be
on relating the insights of feminist criticism and theory to literary texts so that students can develop their own feminist critical practice. Oral reports, short essays, two longer papers

ENGL 295 The Essay in English
Spring. 4 credits. Prerequisite: completion of freshman seminar requirement.

TBA, L. Fakundiny.
What is an essay and what is it for? How does it work as prose discourse, as a text of the self? Impelled by such generic questions and others raised by Montaigne's French Essais (1588), this course explores the invention of the essay in English during the sixteenth and seventeenth centuries and its flowering in the periodicals and magazines of the eighteenth and nineteenth centuries. Readings include selections from the work of Bacon,
Cornwallis, Ionne, Earle, Cowley, Temple, Swift, Addison, Steele, Johnson, Franklin, Goldsmith, Lamb, Hazlitt, Irving, and DeQuincey. Essays by earlier writers are matched rhetorically and/or thematically with readings from more recent practitioners of the genre including Dubois, Woolf, Orwell, Welty, Baldwin, Selzer, Ozick, Achebe, Didion, S. Naipaul, Dillard, Sanders, and others. This is a course for students interested in reading essays and in thinking about how this nonfiction prose genre developed and how it works. No special background in literary history is assumed.

## Courses for Sophomores, Juniors, and Seniors

Courses at the 300 level are open to sophomores, juniors, and seniors and to others with the permission of the instructor.

## ENGL 302 Literature and Theory (also English 702 and Comparative Literature 302 and 702)

Fall. 4 credits.
M W F 10:10-11:00. J. Culler.
Study of issues in contemporary theoretical debates, with particular attention to structuralism, deconstruction, psychoanalysis, and feminism. Readings by Barthes, Derrida, Foucault, B. Johnson, J. Rose, and others. No previous knowledge of literary theory is assumed.

## ENGL 308 Icelandic Family Sagas

Spring 4 credits. Limited to 30 students TBA. T. Hill. An introduction to the Icelandic family sagathe "native" heroic literary genre of Icelandic tradition. Texts will vary but will normally include the Prose Edda, the Poetic Edda, Hrafnkels Saga, Njals Saga, Laxdaela Saga, and Grettirs Saga. All readings will be in translation
[ENGL 310 Old English Literature in Translation \#
4 credits. Not offered 1994-95.]
ENGL 311 An Introduction to Early Medieval Archaeology and Culture (also Archaeology 311, English 603) \#

Fall. 4 credits.
M W F 11:15-12:05. R. Farrell.
This course will cover the period 400 to 1100 with England and Ireland the centers of interest. Topics will include the transition from late classical to medieval, the complex cultural relations between England and Ireland, the continent and the northern world. The relationships between documentary and
artifactual evidence will be closely examined. The major written texts will be Tain, Beourulf, and Bede's ecclesiastical history. Students will be urged to follow their interests in oral reports and brief research papers. Those taking the course for graduate credit will be expected to engage in a significant research effort. Permission of the instructor required for registration.

ENGL 319 Chaucer
Fall. 4 credits.
M W F 10:10-11:00. R. Farrell. The course will center on a close reading of the major stories from the Canterbury Tales, Troilus and Criseyde, and some of the minor works. Students will be given ample opportunity to learn Chaucer's language, so that all dimensions of the poems will be available to them. Prior knowledge of Middle English is neither expected nor required; course participants will be encouraged to follow up their own interests in class reports and papers.
[ENGL 320 The Sixteenth CenturyTudor Culture \#
4 credits. Not offered 1994-95.]
ENGL 321 Spenser and Malory \#
Fall. 4 credits. Limited to 45 students.
M W F 1:25-2:15. C. Kaske.
Paired selections covering about half of Malory's Morte d'Artbur and half of Spenser's Faerie Queene. Chretien's romances, Sir Gawain and the Green Knight, and some of Spenser's minor poems will be mentioned occasionally as background. Comparisons will assess possible literary influence, the distinctive genius of each author as a writer of romance, and the development of Arthurian romance from the Middle Ages to the Renaissance. Informal lecture and discussion. Two papers, no exams.

## ENGL 322 The Seventeenth Century *

 Fall. 4 credits.M W F 10:10-11:00. B. Adams. Representative English drama, poetry, and prose from the Jacobean period through the English Revolution. Readings of both major figures (Shakespeare, Donne, Jonson, Marvell, Milton) and minor ones (prophets, radicals, royalists) in the context of historical change and challenges.

## [ENGL 325 The Culture of the

 Renaissance (also Comparative Literature 362, and History 364)4 credits. Not offered 1994-95.]
ENGL 327 Shakespeare
Fall. 4 credits.
M W F 11:15-12:05. B. Correll.
A survey of representative Shakespearean drama, treating formal, contextual, and thematic aspects.
ENGL 329 Milton \#
Spring. 4 credits
TBA. G. Teskey.
An introduction to the poetry and thought of John Milton.

## ENGL 330 Restoration and EighteenthCentury Literature \#

Fall. 4 credits.
T R 1:25-2:40. F. Bogel.
Close reading of texts in a variety of genres (poetry, fiction, drama, autobiography) will be guided by such topics as the nature of satire, irony, and mock-forms; the languages of the ridiculous and the sublime; the authority and fallibility of human knowledge; connections
among melancholy, madness, and imagination. Works by such writers as Rochester, Dryden, Swift, Gay, Defoe, Johnson, Boswell, Sterne, and Cowper

## [ENGL 333 The Eighteenth-Century English Novel \#

4 credits. Not offered 1994-95.]
ENGL 336 Contemporary American Theatre (also Theatre Arts 337)
Fall. 4 credits. Limited to 20 students.
T R 1:25-2:40. J. E. Gainor.
A survey of American drama and theatre post1960. Particular emphasis will be placed on plays by women and dramatists of color to explore questions of identity and theatrical response to contemporary American culture.

## ENGL 340 The English Romantic Period \#

Fall. 4 credits.
M W F 10:10-11:00. R. Parker.
Readings in various writers from the late 1780s through the 1820 s --among them Blake, Burke, Wordsworth, Wollstonecraft, Coleridge, Byron, Mary Shelley, Percy Shelley, and Keats-with major emphasis on poetry but substantial collateral attention also to prose fiction, drama, letters, and criticism. The course will be concerned as much with formal experiments in narrative, lyric, and dramatic representation as with political and cultural contexts in an age of national reform and international revolution.
[ENGL 345 The Victorian Period *
4 credits. Not offered 1994-95.l
[ENGL 346 Freud: Optional Clinical Discussion Section (also Comparative Literature 351, German Studies 351, Psychology 391)
1 credit. Students enrolled in this section must be simultaneously enrolled in the Freud lecture course (347/389). Not offered 1994-95.]
[ENGL 347 Reading Freud: Race, Gender, and Psychoanalysis (also Comparative Literature 347, German Studies 347, and Psychology 389)
3 credits. Not offered 1994-95.]
ENGL 348 The Female Literary Tradition Spring. 4 credits.

TBA. S. Samuels.
A course designed to survey and investigate the notion of a "female literary tradition" in Britain and America from the late eighteenth century to the twentieth century. Among other things, we will ask what it means to consider women's writing-in other words, we will question the premises of the course as we work out ways of reading and interpreting works written by women out of very different historical and political circumstances. Authors may include Mary Wollstonecraft, Hanna Foster, Aphra Behn, Jane Austen, Mary Shelley, Charlotte Bronte, Harriet Beecher Stowe, George Eliot, Willa Cather, Edith Wharton, Virginia Woolf, Jean Rhys, Louise Erdrich, and Toni Morrison.

## ENGL 350 The Early Twentieth Century (to 1914) <br> Fall. 4 credits.

T R 10:10-11:25. D. Schwarz
Critical study of major works by Hardy, Conrad, Lawrence, Joyce, Woolf, Eliot, Yeats, Hopkins, Wilde, Wallace Stevens and others. While the emphasis will be on close reading of individual works we shall place the authors and works within the context of literary and intellectual history. The course will seek to
define the development of literary modernism (mostly but not exclusively in England), and relate literary modernism to other intellectual developments, including those in painting and sculpture, especially the works of Picasso,
Rodin and Matisse.

## ENGL 353 Postcolonial Literature

Spring. 4 credits.
TBA. S. Mohanty.
Topic: Modern Indian Literature and Culture. A survey of twentieth-century literature, film, and other cultural productions from the Indian subcontinent. Our approach will be thematic and historical, and the course will include some works by historians, anthropologists, and social theorists (e.g., Karl Marx, Bipan Chandra, M. N. Srinivas, Romila Thapar). Literary works by Anglophone writers as well as those from various regional traditions such as Hindi, Oriya, Marathi, Bengali, and Tamil (to be read in translation). Texts will be selected in part to represent the variety and diversity of styles, attitudes, and voices that constitute modern "Indian" writing-from R. K. Narayan and Rabindranath Tagore to Nissim Ezekiel and Jayanta Mohapatra, and from Salman Rushdie and Anita Desai to Gopinath Mohanty, Mahasveta Devi, and Agha Shahid Ali. Films and videos will be used to deepen our understanding of emerging cultural trends and social movements. Three short papers ( $4-6 \mathrm{pp}$.), and a journal.

## [ENGL 354 The British Modernist Novel

4 credits. Not offered 1994-95.]

## ENGL 358 Twentieth-Century

 Experimental Fiction by WomenFall. 4 credits.
T R 1:25-2:40. M. Hite.
With only a few exceptions, the works of fiction that we associate with the two great avant-garde movements of the twentieth century, modernism and postmodernism, were written by men. Does this mean that women writers prefer traditional modes of narration or are uneasy with innovation or have some sort of innate or acculturated affinity with realism or naturalism? This seminar will examine the cultural contexts that may bias readers against seeing what is genuinely new and exciting in works by female authors, as well as ways that the works themselves may or may not resemble works by acknowledged experimental writers who are men-the difference that sexual differences may make. Writers include Virginia Woolf, H. D. (Hikda Doolittle), Djuna Barnes, Doris Lessing, Toni Morrison, and Margaret Atwood.

## [ENGL 360 The Esthetes and Their Critics \# <br> 4 credits. Not offered $1994-95$.

## ENGL 361 Early American Literature

 (also American Studies 361)Spring. 4 credits.
TBA. S. Samuels.
American writing from the 1630 s to the 1830 s, including prose and poetry of the Puritans, Edwards, Franklin, Crevecoeur, Jefferson, Brockden Brown, Irving, Bryant, Cooper, and the early work of Poe, Hawthorne, and Emerson. This course may be used to fulfill the major requirement of courses in literature before 1800 .

ENGL 362 The American Renaissance (also American Studies 362) \#

## Spring. 4 credits.

TBA. J. Bishop.
A course with this title may be expected to include exemplary testimony by Emerson, Thoreau, Whitman, Hawthorne, Melville, and Dickinson. This should leave room for one or two additional texts by such recently rediscovered writers of the period as Margaret Fuller, Harriet Jacobs, or perhaps even Harriet Beecher Stowe.

ENGL 363 The Age of Realism and Naturalism
Fall. 4 credits.
T R 10:10-11:25. M. Seltzer.
The literary expression of new attitudes toward American society and culture between the Civil War and the First World War. We will read a sequence of representative instances, chiefly fictional or historical, selected from the work of such authors as Whitman, Twain, Howells, Cable, H. James, W. James, Crane, Wharton, H. Adams, S. O. Jewett, Dreiser, and Cather.

【ENGL 364 American Literature between the Wars (also American Studies 364)

4 credits. Not offered 1994-95.]
[ENGL 365 American Literature since 1945
Spring. 4 credits. Not offered 1994-95. TBA. L. Herrin.
This course will alternate with English 364 which surveys American literature between the two world wars. Most of the writers we will study still live and write and change. Consequently, the verdict will not be in. Fiction writers will most likely include Bellow, Nabokov, Barth, Ellison, Welty, John Hawkes, Toni Morrison, and Louise Erdrich. From an anthology of contemporary American poetry we will read Robert Lowell, A. R. Ammons, Sylvia Plath, Gary Snyder, Theodore Roethke, and others. If we have time we will look at the personally engaged journalism of Norman Mailer and Joan Didon. Writers will be chosen who will give us as keen and varied and provocative a view of ourselves as possible.]

ENGL 366 The Nineteenth-Century American Novel (also American Studies 366)
Fall. 4 credits. Enrollment limited to 65 students.

T R 2:55-4:10. J. Porte.
A study of the broad range of American fiction in its first flowering, this course will include such major works as Hawthorne's The Scarlet Letter, Melville's Moby-Dick, Stowe's Uncle Tom's Cabin, James's The Portrait of a Lady, Twain's Adventures of Huckleberry Finn, and Crane's The Red Badge of Courage. Time permitting, other authors to be read may include Brockden Brown, Rebecca Rush, James Fenimore Cooper, Harriet Wilson, William Dean Howells, Harold Frederic, and Kate Chopin.
ENGL 367 The Modern American Novel (up to WW II)

## Fall. 4 credits.

T R 11:40-12:55. H. Spillers. A reading of some modern American writers of the first half of the twentieth century. Works by Fitzgerald, Faulkner, and others. Lectures with some opportunity for discussion. Emphasis will be on the individual works in their historical contexts.

## ENGL 370 The Nineteenth-Century

 English Novel \#Fall. 4 credits.
M W F 1:25-2:15. H. Shaw.
A study of representative works by major British novelists from Austen to Eliot. The course concentrates on how the large panoramic social novels that are the glory of Victorian fiction explore individual psychology and place individuals in social and historical context. These novels helped men and women in the nineteenth century to imagine and confront a range of problems that are still with us today. Yet for all their underlying seriousness, or perhaps because of it, they are full of laughter. Works by Austen, Scott, Dickens, Trollope, and Eliot.
[ENGL 371 American Poetry to 1950 4 credits. Not offered 1994-95.J
ENGL 372 English Drama to 1700 (also Theatre Arts 372)
Fall. 4 credits.
T R 2:55-f:10. S. McMillin.
Major plays and other events in the English theatre, from the medieval craft cycles through the age of Shakespeare to the Restoration period. Writers include Marlowe, Kyd, Shakespeare, Dekker, Jonson, Middleton, Webster, Etherege and Wycherley.
ENGL 373 English Drama from 1700 to the Present (also Theatre Arts 373) Spring. 4 credits.

TBA. S. McMillin.
The modern side of English drama. from the Restoration to contemporary plays. Writers include Behn, Congreve, Dryden, Tate, Sheridan, Shelley, Robertson, Shaw, and Churchill.

## [ENGL 374 Nineteenth-Century American Women Writers (also Women's Studies 374) \# <br> 4 credits. Not offered 1994-95.]

## ENGL 379 Reading Nabokov (also Russian Literature 385 and Comparative Literature 385)

## Fall. 4 credits.

T R 2:55-4:10. M. Scammell.
This course offers an exciting trip to the intricate world of Nabokovian fiction. After establishing himself in Europe as a distinguished Russian writer, Nabokov, at the outbreak of WWII, came to the United States where he reestablished himself, this time as an American writer of world renown. In our analysis of the Nabokovian artistic universe, we shall focus on two of his splendid achievements as a Russian writer, The Defense (1930) and Despair (1934) (both in their English form), and then examine the two widely read novels that he wrote in Ithaca while teaching literature at Cornell-Lolita (1955) and Pnin (1957). Course enrollment will be limited to 25 .

## ENGL 381 Reading as Writing

Fall. 4 credits. Limited to 15 students by permission of the instructor on the basis of writing samples (prose) submitted in advance, preferably during preregistration.

Fall: T R 1:25-2:40. S. Davis.
A course in writing about texts from a range of genres including but not necessarily limited to the epic, the satire, the novel; for English majors or nonmajors who have enjoyed and done well in such courses as English 270-272, 288-289, 388-389 (as well as courses in English, American, and other literatures), and who have an interest in the processes by
which our solitary experiences as readers evolve into written commentary accessible to the understanding and judgment of others. The course emphasizes close readings as the initial stage of an interpretive continuum that culminates in essays about individual texts. Students should be prepared to read a small group of works attentively and repeatedly, to present their readings to the class both orally and in writing and, by means of these activities, to develop a portfolio of well-crafted prose for final submission at the end of term.

## ENGL 382-383 Narrative Writing

Fall, 382; spring, 383. 4 credits each term. Each section limited to 15 students. Students are encouraged to take English 280 or 281. Prerequisite: permission of instructor, normally on the basis of a manuscript.

382 Fall: M W 11:15-12:05, S. Vaughn; M W 2:30-3:20, M. McCoy; T 2:30-4:25,
R. Morgan; plus conferences to be
arranged. 383 Spring: TBA,
D. McCall; TBA, Staff; TBA, M. Koch. The writing of fiction; study of models; analysis of students' work.

## ENGL 384-385 Verse Writing

Fall or summer, 384 ; spring, 385 . 4 credits each term. Each section limited to 15 students. Prerequisites: English 280 or 281 and permission of instructor.

384 Fall: M W, A. Ammons; M W 2:30-4:25, R. Morgan; M W 9:05-9:55, J. Gladding; M 2:30-4:25. P. Janowitz. 385 Spring: TBA, P. Janowitz; TBA,
K. McClane; TBA, Staff.

The writing of poetry; study of models; analysis of students' poems; personal conferences.

## ENGL 386 Philosophic Fictions

Spring. 4 credits. Permission of the instructor. Students wishing to enter the course should furnish the instructor with a writing sample before the start of the term.

TBA. S. Davis.
"Fictions"-of voice, audience, plot, point of view, figurative language, and thoughtabound in all good expository writing; they stand out in works that deliberately test and play with ideas: dialogues, satires, parodies, parables, philosophic tales, and "thoughtexperiments." Students will write critically about such works and issues they raise, and experiment with writing in similar forms. The "fictions" read and written in this course are not conventional realistic narratives or evocations of personal experience; they are the vehicles and animating resources of writers who want to argue flexibly, provoke thought, ridicule vice or folly, play games, answer questions, or involve readers in pleasingly or disturbingly insoluble problems. Readings will include such works as Plato's Gorgias, Swift's "Modest Proposal," Voltaire's Candide, Carroll's Alice books, short fictions by Borges and Octavia Butler, essays by Richard Rorty and Anthony Appiah, selections from Witgenstein's Pbilosophical Investigations, and Stoppard's Dogg's Hamlet, Caboot's Macheth.
ENGL 387 Autobiography: Theory and Practice
Spring. 4 credits.

## TBA. A. Boehm.

In this nonfiction prose-writing seminar we explicate canonical autobiographies as models of rhetoric to be imitated in weekly writing assignments.
[ENGL 388[389] The Art of the Essay Fall. 4 credits. Limited to 15 students. Not offered 1994-95.]

## ENGL 390 Black Autobiography

Fall. 4 credits. Not offered 1994-95.
T R 1:25-2:40. H. Mullen. How does autobiographical writing influence cultural constructions of black identity? How do cultural constructions of black identity shape the writing of black autobiography? How do writers negotiate between individual and collective identities? What is the relation of nineteenth and early twentieth century slave narrative, spiritual narratives, and other autobiographical writings to contemporary black autobiographies? What narrative conventions and tropes recur in the tradition of black autobiographical writing? Discussions will focus on these and other questions as they relate to autobiographers from Frederick Douglass and Harriet Jacobs to Lorene Cary and Jake Lamar.]

## ENGL 395 Video: Art, Theory, Politics (also Theatre Arts 395)

## Fall. 4 credits.

T R 11:40-12:55. T. Murray.
The course will offer an overview of video art and alternative documentary video (which often incorporates styles of "video art") over roughly the past twenty-five years. It will analyze three historical phases of video: 1) the development of video from its earliest turn away from television; 2) video's relation to performance art and installation; 3) video's return to television through cable and its incorporation in film through experiments in technology. Screenings will include early political and feminist video, (from Ant Farm, Chip Lord, Martha Rosier, Joan Jonas, Lynn Hershman, and Paper Tiger TV, etc.), conceptual video of the 80's and 90's (Woody Vasulka, Thierry Kuntzel, Mary Lucier, Bill Viola, Gary Hill, Steve Fagin, etc.), and gay and multicultural video of the 90's (Muntadas, Juan Downey, the Yonemotos, Jerry Tartaglia, Gregg Bordowitz, Richard Fung, Pratibha Parmar, Marlon Riggs, etc.). Secondary theoretical readings on postmodernism, video theory, multiculturalism, and documentary will provide students with a cultural and political context for the discussion of video style, dissemination, and reception. Lab fee.

## Courses for Advanced Undergraduates

Enrollment in courses at the 400 level is generally limited by prerequisite or permission of the instructor.

## ENGL 401 Community as Metaphor:

 Orality in American Indian Cultures (also ENGL 601 and Society for the Humanities 410)Fall. 4 credits. Limited to 17 students. W 2:30-4:25. K. Shanley.
Although this seminar will focus on American Indian oral traditions and literatures, we will also discuss American ethnopoetics, including a brief exploration of the expressive materials from other American cultural groupsAppalachian, African American, etc. Readings of primary materials will range in form and subject from treaties and other contractual documents to contemporary poetry. Readings in secondary sources will include recent theoretical works on community, how it is constituted, defined, and perpetuated; we will also discuss American values regarding competitiveness. Central to our study will also be the question of how language is experi-
enced in the body and what social values therefore emerge with oral performance. What pulls together these topics-oral literature, biological function, community, competitiveness, and textual artifacts such as treaties or poetry-is our effort to understand how individuals and communities metaphorize their wholeness and interconnectedness. Students will be expected to participate in discussion and to work cooperatively in groups, in addition to doing the assigned written work

## ENGL 402 Literature as Moral Inquiry

 Fall. 4 credits.T R 2:55-4:10. S. Mohanty
What can literary works, especially novels and short stories, tell us about moral issues? Should they be seen as suggesting a form of moral inquiry similar to the kind of philosophical discussion we get in, say, Aristotle's Nicomachean Ethics? Do they deal with the same range of issues? Can reading philosophical works in ethics together with novels that deal with similar themes help us understand these themes better? This course is an attempt to answer these questions. We will read selections from key texts in moral philosophy, including works by Aristotle, Kant, Marx, Nietzsche, and Rawls. We will also read classic works like the Bhagavad Gita and recent works in feminist ethical theory Our attempt will be to use these works to help us understand the nature of moral debate and inquiry in novels like Eliot's
Middlemarch, James's Portrait of a Lady, Morrison's Beloved, Woolf's Mrs. Dalloway, Conrad's Heart of Darkness, Achebe's Things Fall Apart, and Handke's The Left-Handed Woman. Other writers we will most probably read include Nadine Gordimer, Doris Lessing, Salman Rushdie, and Kazuo Ishiguro, The emphasis will be on close reading, with particular attention to the relationship between formal elements (such as the use of narrative techniques) and the moral questions the texts organize and explore. Assignments include two papers and a journal.

## ENGL 404 History into Fiction: Nazis and the Literary Imagination (also Comparative Literature 404, and German Studies 414)

Fall. 4 credits. By permission of instructor. T R 11:40-12:55. E. Rosenberg.
The twelve years of Hitler's rule remain the most critical, "longest" years of the century. We shall read some seven or eight texts by Anglophone and Continental novelists (and a few playwrights and poets) that explore salient features of the regime: Weimar and Hitler's rise to power (e.g., Mann's "Mario and the Magician," "Disorder and Early Suffering," Brecht's Arturo Ui, Faulkner's "Percy Grimm," Isherwood's Goodbye to Berlin); civilian life in Nazi Germany (Brecht's "Jewish Wife" and other one-acters, Grass's Tin Drum); World War II and the Occupation of Europe (Camus's The Plague, Boell's short fiction, Anne Frank's Diary; the persecution of European Jews and the genocide (e.g., Sartre's "Childhood of a Leader," Weiss's Investigation, Borowski's This Way for the Gas, Spiegelman's Maus I or Maus ID; lyrics by Celan, Nelly Sachs, Anthony Hecht. Brief ancillary selections by historians and memorialists (Arendt, Primo Levi, Bettelheim, Anne Frank); uses of documentary materials. Two papers; no exam. Limited enrollment.

## [ENGL 405 The Politics of Contemporary

 Criticism4 credits. Limited to 15 students. Open only to undergraduates. Prerequisites: permission of instructor. Background in literary studies will be expected, but no training in critical theory will be presumed. Not offered 1994-95.]

## ENGL 407 Constructions of African American Heroism <br> 4 credits. Not offered 1994-95.]

## ENGL 408 Poetry of the 1990s (also

 Comparative Literature 472)Fall. 4 credits
W 10:10-12:05. J. Monroe.
Where is poetry now? Where is it heading as we move toward the twenty-first century? What is its current situation in light of the historic changes that have occurred over the past several years? Exploring how contemporary poetry is responding to a new era of altered expectations and redrawn boundaries, a time of renewal and redefinition, we'll track the principal issues, directions, figures, and forces shaping the process of poetry's unfolding in the twentieth century's final decade. Materials will be drawn from a wide variety of forms and contexts, including literary journals, general-circulation magazines, anthologies, and non-print media, as well as individual poetry collections.

## ENGL 411 Introduction to Old English

 (also English 611)Fall. 4 credits.
M W F 12:20-1:10. T. Hill.
This course will provide participants an understanding of the earliest English language and literature. No previous work in Old or Middle English is expected or required. Knowledge of the base and matrix of English will provide students with a new perspective on all aspects of English language and literature.

## ENGL 412 Beowulf (also English 612) *

 Spring. 4 credits.TBA. A. Galloway.
A close reading of Beowulf. Attention will be given to relevant literary, cultural, and linguistic issues. One semester's study, or the equivalent, of Old English is a prerequisite.
[ENGL 413 Middle English (also English 614) \#

4 credits. Not offered 1994-95.]
[ENGL 421 Spenser (also English 620) 4 credits. Not offered 1994-95.]
[ENGL 423 Seventeenth-Century Lyric * 4 credits. Not offered 1994-95.]

## [ENGL 424 Lyric Sequences (also English 624) <br> 4 credits. Not offered 1994-95.]

## ENGL 427 Studies in Shakespeare

Fall and spring. 4 credits.
Fall: M W F 2:30-3:20. C. Levy
Fall: Courtesy, Romance, and Shakespearean History
A study of themes and patterns in Shakespeare's later history plays (Richard II, Parts I and II of Henry $I V$, and Henry $V$ ) in the perspective afforded particularly by
Castiglione's Book of the Courtier, Elyot's The Governour, A Mirror for Magistrates, and Sidney's The Countesse of Pembrokes Arcadia. Among topics to be explored are growth, responsibility, play, order, and community. Two short papers and a term-paper of about
ten pages. Each student will conduct class discussion on topics he or she has explored for two of those papers and on at least one other topic. No final examination.

Spring: TBA. B. Adams. Spring: Shakespeare and His Contemporaries Intensive study of four or five Shakespeare's plays along with comparable works by major dramatists of the Elizabethan and Jacobean periods, such as Christopher Marlowe, Thomas Kyd, John Marston, Ben Jonson, John Webster, John Fletcher, Thomas Middleton, and Cyril Tourneur

## ENGL 429 Readings in the New Testament (also Comparative Literature 429, NES 429, and

 Religious Studies 429) \#
## Fall. 4 credits.

M W F 12:20-1:10. J. Bishop. Close readings of representative texts from the New Testament in modern scholarly editions, with the help of appropriate commentary, introductory and specialized. The focus for 1993 will be on Mark, John, and the Johannine letters. All readings will be in English, but repeated reference to the Greek original will be made. Graduate students and undergraduates from other colleges who are interested in the material should not feel inhibited from enrolling. The approach will be primarily exegetical; that is, we will try to find out what the texts say and what they mean by what they say. Thus we can hope to stay open to scholarly and religious issues alike.

## ENGL 431 Scenes of Female Enlightenment

Spring. 4 credits
TBA. M. Jacobus.
In this course we will explore the ways in which Enlightenment thinking about women and women's own concern with their rights and education during the late eighteenth century intersects with an inquiry into femininity itself. How did the focus on sentimentality limit, shape, or enable emancipatory feminist discourse? Starting with Rousseau's Nouvelle Eloise and Emile, we will trace the influence of Rousseau on a variety of eighteenth-century sentimental and educational writers, including Saint-Pierre (Paul and Vinginia), Edgeworth (Belinda), and Wollstonecraft (Vindication of the Rights of Women). If available, we will also read selections from the women educationalists of the period, such as Mrs. Macaulay and Hannah More. Alongside novels of feminist protest by Wollstonecraft (The Wrongs of Woman) and Mary Hays (Memoirs of Emma Courtenay), we will explore other motherdaughter novels of the 1790 s by Inchbald ( A Simple Story) and Opie (Adeline Moubray). As well as reading Diderot's The Nun and de Sade's Justine-works of the French Enlightenment and libertine Revolution, respec-tively-we will read Radcliffe's Romance of the Fonest and Mysteries of Udolpho as the site of the gothic construction of female "enlightenment." Selected novels by Austen (Persuasion and Mansfield Park), and Burney (The Wanderer) will extend the course into the early nineteenth-century novel for a retrospective view of the feminist "Enlightenment" of the Revolutionary period.

## [ENGL 434 Special Topics in Eighteenth-

 Century Literature: Empire and Literature in the Eighteenth Century4 credits. Not offered 1994-95.]
[ENGL 435 The Victorian and Edwardian Theatre (aiso Theatre Arts 435)
4 credits. Not offered 1994-95.]
ENQL 437 Fictions of Apartheid and Modes of Liberalism (장
Spring. 4 credits.
TBA. B. Jeyifo.
This course involves a study of selected works of four major contemporary white South African authors: Athol Fugard, Nadine Gordimer, Breyten Breytenbach, and J. M. Coetzee. The genres include drama, fiction, and the essay. Issues examined include modernity and Apartheid, constructions and deconstructions of racialized identity, ideological interpellations of the subject by juridical and cultural texts, revolutionary optimism and philosophical pessimism.

## ENGL 438 Libertines and License (also French Literature 474)

Spring. 4 credits.
R. Parker.

The course will chart the progress of the libertine chiefly through a number of eighteenth- and early nineteenth-century English and French plays, novels, poems, and graphic works, with particular interest in the aesthetic conventions and cultural contexts for representing intellectual, political, social, and erotic excess and transgression. Works (in translation where appropriate) by such writers as Molière, Richardson, Hogarth, Diderot, Schiller, Sade, "Monk" Lewis, Blake, Coleridge, Hoffman, and Byron.

## ENGL 439 Austen and the Eighteenth Century

Spring. 4 credits. Limited to 20 students. TBA. H. Shaw.
This course will give students the opportunity to read and discuss nearly all of Jane Austen's fiction, as well as works by writers who influenced her. Austen's novels draw deftly on eighteenth-century thought and literature; exploring these links should enrich our experience of Austen's wit and art.
Although this course may be used to fulfill the major requirement of courses before 1800, it is not limited to English majors.
[ENGL 441 The British Romantic Novel 4 credits. Not offered 1994-95.1

## ENGL 442 Testimonial Narratives: U.S. Latinos at War (also Hispanic American Studies 442 and Spanish Literature 494) <br> Spring. 4 credits.

TBA. B. V. Olguin.
This course examines multi-media representations of U.S. Latinos at war in contexts that range from their roles in foreign conflicts as "U.S. Government Issue Personnel" (G.I.'s), to their emergence as nationalist and internationalist cadre in wars of national liberation. The texts examined include memoirs, testimonial narratives, testimonial fiction, narrative poetry, drama, feature and documentary film, and also various aural vernacular texts from corridos to rap. Students will consider the broader implications of the dramatic ruptures manifested by and represented in the cultural production associated with warfare, where hegemonic notions of aesthetics and subjectivity, nation and nationality, as well as identity and ideology are called into question.
[ENGL 443 The Dandy in London and Dublin \#
4 credits. Not offered 1994-95.]

## [ENGL 445 Nineteenth-Century Women's Fiction

4 credits. Not offered 1994-95.]

## [ENGL 446 Victorian Poetry

4 credits. Not offered 1994-95.]

## ENGL 447 Fictionalized Biography and

 the Representation of the Homoerotic (also 5 Hum 423)Fall. 3 credits. Limited to 17 students. M 2:30-4 25. R. Vanita.
This course will examine how in the late nineteenth and early twentieth centuries, the genre of the 'portrait' or fictionalized biography develops as a respectable way of talking about homosexuality. Such texts often allude to earlier canonical texts, and use encoded tropes, constructing a tradition that legitimizes their preoccupations.
ENGL 448 The American Short Story Spring. 4 credits

TBA. R. Morgan.
A seminar exploring the origins of the modern short story in the magazines and newspapers of the late eighteenth century and early nineteenth century, and the evolution of the form through the work of Irving. Poe, Hawthorne, Melville, Twain, James, Jewett, and others to twentieth-century examples. I would like to consider the larger background of the short narrative in the work of Boccaccio and later European authors, as well as the impact of history and popular media on the contemporary short story. Students will write both critical papers and works of fiction.

## ENGL 450 The History of the Book

Spring. 4 credits. Limited to 20 students. Prerequisite: permission of the instructor. TBA. D. Eddy.
A study of the physical aspect of books printed during the last six centuries. Included are papermaking, typography and printing, bookbinding, and the history of book illustrations; the transmission of texts and bibliographical descriptions of hand-printed and modern trade books. Above all, this is the study of the book as a work of art.

## ENGL 454 Theatre and Society (also

 Thetr 434)Fall. 4 credits. Prerequisite: permission of instructor or some work in theatre history or dramatic literature at the 300 level.

W 10:10-12:05. M. Hays.
Staging the End of the Century: reflections on American life in the works of Tony Kushner, Anna Smith, Jose Rivera, Paula Vogel, Richard Greenberg, and others.

## ENGL 460 Social Relations: American

 History and Female Sexuality falso ENGL 605 and Society for the Humanities 416)
## Spring. 4 credits.

T 2:30-4:25. Lois Brown.
In this course we will study depictions of female sexuality in nineteenth- and twentiethcentury American literature. As we explore a range of white and African-American novels, we will examine the ways in which women's bodies are transformed into symbols of protest and incorporated into national debates such as those about slavery and suffrage. We will discuss the influence of race on notions of purity, chastity, virtue, romance, and sin and debate the ways in which rape, incest,
motherhood, and marriage become allegories of American women's historical experiences and goals. In addition, we will explore the ways in which class, race, and political identity determine sexual tragedy or triumph and who becomes "other" based on their sexual legacy.

[ENGL 462 The Scarlet Letter and American Literature<br>4 credits. Not offered 1994-95.]

[ENGL 464 Black Women Writers
4 credits. Not offered 1994-95.]
[ENGL 467 Culture and Technology
4 credits. Not offered 1994-95.]

## [ENGL 468 James Baldwin (also English 686)

4 credits. Not offered 1994-95.]
[ENGL 469 William Faulkner
4 credits. Not offered 1994-95.]
ENGL 470 Studies in the Novel
Fall and spring. 4 credits. Limited to 15 students, juniors and seniors only.
Fall: Hawthorne, Melville, and James
T R 1:25-2:40. D. McCall.
Hawthorne, Melville, and James: the major texts.
Spring: Virginia Woolf
TBA. M. Hite.
This seminar will consider six major novelsMrs. Dalloway, To the Lightbouse, Orlando, The Waves, The Years (along with Woolf's unfinished novel/essay The Pargiters), and Between the Acts-as well as A Room of One's Own, Three Guineas, and a selection of the shorter essays. We will also look at relevant material from the diaries and occasionally from the letters. Class members will give at least two presentations over the course of the semester and will be expected to participate regularly in discussions. Some short in-class writings, two major papers (10-15 pages).

## ENGL 471 American Indian Women's

 LiteratureSpring. 4 credits.
TBA. K. Shanley.
From Pocahontas to Shakes a Fist in Dances with Wolves, depictions of American Indian women rarely present their points of view. Through a variety of genres-short fiction, autobiographies, poetry, and oral historieswe will listen to the voices of American Indian women; we will listen for their aesthetic and cultural values, as those values reflect Indian history in general, tribal histories and values, and their individual life stories. We will begin with works from or about nineteenth-century life and proceed to an examination of works by such well-known Indian women writers as Beth Brant, Louise Erdrich, Leslie Silko, and Joy Harjo. We will explore questions such as: How does the image of Pocahontas affect the representation of other Indian women? Who are American Indian women activists, and have they written of their lives? What is the relationship between the women in myths and legends and women in the real world? The student's grade will be based on two formal papers and a number of informal writing assignments and reports.
ENGL 472 Irish Culture: 1700-1921
Spring. 4 credits.
TBA. S. Siegel.
Readings will include documents in the history of Anglo-Irish relations; graphic and verbal portraits of Ireland and her inhabitants; the theater in Dublin from Smock-Alley to the

Abbey. Texts will include deTocqueville, Renan, Froude; The Nation, The Gentleman's Magazine, and Punch; the Sheridans, Swift, and Wilde. Examination will be by short seminar reports and two short or one long paper

[ENGL 473 Through the Thirties: African American Literature, 1900-1939<br>4 credits. Not offered 1994-95.]

[ENGL 474 African American Poetry since 1940
4 credits. Not offered 1994-95.]
[ENGL 477 Children's Literature
Fall. 4 credits. Not offered 1994-95.]

## [ENGL 478 Self and Nation in Asian American Literature (also Asian American Studies 478) <br> 4 credits. Not offered 1994-95.]

## [ENGL 479 Jewish-American Writing (also Jewish Studies 478, American Studies 479)

4 credits. Not offered 1994-95.]

## ENGL 480-481 Seminar in Writing

Fall and spring. 4 credits. Each section limited to 15 students. Students are encouraged to take English 280 or 281 and at least one 300level writing course. Prerequisite; permission of instructor, normally on the basis of a manuscript.

480 Fall: W 2:30-4:25, M. McCoy; M W 12:20-1:10. S. Vaughn.
481 Spring: TBA, R. Morgan; TBA,
S. Vaughn.

Intended for those writers who have already gained a basic mastery of technique. Although English 480 is not a prerequisite for 481, students normally enroll for both terms and should be capable of a major project-a collection of stories or poems, a group of personal essays, or perhaps a novel-to be completed by the end of the second semester. Seminars are used for discussion of the students' manuscripts and published works that individual members have found of exceptional value.
ENGL 484 The Echo of Tradition: Modernists and Their Sources
Fall. 4 credits.
M 7:30-9:30. S. Siegel.
T. S. Eliot's Wasteland and Dante; Joyce's Ulysses and Homer; Virginia Woolf's Mrs. Dalloway and Shakespeare: this course in these exemplary "modernist" texts will consider as well the tradition that inspired them, and through carefully selected passages from "classic" texts, some of the sources they quote, echo, and revise.

## ENGL 485 American Modernist Writing

 Spring. 4 credits.TBA. J. Porte.
A study of writing by American authors from about 1900 to 1930. Special attention will be paid to developing theories of Modernism, as well as to cultural issues in a specifically American context. Authors to be studied include Gertrude Stein, Ezra Pound, T. S. Eliot, Wallace Stevens, William Carlos Williams, Hemingway, Fitzgerald, Faulkner, Hart Crane, Marianne Moore, and Willa Cather.
ENGL 487 Script Writing
Fall. 4 credits. Limited to 15 students. Prerequisite: English 280 or 281 and at least one 300 -level writing course in any genre. Permission of the instructor, on the basis of manuscripts-poetry, fiction, first-
person essay, or dramatic script. Prefer-
ence given to preregistered students, but preregistration is not a guarantee of admission to the course.

M W F 1:25-2:15. C. Harrison.
Topic for fall 1994: Scripts for the Voice The emphasis of the course in fall 1994 will be the radio play. Readings/listenings for the course will include works by poets, novelists, film makers, and playwrights written for radio between the 1930s and the present. Monday and Wednesday classes will be devoted to workshops addressed to student manuscripts and/or to discussions of professional work. Fridays will be devoted to conferences and/or to audio (or occasionally) video events. Minimum writing requirement: 50 pages.

## ENQL 488 Images of Resistance in

 African American Literature (also ENGL 602 and Society for the Humanities 403)Fall. 4 credits. Limited to 17 students. R 2:30-4:25. L. Brown.
In this course we will explore a number of writings and films for their interpretations of various nineteenth- and twentieth-century African American struggles. We will discuss the re-readings and re-presentations of slave revolts, consider the politics of sexual empowerment, seek out the differences in individual and collective acts of rebellion and self-defense. We will also analyze the narrative strategies and postures that authors employ as they consider the necessities and dangers of separatism, heroism, emancipation and violence. Primary materials may include poetry by James Monroe Whitfield, Countee Cullen and Paul Laurence Dunbar, Toni Cade Bambara's The Salt Eaters, David Bradley's The Chaneysville Incident, Octavia Butler's Kindred, Anne Moody's Coming of Age in Mississippi, Toni Morrison's Beloved, William Stryon's Confessions of Nat Tumer, David Walker's Walker's Appeal, and Sherley Anne Williams' Dessa Rose. By permission of instructor only.

## ENGL 491 Honors Seminar I

Fall. 4 credits.
Section 1. Renaissance Texts: Power and Identity

M 2:00-4:25. B. Correll.
Study of a lively body of Renaissance cultural texts, critically focused on questions of subject formation and changing relations of power in the early modern period.
Section 2. Mary Wollstonecraft and Mary Shelley (also Women's Studies 491)

T R 1:25-2:40. M. Jacobus.
In this seminar we will focus on the writings and the autobiographical and biographical constructions of two famous women who were mother and daughter. We will read Mary Wollstonecraft's major writings of the 1780 s and 1790 s, beginning with her novel, Mary, and Tboughts on the Education of Daughters, before taking on her first Vindication (of the Rights of Men) and the feminist Vindication of the Rights of Women. We will also read her political writings about the French Revolution, her travel book, Letters written during a short residence in Sweden, Noruay, and Denmark, and her unfinished novel, The Wrongs of Women, as well as selections from her letters and Godwin's Memoir of the Author of the Rights of Woman. In the second part of the course, we will read Mary Shelley's writing, starting with her early History of a Six Week's Tour and Frankenstein; or, the Modern Prometbeus. We will also read
some of her later novels, including Valperga, The Last Man, and Perkin Warbeck, as well as her novel about incest, Mathilda, along with selections from her letters and Journals. Alongside the primary texts, the seminar will include readings that situate both Mary Wollstonecraft and Mary Shelley in relation to feminist theory and criticism as well as the Romantic movement. You will be expected to contribute an oral report, short papers, and a final longer paper.

## ENGL 492 Honors Seminar II

Spring. 4 credits.
Section 1. Reading Joyce's Ulysses
TBA. D. Schwarz.
A thorough, episode-by-episode study of the art of meaning of Joyce's Ulysses. We will explore the relationship between it and the other experiments in modernism and show how Ulysses redefines the concepts of epic and hero. We will also view Ulysses to address major issues in literary study and to test various critical and scholarly approaches. Such a self-conscious inquiry into theories and methods should prepare students to confront other complex texts and help them define their own critical positions as they plan their senior honors theses.
Section 2. On Minority Discourses
TBA. H. Spillers.
During the late 1980s, Professor Jan Abdul Muhammed and David Lloyd, editors of Cultural Critique, devoted an entire issue of the joumal to a problem that they named "minority discourse." All the essays in this volume, which became a text of the same name, examined a range of questions that converged on this problematic. Even though it is fair to say that "minority discourse" existed before it was called such, as the institutional loci of "area" studies, modeled on "women and gender," "African-American literature and culture, ${ }^{n}$ and the post-colonial context, given impetus by Edward Said's Orientalism (1978), the editors' designation not only clinched a new reality of the curriculum, but made its combined site an occasion for systematic inquiry and theorization: 1) What is the "minority" component in this discourse, and how is it positioned in relationship to a "cultural dominant," as the formulation implies? 2) What is the relationship between the "fields" that constitute "minority discourse"-in what ways to they contrast and differ, as well as overlap? 3) How does "race" figure into the mix? 4) What do we gain by seeing a sociopolitical problematic in light of discourse theory, or discursivity, which comes to focus on language and position in discourse? The series of questions raised by the journal issue linked parallel studies as intertextual components of a post-modernist, post-colonial paradigm.
This course is designed to examine in some detail the positions taken by the essayists in "minority discourse" and to try to decide on their bases what further problems of the cultural critique might be anticipated. In addition to this text, we will examine a number of other critical positions articulated by theorists of the new area studies Chicano/Chicana; Asian-American; AfricanAmerican; post-colonial. Edward Said's Orientalism and his more recent Culture and Imperialism will be among the key texts, as well as the work of Gloria Anzaldua, Gayatri Spivak, the Subaltern Group, and Trinh Minha, among others, who have offered significant theoretical advances on the subject.

Section 3. Problems in the Novel: Murder and Crime-Writing
Spring. 4 credits. Limited to 15 students. TBA. M. Seltzer.
An investigation of the representation of murder across a range of novels, non-fictional accounts, and film. Focus on turn-of-thecentury and recent materials.

ENGL 493 Monors Essay Tutorial I Fall or spring. 4 credits. Prerequisites: senior standing and permission of Director of the Honors Program.

Staff.
ENGL 494 Honors Essay Tutorial II
Fall or spring. 4 credits. Prerequisites: English 493 and permission of Director of the Honors Program. Staff.

ENGL 495 Independent Study
Fall or spring. 2-4 credits. Prerequisites: Permission of departmental adviser and director of undergraduate studies. Staff.

## Courses Primarily for Graduate Students

Permission of the instructor is a prerequisite for admission to courses numbered in the 600 s . These are intended primarily for graduate students, although qualified undergraduates are sometimes admitted. Undergraduates seeking admission to a 600 -level course should consult the instructor. The list of courses given below is illustrative only; a definitive list, together with course descriptions and class meeting times, is published in a separate department brochure before course enrollment each term.

## Graduate English Courses 1994-95

Fall
ENGL 600 Colloquium for Entering Students
T. Murray.

ENGL 601 Community as Metaphor: Orality in American Indian Culture (also ENGL 401 and Society for the Humanities 410)
K. Shanley.

ENGL 602 Images of Resistance in African American Literature |also ENGL 488 and Society for the Humanities 416)
Lois Brown
ENGL 603 Medieval Archaeology and Literature (also ENGL 311 and Archaeology 311)
R. Farrell.

ENGL 611 Old English (also English 411) T. Hill.

ENGL 615 Piers Plowman T. Hill.

ENGL 628 Elizabethan and Jacobean Drama
S. McMillin.

ENGL 630 Aesthetics in the Eighteenth Century
N. Saccamano.

ENOL 634 The Feminization of Ideology in the Eighteenth Century
Laura Brown.

ENGL 643 Writers of the Revolution R. Parker.

ENGL 650 The Modern British Novel: Colonialism and the Decline of the Empire
D. Schwarz.

ENGL 651 Comic Irish Drama: Wilde, Shaw, Synge
S. Siegel

ENGL 666 The Crowd/the Mass/the Public
M. Seltzer.

ENGL 684 Black Male Writers: Wright, Ellison, Baldwin, and David Bradley
H. Spillers

ENGL 694 Marxism and Post-Colonial Discourse
B. Jeyifo.

ENGL 702 Literature and Theory J. Culler.

ENGL 780.1 MFA Seminar: Poetry P. Janowitz.

ENGL 780.2 MFA Seminar: Fiction D. McCall.

## Spring

ENGL 605 Social Relations: American History and Female Sexuality (also ENGL 460 and Society for the Humanities 416)
Lois Brown.
ENGL 612 Beowulf (also ENGL 412) A. Galloway

ENGL 619 Chaucer W. Wetherbee.

ENGL 623 Faerie Queene G. Teskey.

ENGL 633 Studies in the Eighteenth Century
F. Bogel.
engl 636 Clarissa to Mansfield Park H. Shaw

ENGL 647 Romantic Narratives and Ideology
C. Chase.

ENGL 660 American Fiction: The Civil War to WWI J. Porte.

ENGL 664 Cultures of American Poetry R. Gilbert.

ENGL 681 Mouth Music D. Fried.

ENGL 689 Asian American Literature S. Wong.

ENGL 692 The Politics of Knowledge and Interpretation S. Mohanty.

ENGL 693 The Object and the Abject: Klein, Kristeva, and Since M. Jacobus.

ENGL 721 Baroque Perspectives: The Return of Theory in the Seventeenth Century
T. Murray

ENGL 759 Virginia Woolf M. Hite.

ENGL 781.1 MFA Seminar: Poetry A. Ammons

ENGL 781.2 MFA Seminar: Fiction L. Herrin.

ENGL 785 Reading for Writers M. McCoy.

## FILM

See listings under Department of Theatre Arts.

## FRENCH LANGUAGE AND LINGUISTICS

See Department of Modem Languages and Linguistics.

## FRENCH LITERATURE

See Department of Romance Studies.

## FRESHMAN WRITING SEMINARS

For information about the requirements for freshman writing seminars and descriptions of seminar offerings, see p. 527 and consult the John S. Knight Writing Program brochure, available from college registrars in August for the fall term and in November for the spring term.

## GEOLOGICAL SCIENCES

B. L. Isacks, chair; A. L. Bloom, director of undergraduate studies; R. W. Allmendinger, K. Attoh, M. Barazangi, W. A. Bassett, J. M. Bird, A. L. Bloom, L. D. Brown,
L. M. Cathles, J. L. Cisne, T. E. Jordan,
D. E. Karig, R. W. Kay, S. Mahlburg Kay, F. H. T. Rhodes, W. B. Travers, D. L. Turcotte, W. M. White

As an intercollege unit, the Department of Geological Sciences has degree programs in both the College of Arts and Sciences (B.A. degree) and the College of Engineering (B.S. degree). Currently, most of the undergraduate majors are in the College of Arts and Sciences. There are nineteen faculty members, including Cornell's president.
We live on a planet with finite resources and a finite capacity to recover quickly from human-induced environmental stresses. It is also a powerful planet, with geologic hazards such as earthquakes and volcanic eruptions that alter the course of history with little prior warning. As the human population grows, understanding the earth and its resources becomes progressively more important for both future policy makers and ordinary citizens. Because the human need to understand the earth is so pervasive, we provide our students with a broad and solid minimal set of required courses plus room to explore more specialized topics with wellchosen electives within and outside the department.

Studies of the earth are becoming increasingly focused on environmental applications. Department faculty members collaborate in research and teaching with faculty from Civil and Environmental Engineering (soil and rock mechanics, hydrology), Materials Science, Agricultural Engineering, Soil, Crop, and Atmospheric Sciences, Biological Sciences, and many others. Students who major in geology are urged to take courses to broaden their experience in other sciences, engineering, and mathematics. To develop observational skills, geology majors attend a summer field camp, usually during the summer following their junior year.
In addition to course work, students learn by involvement in research projects. Facilities include equipment for processing seismic signals and digital images of the earth's surface, isotopic analytical instruments, and extensive libraries of earthquake records, satellite images, and exploration seismic records. High-pressure, high-temperature mineral physics research uses the diamond anvil cell and the Cornell High Energy Synchroton Source (CHESS).
Employment opportunities include environmental sciences (groundwater management, waste disposal), resource development (petroleum and minerals), public policy, education, and research. Undergraduates have served as field assistants for faculty members and graduate students who work in Greenland, British Columbia, the Aleutian Islands, Scotland, Switzerland, the South Pacific, Barbados, and South America. Undergraduates are encouraged to participate in research activities, frequently as paid assistants.

## The Major

The prerequisites for admission to a major in geological sciences in the College of Arts and Sciences are two two-semester sequences, Mathematics 111-112 or 191-192 and Physics 207-208 or 112-213, or their equivalents, and a semester course in chemistry, such as Chemistry 207 or 211. Geological Sciences $101,103,111,201$, or 202 followed by 102 , 104 , or 206 are strongly recommended, but a student with a strong foundation in mathematics and science may be accepted as a major without completion of an introductory sequence.
Majors take Geological Sciences 210 and 214 (which collectively equal 1 course credit), the five 300 -level core courses in geological sciences, a summer field geology course, 6 credits of additional course work from geological sciences courses numbered 300, 400 , or 600 , plus an additional course in either computer science or biological science, or an intermediate-level course in biological science, mathematics, chemistry, or physics. Seniors are encouraged to undertake a research project or honors thesis.

## Core Courses

GEOL 326 Structural Geology
GEOL 355 Mineralogy
GEOL 356 Petrology and Geochemistry
GEOL 375 Sedimentology and Stratigraphy

GEOL 388 Geophysics and Geotectonicः

Prospective majors should consult one of the following departmental major advisersW. A. Bassett, A. L. Bloom, L. M. Cathles, J. L. Cisne, D. E. Karig, or B. L. Isacks-as early as possible for advice in planning a program. Students majoring in geological sciences may attend the departmental seminars and take advantage of cruises, field trips, and conferences offered through the Department of Geological Sciences.
Courses offered at the 100 and 200 level are open to all students. Certain 300- and 400 -level courses in geology also may be of particular interest to students of chemistry, biology, ecology, and physics. Students are encouraged to inquire about courses that interest them at the department office in Snee Hall.

Honors. An honors program is offered by the Department of Geological Sciences for superior students. Candidates for honors must maintain an overall 3.0 grade-point average and a cumulative average of 3.5 in the major and complete an honors thesis (Geological Sciences 490). Students interested in applying should contact the director of undergraduate studies during the second semester of the junior year.

## Courses

For complete course descriptions, see the Geological Sciences listing in the College of Engineering section.

## GEOL 101 Introductory Geological

 SciencesFall, spring. 3 credits
2 lecs, 1 lab, field trips, evening exams in the fall term.

## GEOL 102 Evolution of the Earth and Life

 [Bio 5 170]Spring. 3 credits. GEOL 101 recommended. 2 lecs, 1 lab, field trips, weekly quizzes, no midterm.

GEOL 103 Introductory Geology in the Field
Fall. 3 credits. Limited to 35 students.
1 lec, 1 lab or field trip, 1 rec.
GEOL 104 Introduction to Oceanography (also Bio S 154)
Spring. 3 credits.
Two lecs, one lab, evening exams.
GEOL 105 Writing on Rocks (Freshman Seminar)
Fall. 3 credits.
J. J. Chiment.

See freshman seminar handbook for description.

## GEOL 108 Frontiers of Geology

Spring. 1 credit. May be taken concurrently with or after GEOL 101, 102, 103, 104, 111, 201, 202, or 206.

1 lec

## GEOL 109 Dinosaurs

Fall. 1 credit.
1 lec

## [GEOL 111 To Know the Earth

Fall. 3 credits. Not offered 1994-95
2 lecs, 1 lab, and field trips.]
GEOL 122 Earthquake! (also ENGRI 122)
Fall. 3 credits.
2 lecs, 1 lab.

GEOL 201 Introduction to the Physics and Chemistry of the Earth (also ENGRD 201)
Spring. 3 credits. Prerequisites: Mathematics 191 and Physics 112.

2 lecs, 1 rec, 1 lab or field trip.
GEOL 202 Environmental Geology Spring. 3 credits.

2 lecs, 1 rec, lab, or field trip.
GEOL 204 Hydrology and the Environment (also SCAS 371 and ABEN 371)
Spring. 3 credits. Prerequisite: 1 course in calculus.

GEOL 206 Geologic Perspective on Climate Changes
Spring. 3 credits.
3 lecs.
GEOL 210 Introduction to Field Methods in Geological Sciences
Fall. 2 credits. Prerequisite: GEOL 101. Weekly field sessions. A weekend field trip.
GEOL 212 Special January Field Trip
Fall. 1 credit. Prerequisites: GEOL 101 or
201 or equivalent, and permission of
instructor. Travel and subsistence expenses to be announced.

1 lec, field trip.
GEOL 213 Marine and Coastal Geology
Summer. 2 credits. Prerequisites: an introductory course in geology or permission of instructor.

GEOL 214 Western Adirondack Field Course
Spring. 1 credit. Prerequisite: GEOL 101 or 201, or permission of instructor.

GEOL 326 Structural Geology
Spring. 4 credits. Prerequisite: GEOL 101 or 201, or permission of instructor.

3 lecs, 1 lab, field trips.

## GEOL 355 Mineralogy

Fall. 4 credits. Prerequisite: GEOL 101 or 201 and Chem 207 or permission of instructor. 2 lecs, 1 lab; assigned problems and readings.
GEOL 356 Petrology and Geochemistry
Spring. 4 credits. Prerequisite: GEOL 355. 3 lecs, 1 lab, 1 field trip; assigned problems and readings.

QEOL 375 Sedimentology and Stratigraphy
Fall. 4 credits. Recommended: GEOL 102 or 201.

3 lecs, 1 lab, field trips
GEOL 388 Geophysics and Geotectonics
Spring. 4 credits. Prerequisites: Mathematics 192 and Physics 208, 213, or equivalent. 3 lecs, 1 lab.

## GEOL 410 Field Geology

Summer. 4 credits. Prerequisites: GEOL
210, 214, 355-56, 375 and 326 strongly
recommended, or permission of instructor.
Four weeks at research sites in the westem
United States or Canada. Fee, approximately $\$ 1,600$.

GEOL 411 Global Change Research: Mountains, Climate, and Erosion
Fall. 3 credits.
1 lec, 2 labs

## [GEOL 423 Petroleum Geology

Fall. 3 credits. Recommended: GEOL 326.
Offered alternate years. Not offered 1994-95.
2 lecs, 1 lab.]
GEOL 425 Precambrian Orogenic Cycles Fall. 3 credits. Prerequisites: GEOL 326 or GEOL 356.

2 lecs, 1 lab/discussion.
[GEOL 426 Geologic Evolution of South America
Spring. 3 credits. Prerequisite: GEOL 326, 356 , or permission of instructor. Not offered 1994-95.

2 lecs, 1 lab.]
GEOL 432 Digital Processing and Analysis of Geophysical Data
Spring. 3 credits. Prerequisite: GEOL 437 or equivalent.

3 lecs.

## GEOL 437 Geophysical Field Methods

Fall. 3 credits. Prerequisites: Physics 213 and Mathematics 192 or equivalents, or permission of instructor.

1 lec, 1 lab.
GEOL 438 Exploration Seismology I: Data Acquisition and Processing
Fall. 3 credits. Offered alternate years. 3 lecs.
[GEOL 439 Exploration Seismology II: Analysis and Interpretation
Spring. 3 credits. Offered alternate years. Not offered 1994-95.

3 lecs.]

## GEOL 441 Geomorphology

Fall. 3 credits. Prerequisites: GEOL 102 or 201, or permission of instructor.

2 lecs, 1 lab.
GEOL 442 Glacial and Quaternary Geology
Spring. 3 credits. Prerequisite: GEOL 441, or permission of instructor.

2 lecs, 1 lab; several field trips.
GEOL 445 Geohydrology (also ABEN 471 and C\&EE 431)
Fall. 3 credits. Prerequisites: Mathematics 294 and Engr 202.

2 lecs, 1 rec.
GEOL 452 X-ray Diffraction Techniques
Spring. 3 credits. Prerequisite: GEOL 355 or permission of instructor. Offered alternate years.

2 lecs, 1 lab.
GEOL 453 Advanced Petrology
Fall. 3 credits. Prerequisite: GEOL 356. Offered alternate years.

2-1/2 lecs, $1 / 2$ lab.
[GEOL 454 Advanced Mineralogy
Spring. 3 credits. Prerequisite: GEOL 355 or permission of instructor. Offered altemate years. Not offered 1994-95.

2 lecs, 1 lab.]
[GEOL 455 Geochemistry
Fall. 4 credits. Prerequisites: Chemistry 207 or equivalent, Mathematics 102. Recommended GEOL 356. Offered alternate years. Not offered 1994-95.

3 lecs, 1 disc.)
GEOL 458 Volcanology
Spring. 3 credits. Corequisite: GEOL 356 or equivalent. Offered alternate years.

2 lecs, 1 labs/rec, possible spring-break
field trip to volcanic area such as Hawaii.
[GEOL 476 Sedimentary Basins:
Tectonics and Mechanics
Spring. 3 credits. Prerequisite: GEOL 375 or permission of instructor. Offered alternate years. Not offered 1994-95.

3 lecs.]
GEOL 478 Advanced Stratigraphy
Spring. 3 credits. Prerequisite: GEOL 375 or permission of instructor. Offered alternate years.

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2 \text { lecs, } 1 \text { lab. }
$$

[GEOL 479 Paleobiology (also Bio Sci 479)

Fall. 3 credits. Prerequisites: Biological Sciences 101-102 and 103-104 or equivalent, and either GEOL 375. Biological Sciences 373, or permission of instructor. Offered alternate years. Not offered 1994-95.

3 lecs.]
[GEOL 481 Senior Survey of Earth Systems
Fall. 3 credits. Limited to seniors majoring in geological sciences. Not offered 1994-95. 1 lec, 1 disc.]
GEOL 490 Honor Thesis (B.A. degree candidates)
Fall, spring. 2 credits.
GEOL 491-492 Undergraduate Research Fall, spring. 1 or 2 credits variable.

## GEOL 500 Design Project in

 GeohydrologyFall, spring. 3-12 credits. An alternative to an industrial project for M.Eng. students choosing the geohydrology option. May continue over two or more semesters.
QEOL 501 Geohydrology Design Project Seminar
Fall, spring. 1 credit. Required for the M.Eng. degree, geohydrology option.

1 rec, hours to be arranged.
GEOL 502 Case Histories in Groundwater Analysis
Spring. 4 credits.
[GEOL 621 Marine Tectonics
Fall. 3 credits. Prerequisites: GEOL 326 and a course in geophysics. Offered alternate years. Not offered 1994-95. 3 lecs.]
[GEOL 622 Advanced Structural Geology I
Spring. 3 credits. Prerequisites: GEOL 326 and permission of instructor. Offered alternate years. Not offered 1994-95.

2 lecs, 1 lab, possible weekend field trips.]

## [GEOL 624 Advanced Structural

 Geology IISpring. 3 credits. Prerequisites: GEOL 326 and permission of instructor. Offered alternate years. Not offered 1994-95.

2 lecs, 1 lab, spring-recess trip.]
[GEOL 625 Tectonic History of Western North America from Craton to Terranes
Fall. 2 credits. Open to seniors and graduate students. Offered alternate years. Not offered 1994-95.

Lecture, term paper, quizzes, no final.]
[GEOL 628 Geology of Orogenic Belts
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.]

GEOL 635 Advanced Geophysics I: Fractals and Chaos in Geology and Geophysics
Fall. 3 credits. Prerequisite: GEOL 388 or permission of instructor.

3 lecs.
GEOL 636 Advanced Geophysics II: Quantitative Geodynamics
Spring. 3 credits. Prerequisite: GEOL 388. 3 lecs.
[GEOL 655 Isotope Geochemistry
Fall. 3 credits. Prerequisites: GEOL 356 or permission of instructor. Offered alternate years. Not offered 1994-95. 3 lecs.]
[GEOL 681 Geotectonics
Fall. 3 credits. Prerequisites: permission of instructor. Not offered 1994-95.

2 lecs.]
GEOL 695 Computer Methods in Geological Sclences
Fall. 3 credits.
GEOL 700-799 Seminars and Special Work
Fall, spring. $1-3$ credits. Prerequisite permission of instructor. Advanced work on original investigations in geological sciences. Topics change from term to term.

## GEOL 722 Advanced Topics in Structural

 GeologyGEOL 725 Rock and Sediment Deformation
[GEOL 731 Plate Tectonics and Geology Not offered 1994-95.]
[GEOL 733 Fractal Chaos - Independent Studies
Not offered 1994-95.]
GEOL 741 Advanced Geomorphology Topics
GEOL 751 Petrology and Geochemistry
GEOL 753 Advanced Topics in Mineral Physics
[GEOL 755 Advanced Topics in Petrology Not offered 1994-95.]

QEOL 757 Current Research in Petrology
[GEOL 762 Advanced Topics in Petroleum Exploration
Not offered 1994-95]
GEOL 771 Advanced Topics in Sedimentology and Stratigraphy
GEOL 773 Paleobiology
GEOL 780 Seismic Record Reading
GEOL 781 Geophysics, Exploration Seismology
GEOL 783 Advanced Topics in Geophysics
GEOL 789 Seismic-Reflection Proflling
GEOL 793 Andes-Himalaya Seminar
GEOL 796 Geochemistry of the Solid Earth
GEOL 797 Fluid-Rock Interactions
GEOL 799 Contemporary Issues in Groundwater Hydrology

## GERMAN STUDIES

D. Bathrick, G. Waite, director of undergraduate studies; B. Buettner, H. Deinert,
I. Ezergailis, S. L. Gilman, A. Groos,
P. U. Hohendahl, B. Martin, chair,
L. M. Olschner, graduate faculty representative

Major areas of specialization cover the period from the early Middle Ages to the twentieth century. While the emphasis remains on literature, the department teaches film, theater, the political culture of Germany, women's studies, music, intellectual history, history of science, and Jewish studies. Courses are designed with the general student population in mind. The department often cosponsors courses with the departments of Comparative Literature, History, History of Art, Government, Music, Near Eastern Studies, and Theatre Arts, as well as with the Medieval Studies and Women's Studies programs. For further information about majors and courses, see Modern Languages and Linguistics.

## The Major

Students majoring in German are encouraged to design their programs in a manner that will allow for diversity in their courses of study. It should enable them to become acquainted with an adequate selection of major works, authors, and movements of German literature and to develop their skill in literary analysis. Students majoring in German will normally proceed through German 201, 202, 203, 204 Students who, because of previous training, are qualified to enroll in 300 - or 400 -level courses will be permitted to do so. For details, students may consult the director of undergraduate studies, G. Waite, in the Department of German Studies, or W. Harbert, in the Department of Modern Languages and Linguistics. Students majoring in German are expected to complete successfully a minimum of six 300 - and 400 -level courses in addition to German 303-304; one of the courses must be a senior seminar (German Studies 410). Some 200-level courses offered by this department (such as German Studies 211) and related deparments will count toward the major as well; please consult your adviser These courses should be a representative selection of subjects in German literature, Germanic linguistics, or both. The attention of students majoring in German is called to the courses offered by departments and programs such as Anthropology, Comparative Literature, History, History of Art, Government, Music, Society for the Humanities, Theatre Arts, and Women's Studies, many of which complement the course offerings in German.
Students majoring in German are expected to become competent in the German language. This comperence is normally demonstrated by the successful completion of German 304 Placement of German majors who have done no work in German at Cornell will be determined by the level of preparation they have obtained elsewhere. For information, students should consult the director of undergraduate studies, G. Waite, or W. Harbert.

## The German Area Studies Major

The German area studies major is intended for students who are interested in subject matter related to German-speaking countries but not necessarily or not exclusively in German literature or linguistics. Students will select appropriate courses offered in history,
government, economics, music, theater arts, or other suitable subjects. Minimum course requirements for the German area studies major are the same as for the German major. These students may select a committee of two or more faculty members to help them design a program and supervise their progress. One committee member must be from the German faculty of either the Department of Modern Languages and Linguistics or the Department of German Studies. The other member(s) should represent the student's main area of interest.
The student majoring in German area studies is expected to become competent in the German language. Such competence is normally demonstrated by successful completion of German 304. A minimum of six area courses above the 200 -level is required for the major; one of the six courses must be a senior seminar (German Studies 410).
Advanced Standing. Students with an AP score of 4 or better are automatically granted three credits in German literature. Students coming to Cornell with advanced standing in German and/or another subject often find it possible to complete two majors. Recent double majors have combined history, psychology, chemistry, biology, or physics with German literature or German area studies. Students in Agriculture and Engineering have entered dual degree programs. Double majors will complete separate programs, one for each major.
Honors. The honors program in German is open to superior students who want to work independently in an area of their own choice. Students are free to select any faculty member of the Field of Germanic Studies (in the case of area studies majors, the appropriate member of their committee) to assist them in designing their honors program, to supervise their work, and to help them select a suitable topic for an honors essay. The independent study courses, German 451 and 452, may form part of the program.

## Study Abroad

Cornell has a formal agreement with the University of Hamburg enabling its undergraduates to take courses in any field offered by the German university. The program offers a challenging course of study and the experience of total immersion in German life and culture. Participants in this program attend a required 3 -credit orientation course in September, which is designed to help them adjust to the academic and social life of Germany. Special field trips are organized as part of the orientation session. Beginning in mid-October, students enroll as fully matriculated students at the University of Hamburg.
Cornell maintains a center in Hamburg with appropriate support staff. The resident director is a faculty member from Cornell, who teaches a special seminar each semester, provides academic advice, and helps ensure the quality of the courses. The center, which includes a classroom, a small library, and word-processing facilities, is used by students for the orientation session, special seminars, tutorials, lectures, and informal gatherings.
Applicants are expected to have attained at least proficiency in German prior to departure. For further information, students should contact the director of undergraduate studies and the director of Cornell Abroad.

## Freshman Writing Seminar Requirement

The following courses will satisfy the freshman writing seminar requirement:
German 109, 151, 175, 211, and 312. For details students should consult the instructors.
Fees. Depending on the course, a small fee may be charged for film rental or photocopied texts for course work.

## Literature

## Freshman Writing Seminars

See Freshman Seminar booklet for course times and descriptions.

## GERST 109 Fairy Tales and the Literary Imagination

Fall or spring. 3 credits.
I. Ezergailis and staff.

QERST 151 Kafka, Hesse, Brecht, and Mann
Fall or spring. 3 credits. H. Deinert and staff

GERST 175 Cinema and Society
Fall or spring. 3 credits.
G. Waite and staff

## Courses Offered in German

GERST 201 Introduction to German Literature I: Prose
Fall or spring. 3 credits. Prerequisite: qualification in German or permission of instructor. Taught in German. Fulfills both the language proficiency requirement and, followed by German 202 or another German literature course at the 200 level or above, the humanities distribution requirement.

## D. McGraw.

An intermediate course designed to improve reading, writing, speaking, and listening skills in German. Emphasis is placed on developing reading competency, tools of literary analysis, and expansion of vocabulary. Grammar review included. The complexities of inner and outer reality as expressed in selected prose works of Bachmann, Brecht, Kafka, Mann, Dürrenmatt, Aichinger and others.
GERST 202 Introduction to German Literature Il: Drama
Fall or spring. 3 credits. Prerequisite: German 201 or permission of instructor. Taught in German. Fulfills both the language proficiency requirement and, together with German 201 or another German literature course at the 200 level or above, the humanities distribution requirement.

## C. Gundermann.

An intermediate course designed to improve reading, writing, speaking, and listening skills in German. Emphasis is placed on developing reading competency, tools of literary analysis, and expansion of vocabulary. Self-confrontation and social conflict in the plays of major Austrian, Swiss, and German dramatists, including Dürrenmatt, Brecht, Frisch, Hofmannsthal, Goethe, and Schiller.

GERST 211 Intensive Workshop in Germanic Studies for Freshmen I \# Fall. 6 credits. Intended for entering freshmen with extensive training in the German language (CPT achievement score of 650, AP of 3 , or comparable evidence; please consult instructor). Taught in German. Satisfies the language and distribution requirements or the freshman writing seminar requirement.
H. Deinert.

Not intended as a survey but rather as a rigorous seminar designed to familiarize students with literary forms and the tools of critical analysis. The course will provide an intensive introduction to the study of German literature through the discussion of exemplary prose works, dramas, and poems from the eighteenth and nineteenth centuries.

## GERST 307 Modern Germany

Spring. 4 credits. Prerequisite: German 201-202 or equivalent. Taught in German L. M. Olschner.

Introduction to the history of postwar Germany, the development of the two Germanys, and their societies. The emphasis is on cultural and social institutions such as mass media, educational systems, and political parties. Further topics include women, reunification, the student movement, and terrorism. We will also follow the rapid changes taking place in Germany today in light of the recent past. Texts are complemented by films and music.

## GERST 312 Intensive Workshop in

 Germanic Studies for Freshmen II Spring. 4 credits. Intended primarily for freshmen with extensive training in the German language (minimum CPT achievement score of 650 or minimum AP' score of 3 , or comparable evidence; please consult instructor). Taught in German. Satisfies the language and distribution requirements or the freshman writing seminar requirement.
## H. Deinert.

Designed mainly as a sequel to the Intensive Workshop I (German 211). The emphasis is on German literature, culture, and political history in the first half of this century. Readings include works by Hofmannsthal, Thomas Mann, Hesse, Kafka, Brecht, Weiss, and Plenzdorf. The visual arts, music, and theater will serve as additional tools of interpretation.

## GERST 315 German Poetry from the

 Middle Ages to the Present *Fall. 4 credits. Prerequisite: German 201-202 or permission of instructor. Taught in German
L. M. Olschner.

An introduction to lyric poetry written in German from the High Middle Ages to the present, this course addresses both those students with no prior experience in reading puetry as well as those who wish to continue their reading. We explore how the language of poetry functions and how it differs from other genres and in doing so become acquainted with prosodic terms and discourse on poetry in German. We trace poetic development from period to period and question the historicity of poetic texts. Manuscript facsimilies, analysis of textual variants, works of art as they relate to the texts, musical sertings of texts, authors reading their own work, and other materials complement the poems.
[GERST 353 Kleist
Not offered 1994-95.]

## [GERST 354 Schiller

Not offered 1994-95.
GERST 357 Major Works of Goethe Spring. 4 credits. Prerequisite: German 201202 or equivalent. Please consult instructor. Taught in German.
H. Deinert.

Poet, statesman, artist, scientist, rebel, conservative, mythmaker, and iconoclast, Goethe stands at the center of Germany's belated Renaissance. Taking his early cues from Homer, Shakespeare, and the Bible, he created cultural icons at once modern and steeped in tradition. We will examine works from all phases of the man's incredibly productive life against the background of political turmoil in Europe and the Americas We will use art, music, and theater as additional tools of interpretation.

## [GERST 365 Austrian Literature

 Not offered 1994-95.]
## Courses in English Translation

GERST 320 Postwar German Novel Spring. 4 credits.
I. Ezergailis.

A reading, in English translation, of such post1945 German novelists as Grass, Böll, Johnson, and Christa Wolf. This course is recommended for the concentration in modern European studies.
[GERST 322 Medicine and Civilization (also Biology and Society 322) \# Not offered 1994-95.]
[GERST 327 Health and Disease (also Biology and Society 327 and Psychology 387)
Not offered 1994-95.]
GERST 330 Political Theory and Cinema (also Comparative Literature 330, Government 370 and Theatre Arts 330)
Fall. 4 credits.
G. Waite

This course provides an introduction to some fundamentals of current film analysis and political theory and their relationship to one another. Our investigation has two main aspects. On the one hand, we will be interested in the work of film-makers who have been particularly concerned to reshape ideas about politics in the cinematographic medium. On the other, we will attempt to develop a way of reading political theory using techniques borrowed from cinema and vice versa-thus forging between these two disciplines productive analogies that are not necessarily based on influence. We will study not only mainstream but also experimental and low-budget films; similarly, we will find political theory in obscure places, as well as more obvious ones. While the course has a historical perspective, the main emphasis will be on contemporary work. Our texts/films will be taken from the works of such thinkers, filmmakers as: P. P. Pasolini, J.-L. Godard, S. Eisenstein, D. Vertov, G. Romero,
R. Corman, M. von Trotta, D. Cronenberg, T. W. Adorno, W. Wenders, R. W. Fassbinder, A. Kluge, P. K. Dick, W. Benjamin,
G. Deleuze, M. Gorris, K. Tahimik, L. Strauss, K. Marx, J. G. Fichte, L. Althusser, R. Scott, L. Buñuel, A. Gramsci.
[GERST 347 Reading Freud: Race, Gender, and Psychoanalysis (also Comparative Literature 347, English 347, Psychology 389)
Not offered 1994-95.]
[GERST 351 Freud: Optional Clinical Discussion Section (also Comparative Literature 351, English 346 and Psychology 391)
Not offered 1994-95.]

GERST 383 Faust in Legend, Literature, and the Arts (also Comparative Literature 383) *
Fall. 4 credits. Readings in English translation; students with knowledge of German and/or French will be encouraged to read the texts in the original languages
L. M. Olschner.

The life and legend of Johann Faust, the necromancer who sold his soul to the devil in return for power and knowledge, have cast a spell on European writers, artists and composers ever since the sixteenth century. We will study this fascination and receptivity through the centuries, from the first Faust book and its English translation to Marlowe, Goethe, Valêry, Mann, and others. We will also consider illustrations and representations of Faust in early woodcuts and works by later visual artists as well as various musical treatments.
[GERST 396 German Film (also Comparative Literature 396 and Theatre Arts 396)
Not offered 1994-95.]
[GERST 411 African Americans and Jewish Americans: Identities, Parallels, and Conflicts (also Africana Studies 411 and Jewish Studies 411)
Not offered 1994-95.]
GERST 413 Women around Freud (also Comparative Literature 412 and Women's Studies 413)
Spring. 4 credits.
B. Martin.

This course is designed: 1) to expose students to the lives and work of women intellectuals in turn-of-the-century and early twentieth-century Austria and Germany who influenced and were influenced by Freud and psychoanalysis; 2) to consider the work of women intellectuals whose interests converged with those of Freud and other psychoanalytic thinkers but whose psychological theories diverged from psychoanalytic thinking; 3) to explore definitions of "intellectuals" and the status of women as intellectuals both at the beginning of the century and in 1994. Our readings and discussions will include the work of Lou Andreas-Salome, Anna Freud, Helene Deutsch, Karen Horney, Sabina Spielrein, Joan Riviere, Melanie Klein, Rose Mayreder, Grete Meisel-Hess, Hedwig Dohm, and Ellen Key.

GERST 414 History into Fiction: Nazis and the Literary Imagination (also English 404, Comparative Literature 404)

Fall. 4 credits. Two papers; no exam.
Limited to 25 ; by permission of instructor. E. Rosenberg.

For course description, see English 404.

## Course in Latvian and Baltic Literature

[GERST 377 Baltic Literature (also Russian Literature 377)
Not offered 1994-95.]

## Graduate and Advanced Undergraduate Courses

GERST 405 Introduction to Medieval German Literature I
Fall. 4 credits. Prerequisite: reading knowledge of German.
A. Groos.

After a brief introduction to basic aspects of the medieval universe, ranging from cosmology to psychology, readings will focus on
introductory texts of late twelfth-century courtly culture. Using the predominant genres of aristocratic self-representation, the heroic epic (Nibelungenlied), Arthurian romance (Hartmann's Iwein), and Minnesang, discussions will investigate the court as the locus of conflicting forces in the rise of the secular culture in Germany, examining such issues as the first vernacular construction of social and sexual identity, generational conflicts within the communal-dynastic order, the rise of individualism (the knightly quest), and subjectivity (the love lyric)

## GERST 406 Introduction to Medieval

 German Literature II \#Spring, 4 credits. Prerequisite: German 405 or equivalent. This is the anchor course for the medieval period.

## A. Groos.

Political lyrics by Walther von der Vogelweide will introduce agendas of conflict in thir-teenth-century German culture, ranging from crusades to civil war. Against this background, we will examine the utopian quest to win the Holy Grail and heal the Fisher King in Wolfram's Parzival, using Bakhtin's approach to pre-novelistic discourse. Readings from the love lyric trace representations to gender across emerging class differences, the increasing complexity of the self, and instabilities of the performance text. Concluding topics include women mystics and late medieval narratives of socio-sexual violence, anti-Semitism, and urban Angst.
[GERST 408 Twentieth-Century German Poetics (also Society for the Humanities 408)
Not offered 1994-95.]

## CERST 410 Senior Seminar: Opera and

 CultureFall. 4 credits. Taught in German. A. Groos.

This course is intended as an introduction to cultural and political issues in German operas of the last two centuries. We will begin with aspects of the Enlightenment in Schikaneder's and Mozart's Zauberflote, and their reception in Goethe's Zauberflote II. Subsequent topics will include problems such as responses to the French Revolution (Treitschke's and Beethoven's Fidelio), Romantic supernaturalism and subjectivity (Wagner's Fliegender Hollander), the transposition of German classicism into Italian Romanticism (Schillers's Kabale und liebe and Verdi's Luisa Miller), the construction of national identity (Wagner's Meistersinger), and fin-de-siecle sexual terror (Hofmannsthal's and Strauss's Elektra). The course will conclude with a modern opera such as Bachmann's and Henze's Der junge Lord. Musical training not required. Although reference will be made to music and musical structures, the main emphasis will be on libretti

## [GERST 416 Literary Translation in the West (also Comparative Literature 416) <br> Not offered 1994-95.]

## GERST 451-452 Independent Study

451, fall; 452, spring. $1-4$ credits each term Prerequisite: permission of instructor Hours to be arranged. Staff

GERST 472 Poetry of the 1990s (also Comparative Literature 472)
Fall. 4 credits
J. Monroe.

For description, see COM L 472

GERST 492 The Advance of Humanism: Aspects of the European Enlightenment (also Comparative Literature 492) \#
Spring. 4 credits. Knowledge of French and/ or German is recommended. German and French texts will be available in English translation. The class will be conducted in English.
P. U. Hohendahl

The seminar is designed for advanced undergraduates with a good background in European literature and/or intellectual history. The course will emphasize questions of secularization and modernization against the backdrop of recent theory (Horkheimer/ Adorno, Foucault, Blumenberg, and Habermas). The discussion will focus on concepts such as enlightenment, reason/ rationality, tolerance, criticism/critique, humanity, and progress. The readings will be taken from English, French, and German literature. The reading list will include Locke, Johnson, Fielding, Hume, Voltaire, Rousseau, Diderot, Lessing, Kant, Herder, and Goethe.
[GERST 496 Theorizing the Public Sphere (also Comparative Literature 496 and History 496)
Not offered 1994-95.]

## Seminars

Note: For complete descriptions of courses numbered 600 or above consult the appropriate instructor

## GERST 600 Special Topics in Feminist

 Theory (also Anthropology 600, Comparative Literature 600, and Women's Studies 600)Fall. 4 credits.
B. Martin and B. Povinelli.

The purpose of this course is to expose graduate students to interdisciplinary approaches in Women's Studies and feminist theory to a variety of topics or questions While many of our graduate courses train students in highly specialized areas of feminist theory, this course aims to teach students how to find common intellectual ground around a single topic from interdisciplinary perspectives without sacrificing the complexity of any disciplinary approach. The course is designed for graduate minors in Women's Studies and students with a specialized interest in feminist theory. Although it is not required, the course is strongly recommended for students obtaining a graduate minor in Women's Studies.

GERST 608 Modern/Postmodern (also Comparative Líterature 608)
Spring. 4 credits.
J. Monroe.

For description, see COM L 608
[GERST 621 Issues in Gay and Lesbian Studies (also Women's Studies 621) Not offered 1994-95.]

## [GERST 623 Seminar in Medieval

 German Literature INot offered 1994-95]
[GERST 626 Nuremberg
Not offered 1994-95.]

## [GERST 627 Baroque

Not offered 1994-95.
[GERST 629 The Enlightenment
Not offered 1994-95.]
[GERST 634 German Romanticism Not offered 1994-95.]

GERST 647 German Literature from 1945 to 1989: Questions of Modernity and Identity
Fall. 4 credits. Anchor course P. U. Hohendahl

This seminar/anchor course will focus on German literature during the period between 1945 and 1989. The goal of the course will be to trace major themes and styles in Germanspeaking literatures, east and west, in light of recent events. While individual texts will be examined within their specific historical (temporal, geopolitical, aesthetic) contexts, the course will also be organized around critical debates concerning such topics as minority, majority voices to challenge and change the canon; writing and social change; questions concerning a national cultural identity; the politics of modernity and postmodernity; etc. Readings will be taken from authors such as Böll, Andersch, Frisch, Grass, Walser, Koeppen, Dürrenmatt, Handke, C. Wolf Weiss, H. Müller, V. Braun, Enzensberger, Hein, and Morgner. The readings will also include critical writings and visual texts from the period.

## GERST 651 Exlle Literature

Spring. 4 credits. Anchor course. Taught in German.
L. M. Olschner.

The Nazi rise to power in 1933 forced many Germans and Austrians into exile around the globe. Lacking publishers and a proper readership, writers especially faced an historical situation with strongly existential dimensions. We will study exemplary aspects of exile in the selected literary works, journals, diaries, and correspondence of these authors as well as material such as radio broadcasts into Germany. The seminar will close with a brief examination of the belated institutional and critical reception of exile literature after the war.

## [GERST 652 Culture in Germany 1933-1945

Not offered 1994-95.]
GERST 653 Opera (also Comparative Literature 655 and Music 679) Spring. 4 credits
A. Groos.

This course will be devoted to aspects of operatic culture in the nineteenth and twentieth centuries, with an emphasis on libretti. I imagine the readings as divided into two parts. The first will introduce canonical operas and central issues in their interpretation and reception, e.g., Die Zauberfote, Macbeth or Otello, Tristan, Madama Butterfly, Elektra. The second part will be devoted to topics of student interest, which I hope will include issues such as politics and opera (e.g., protofascism in Rienzi, national identity in Die Meistersinger or Der Roland von Berlin, fascist opera in Germany and Italy, politics as opera in Nixon in China), issues in gender and sexuality (Carmen, Parsifal, Billy Budd). representations of madness and disease (La sonambula, La traviata, the two Bobemes, I medici), orientalism and occidentalism (La fanciulla del West), and opera as film (Traviata, Carmen, Parsifal) or theatre (M. Butterfly).

## GERST 661 After the City: From

 Metropolis to Electropolis (also Architecture 338/638 and Comparative Literature 661)
## Fall. 4 credits.

G. Waite and W. Goehner.

Urbanization of global reality fueled by expanding multinational corporations and the ubiquity of immaterial telecommunication is changing the face of our cities. The Metropolis no longer can serve as the exclusive site and standard of our experience of everyday life. Rather, it is rapidly being replaced and morphed into what we are calling
"Electropolis": the matrix of a late capitalist, post-civic information society. The interdisciplinary workshop/seminar will examine texts from E. A. Poe to Neal Stephenson and projects from Hilberseimer to Koolhaas.
[GERST 664 Late Nineteenth Century: Masochism, Externalization, and Identity Formation at the Fin de Siècle
Not offered 1994-95.]

## GERST 666 Ingeborg Bachmann

Fall. 4 credits.
I. Ezergailis.

A close reading of Bachmann's poetry, fiction, and essays, with an eye to textual and cultural context.

## [GERST 673 Franz Kafka and the Problem of "Minor" Literature (also Comparative Literature 673) <br> Not offered 1994-95.1

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[GERST 674 Contemporary Poetry and Culture: 1968-1993 (also Comparative Literature 674)
Not offered 1994-95.]
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[GERST 675 After the Divide: German Critical Theory of the Seventies and Eighties (also Comparative Literature 675 and History 675)
Not offered 1994-95.]

## [GERST 679 Bertolt Brecht in Context (also Comparative Literature 679 and Theatre Arts 679) <br> Not offered 1994-95.]

CERST 685 Gramsci and Cultural Politics (also Comparative Literature 685 and Government 675)
Spring. 4 credits.
G. Waite.

The modern transnational-capitalist state rules not only by domination and coercion but by the "noncoercive coercion" of cultural hegemony. What is the proper role of intellectuals (and who and what is an intellectual?) in cultural politics? How do the "leftist" cultural critics, theorists, and artists living under late capitalism relate as individuals and collectively to nascent socialist countries? What is the relationship of intellectuals to political parties? We will deal with the political and cultural writings of Antonio Gramsci-whether Gramsci is best understood as a "Western Marxist" or as an extension of Leninist "orthodoxy"-and with the response of critics, artists, and cultural practices to Gramsci's challenge: the neorealist film La Terra trema, Griffith's drama Occupations, the paintings of Cremonini, Fowles's novel Daniel Martin, Pasolini's poem cycle "Ashes for Gramsci." The mass-media analyses of Parenti (Inventing Reality) and Kukarkin (The Passing Age), the political philosophy of Laclau and Mouffe (Hegemony and the Socialist Strategy), the theory and
practice of "low-intensity conflict" as developed by the CIA and the NSC, and the cultural theories of Williams (Marxism and Literature) and Said (The World, the Text, and the Critic).

## [GERST 690 Feminist Criticism and

 Theory (also Women's Studies 690)Not offered 1994-95.]
[GERST 692 The Politics of Criticism (also Comparative Literature 692 and Theatre Arts 692)
Not offered 1994-95.]
[GERST 710 Research Methods in Medieval Literature
Not offered 1994-95.]

## GERST 753-754 Tutorial in German

 LiteratureFall and spring. $1-4$ credits per term.
Prerequisite: permission of instructor. Hours to be arranged. Staff.

## Related Courses in Other Departments

## Modern Languages and Linguistics

GERMAN 401 Introduction to Germanic Linguistics
Fall.
W. Harbert.

GERMAN 407 Teaching German as a Foreign Language
Fall.
Staff.

LING 635 Indo-European Workshop Fall.
J. H. Jasanoff

GOVT 342 The New Europe Spring.
P. Katzenstein.

HIST 363 European Cultural History Spring.
M. Steinberg.

HIST 379 Origins of World War I Spring.
I. Hull, W. Pintner, D. Baugh.

## GOVERNMENT

R. Herring, chair; B. R. O'G. Anderson, R. Bensel, M. G. Bernal, S. Buck-Morss, R. Bullock, V'. Bunce, T. Christensen, N. Hirschmann, M. Katzenstein,
P. Katzenstein, E. W. Kelley, J. Kirshner,
I. Kramnick, T. J. Lowi, W'. Mebane,
J. Pontusson. J. Rabkin, A. Rutten, E. Sanders, H. Schamis, L. Scheinman, M. Shefter, V. Shue, A. M. Smith, S. G. Tarrow, S. Telhami, N. T. Uphoff

Government is what Cornell calls a department that elsewhere might be termed political science. The focus of this discipline is power applied to public purposes. Some faculty concentrate on purposes, some on applications. Some engage in the close reading of great texts of political philosophy, while others analyze the behavior of power-wielders and publics in this and other societies. Government is divided into four subfields: U. S. politics, comparative politics (other nations), political theory (philosophy), and international relations (transactions between nations).

To accommodate new courses or course changes, a supplementary announcement is prepared by the department. Before enrolling in courses or registering each term, students are requested to consult the current supplement listing courses in government, available in 125 McGraw Hall.

## The Major

To be admitted to the major, a student must (1) pass three government courses, and (2) achieve a grade of at least a " $B$ " in two of those courses.

To complete the major, a student must (1) pass two of the introductory government courses (Government 111, 131 or 231, 161, 181 or 281 ); (2) pass an additional course in one of the remaining subfields (American government, comparative government, political theory, or international relations). This course may be any course offered in the government department, including introductory courses, upper-level courses or seminars; (3) accumulate an additional 24 credits of government course work at the 300 -level or above; (4) complete at least one seminar-style course in government which may be applied toward the 24 credits. These courses are typically numbered $400 . \mathrm{XX}$ and students are admitted by application only; (5) accumulate 16 credits in upper-level courses in related fields (such as anthropology, economics, history, psychology, and sociology). Upperlevel courses are usually courses numbered at the 300 -level or above. Students should consult with their major adviser to choose appropriate courses. All choices of related courses must be approved by the major adviser, the undergraduate adviser, or the director of undergraduate studies; (6) all courses used to fulfill a government major must be passed with a letter grade.
To summarize, a total of 9 government courses and 4 additional courses ( 16 credits) of upper-level related courses are required to complete the major.
Cornell-in-Washington Program. Government majors may apply to the Comell-inWashington program to take courses and undertake a closely supervised externship during a fall or spring semester.
Study Abroad in Geneva. French, history, and government majors, or other students with a commitment to international experience, may study abroad in Geneva, Switzerland. Geneva is an especially appropriate location for students with an interest in international affairs, as many international organizations maintain offices there, among them the United Nations, the Red Cross, the Headquarters of the World Health Organization, the International Labor Organization, the International Telecommunications Union, the World Intellectual Property Organization, the European Nuclear Research Center, and the Ecumenical Center at Grand-Saconnex. Cornell students enroll full-time in the University of Geneva and affiliated schools, including the Graduate School of International Studies (HEI) and the Development Studies Institute, where they take year-long courses, studying with Swiss and international students. They can choose classes in many subjects, including literature, economics and other social sciences, law, theology, psychology, education, architecture, physical education, and French language, civilization and history.

The University of Geneva offers four consecutive three-week language and civilization summer courses beginning in midJuly, which prepare students for the mandatory French exam given in early October. Cornell students must attend the last of these sessions, from mid-September to early October, but earlier sessions are recommended for students who need additional language preparation.

Interested students can participate in internships at international organizations, and qualified participants may be able to work under the direction of officials on research studies that are of mutual interest.
Students must be Cornell undergraduates with a strong academic record. The minimum French preparation is the completion of French 204 or 213 , or its equivalent in advanced credit or placement by the Cornell C.A.S.E. examination. Students should plan to study abroad for the entire academic year. Students interested in the study abroad program in Geneva should contact the Comell Abroad office ( 474 Uris) for further information.
European Studies Concentration. Government majors may elect to group some of their required and optional courses in the area of European studies, drawing from a wide variety of courses in relevant departments. Students are invited to consult Professors P. Katzenstein, Scheinman, and Tarrow for advice on course selection and foreign study programs.
Model European Community Simulation. Undergraduates with an interest in the European Community, public affairs, or debating may participate in the annual Modern European Community Simulation (SUNYMEC) held in April at SUNY Brockport. The simulation is an opportunity for participants, representing politicians from the member nations of the European Community, to discuss issues and resolutions of current concern to the EC.
To prepare for this simulation, a 2 -credit independent study seminar is offered each spring. Participation in the simulation will be open only to those who register for this seminar. Anyone interested in participating or in finding out more information should contact the Western Societies Program at 130 Uris Hall, 255-7592.
International Relations Concentration.
See the description under "Special Programs and Interdisciplinary Studies."
Honors. Each fall a small number of qualified seniors enter the honors program. To apply, junior majors submit applications in April. Along with a fuller description of the honors program, application forms are available in 125 McGraw Hall. The two courses comprising the honors sequence (honors courses) are described below.

## Introductory Courses

Students registering for introductory courses should register for the lecture only. Sections will be assigned during the first week of class. Introductory courses are also offered during summer session.
GOVT 111 Introduction to American Government and Politics
Spring and summer. 3 credits.
T. J. Lowi.

An introduction to government through the American experience. Concentration on analysis of the institutions of government and politics as mechanisms of social control.

## GOVT 161 Introduction to Political

 PhilosophyFall and summer. 3 credits.
I. Kramnick.

A survey of the development of Western political theory from Plato to the present. Readings from the works of the major theorists. An examination of the relevance of their ideas to contemporary politics.

## GOVT 181 Introduction to International Relations

Fall and summer. 3 credits.
S. Telhami.

An introduction to the basic concepts and practice of international politics.

## GOVT 231 Introduction to Comparative Government and Politics

Spring and summer. 4 credits.
M. Minkenberg.

This course provides a survey of the institutions, political processes, and policies of contemporary states. It focuses on the conditions for and workings of democracy. Looking at Westem Europe, we will analyze institutional variations among liberal democracies, and their political implications. We will then probe the origins of democracy in Western societies and the reasons why communism and other forms of authoritarian rule have prevailed elsewhere. Finally, we will explore the impetus behind and the obstacles to democratization in the Third World and the erstwhile Communist Bloc. Throughout this survey, problems of democracy will be related to problems of economic development, efficiency, and equality.

## Freshman Writing Seminars

## GOVT 100 Freshman Seminars

Fall, spring, or summer. 3 credits. Seminars will be offered in fall, spring, and summer terms. Consult the listings for the Freshman Seminar Program in the section "Special Programs and Interdisciplinary Studies," the supplement issued by the department, and the Freshman Seminar booklet for course
descriptions and instructors.

## Major Seminars

## GOVT 400 Major Seminars

Fall or spring. 4 credits.
These seminars, emphasizing important controversies in the discipline, cap the majors' experience. Thus preference in admission is given majors over nonmajors and seniors over juniors. Topics and instructors change each semester. To apply, students should pick up an application in 125 McGraw Hall during the course selection period the semester before the seminar is given.
The following courses are open to sophomores, juniors, and seniors without prerequisites unless otherwise indicated.

## American Government and Institutions

Government 111 is recommended.
GOVT 301 The Political Economy of American Industrialization
Spring. 4 credits.
R. Bensel.

This course is organized around three broad themes: American state expansion in the late nineteenth century, the political economy of class and regional conflict that shaped the party system and democratic politics generally, and the process of industrialization that propelled the United States into the front rank of the world economy by the turn of the century. The first part of the course stresses the importance of the Civil War and the coincident suppression of southern separatism to subsequent American political development and state formation. The second part of the course connects the national political economy and the central state established by the Civil War to the structure of the party system, operation of democratic institutions, and rapid industrialization during the last decades of the nineteenth century. Also included are comparison of Union and Confederate state formation during the Civil War, analysis of the political economy of cotton production, an examination of the role of finance capital in industrial expansion, and a consideration of possible developmental trajectories other than the high-tariff, goldstandard one actually followed by the United States.

## [GOVT 302 Social Movements in American Politics (also American Studies 302) <br> 4 credits. Not offered 1994-95.|

[GOVT 305 Atomic Consequences: The Incorporation of Nuclear Weapons in Postwar America (also S\&TS 350) 4 credits. Not offered 1994-95.1

## GOVT 309 Science in the American

 Polity (also S\&TS 390)Spring. 4 credits.
S. Jasanoff

How did American become a leading nation in scientific and technical research? This course charts the development of American science from its origins in gentlemanly societies in the early nineteenth century through the development of large-scale federally funded research or Big Science. Particular attention will be paid to the importance of government patronage in creating new social and intellectual spaces for research; the importance of medicine and the biomedical disciplines for the development of university-based research; the origins and expansion of research in corporations; and the role of war in the political economy of American sciences.

## GOVT 310 Power and Poverty in America

 Spring. 4 credits.
## E. W. Kelley.

Despite egalitarian democratic rights, the United States remains a stratified society conspicuous for great disparities in the allocation of income and wealth. The purpose of this class is to investigate these disparities, both empirically and normatively, and to assess the impact of government upon them. Topics for discussion will include: what do we mean by distributional inequality and by the demand for greater egalitarianism? What is the extent of inequality and of poverty in America today? How does one establish minimum standards for distributional justice? Is the United States currently on the road toward achieving that minimum standard? What is the array of federal welfare programs presently available and what is their effect? What reforms or changes are currently on the political agenda? Can we imagine a society
somewhat like that in the United States achieving a very different distribution of educational and occupational outcomes as described by race, income class, and language spoken by parents?

## [GOVT 311 Urban Politics

4 credits. Not offered 1994-95.]
GOVT 313 The Nature, Functions, and Limits of Law
Spring. 4 credits. Undergraduates only J. Siliciano.

A general education course for students at the sophomore and higher levels. Law is presented not as a body of rules but as a set of varied techniques for resolving conflicts and dealing with social problems. The roles of courts, legislatures, and administrative agencies in the legal process is analyzed, considering also the constitutional limits on their power and practical limits of their effectiveness. Assigned readings consist mainly of judicial and administrative decisions, statutes and rules, and commentaries on the legal process. Students are expected to read assigned materials before each class and to be prepared for participation in class discussion.
[GOVT 316 The American Presidency (also American Studies 316)
4 credits. Not offered 1994-95.]
[GOVT 317 Campaigns and Elections 4 credits. Not offered 1994-95.]

GOVT 318 The American Congress
Fall. 4 credits.
M. Shefter.

The role of Congress in the American political system. Topics to be discussed: the political setting within which Congress operates, the structure of Congress, the salient features of the legislative process, and recent congressional behavior in a number of policy areas

## GOVT 324 Legal Reasoning and Legal Adaptation: A Comparison of American and Talmudic Law

Fall. 4 credits.
J. Rabkin.

Legislatures may change old Jaws to reflect new preferences, but much American law is still adapted to modern challenges by judges invoking old precedents and principles, particularly in fields like family law, the law of contracts, and the law of torts. Talmudic law, which rests on much older principles and precepts and cannot fall back on new legislation to justify change in the modern world, must also be adapted to new circumstances. The rabbinic authorities who seek to apply this law often invoke similar kinds of reasoning as American courts but under peculiar constraints. This course, an unusual venture in comparative law, will focus on characteristic modes of reasoning in each system, rather than attempting any systematic surveys of legal outcomes. Readings will include selections from ancient texts as well as modern decisions and contemporary commentaries. No previous background is required.

## [GOVT 327 Civil Liberties in the United States <br> 4 credits. Not offered 1994-95.]

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[GOVT 328 Constitutional Politics: The United States Supreme Court
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4 credits. Not offered 1994-95.]

## GOVT 353 Feminism Movements and the

 State (also Women's Studies 353)Fall. 4 credits. Permission of the instructor only. Students seeking admission to the course must attend first class of the semester.
M. Katzenstein.

The course examines the aims and strategies of the feminist movement in the United States and the response of both society and the state to feminist claims. It is thus a course about political protest and the capacity of American political institutions to promote and shape as well as to counter social change. In examining the law and public policy on such issues as job discrimination, wife battery, rape. abortion, etc., the course explores the contradictions between, and the congruence of, the dual ideals of individual choice and group equality.
GOVT 401 Introduction to Science and Technology Policy (also S8TS 431)

## Fall. 4 credits.

H. Gottweis

Politicians, lobbyists, party strategists, social movements, and other political actors have an important influence on the development of science and technology. At the same time, scientific discourse and technological opportunities exert significant impact on politics. The course focuses on this dynamic interrelationship between science, technology, and politics. It provides an introduction to various theoretical approaches and concepts in science and technology policy studies and their application to empirical research. Students research teams will conduct case studies in fields such as technology policy, energy policy, environmental policy, and health policy. Geographically the emphasis will be on the U.S., but case studies on Canada, Japan, Europe, and Third World countries will also be included.
[GOVT 403 State and Economy in Comparative Perspective
4 credits. Not offered 1994-95.]

## [GOVT 404 American Political

 Development in the 20th Century 4 credits. Not offered 1994-95.J
## GOVT 405 Government and the Economy

 Spring. 4 credits.E. W. Kelley.

What would Adam Smith and Karl Marx consider the causes of such problems as stagflation, an unfavorable balance of trade, the threat of protectionism, the growth of massive public and private sector bureaucracies, and excessive government regulation? What suggestions would they make about remedies? How can we evaluate both their suggestions, and their evidence? Is representative democracy itself part of the problem? Can Woodrow Wilson, Thomas Jefferson, or Grant McConnell help us understand the effects of legislative behavior on economic transactions? This course will use selected works of Smith, Marx, Durkheim, Wilson, and more recent authors like Mancur Olson, Bendix, and McConnell. Substantive focus will be on classical political economy; the development of the state; the rise of professions, guilds. and labor unions; regulation and the increased delegation of public authority to private groups. Methodological focus will be on the ways of evaluating both discursive and quantitative evidence for the factual and causal claims of the authors read.

## [GOVT 406 Politics of Education

4 credits. Not offered 1994-95.]

## [GOVT 407 Law, Science, and Public Values (also S\&TS 407) <br> 4 credits. Not offered 1994-95.]

# GOVT 410/610 Democratic Theory and Institutions <br> 4 credits. Not offered 1994-95.1 

## [GOVT 412 Voting and Political Participation

4 credits. Not offered 1994-95.]

## [GOVT 413/613 Politics and Economics in Local Areas

4 credits. Not offered 1994-95.]
GOVT 427 The Politics of Environmental Protection in America (also S\&TS 427)

Fall. 4 credits
S. Jasanoff.

An introduction to the distinctive features of environmental protection in America, focusing particularly on the role of law, science, and citizen activism and public policymaking. Readings from law, political science, and policy analysis will examine the changing role of expert agencies, courts, public interest groups, Congress, and the states in environmental politics since the late 1960 s . Case studies of specific environmental controversies (nuclear power, siting, pesticides, endangered species) will be used to explore dominant public conceptions of risk and safety, regulatory costs and benefits, and the goals and instruments of environmental policy

## GOVT 428 Government and Public

 Policy: An Introduction to Analysis and CriticismFall. 4 credits
T. J. Lowi.

Government 428 concentrates on history and criticism of U.S. policies and the politics associated with them. Particular attention given to the origins and character of the regulatory state and the welfare state

## Comparative Government

Government 131 or 231 is recommended.
[GOVT 271 Introduction to African Development (also CRP 271 and ASRC 271)
3 credits. Not offered 1994-95.]
[GOVT 325 Eastern Europe
4 credits. Not offered 1994-95.]
[COVT 332 Modern European Politics 4 credits. Not offered 1994-95.]
[GOVT 333 Government and Politics of the Former Soviet Union
4 credits. Not offered 1994-95.]
[GOVT 335 America in the World 4 credits. Not offered 1994-95.]

GOVT 340 Latin American Politics Spring. 4 credits.
H. Schamis.

This is the introductory lecture course to the politics of Latin America. The main purpose is to view the region in a conceptual and comparative perspective. Country cases will be introduced to explain the significance of competing theoretical frameworks that have shaped the debate in the field. The class will focus on the political economies of the region to analyze the role of groups and classes
under different political regimes and contrasting strategies of development.

GOVT 342 The New Europe
Spring. 4 credits.
P. Katzenstein.

German unification in 1990 and the accelerating movement toward European integration have created new political conditions for our understanding of German and European politics. The end of the Cold War has brought forth old fears about the domination of Europe by an unpredictable German giant. Alternately, these changes have also fueled new hopes for Germany and Europe as models of political pluralism in a more peaceful and prosperous world. This course will thus reflect on two kinds of politics: the specter of the "Germanization" of Europe and the vision of the "Europeanization" of Germany.

## GOVT 344 Government and Politics of Southeast Asia

## Fall. 4 credits

B. Anderson

The course will focus on the comparative analysis of the nature and origins of political conflict in selected Southeast Asian nationstates. Particular attention will be given to nationalism/ethnicity, religion, and class, as well as to the differential impact of colonial rule.

## [GOVT 345 Modern European Politics

 4 credits. Not offered 1994-95.][GOVT 347 Government and Politice of China
4 credits. Not offered 1994-95.]

## GOVT 349 Political Role of the Military

 Spring. 4 credits.B. Anderson.

Comparative study of the political consequences of the global spread since the early nineteenth century, of professionally officered, industrially equipped militaries. Case studies of selected European, Asian, African, and American states will investigate the relationships of these militaries to nationalism, imperialism, technological innovation, and munitions industries, as well as class, ethnic, and religious conflict. Particular attention will be paid to the peculiarities of the modern military's organizational structure in shaping its political roles.
OOVT 350 Comparative Revolutions Spring. 4 credits.
S. Tarrow.

A comparative study of the great modern revolutions seen as social movements, from the French and American revolutions of the eighteenth century to the Russian and Chinese revolutions of the twentieth century, ending with a consideration of the recent "velvet" revolutions in Eastern Europe. Attention is given to the international context of internal political opportunity structures which turn revolt and rebellion into revolution.

## QOVT 351 India: Sacial and Economic

 Change in a Democratic PolitySpring. 4 credits.
M. Katzenstein

This course explores the social, economic, and political forces that have shaped India's development since independence. It considers why democratic political institutions in India have proved so resilient and what effect these institutions have on the economic and social policies that are pursued. The
mportance of international as well as domestic forces in shaping India's economic and political choices is also assessed.

## GOVT 354 America in the World

 EconomyFall. 4 credits.
P. Katzenstein.

Unemployed auto workers in Detroit and the wood stoves in New England signal an important change in America's relation to the world economy. This course characterizes these changes in a number of fields (trade, money, energy, technology), explains them as the result of the political choices of a declining imperial power that differs substantially for the choices of other states (Japan, Germany, Britain, France, the small European states, and Korea), and examines their consequences for America and international politics.

## GOVT 358 Modern History of the Middle East: Changing Politics, Society, and Ideas (also Near Eastern Studies 294)

Fall. 4 credits.
Staff.
This introductory course is designed to acquaint students with the main political, social, and cultural trends that have shaped the modern and contemporary history of the Middle East. While discussing developments in the region during the nineteenth and twentieth centuries, the lectures will focus on such themes as modernization, nationalism, Islamic response, and Arab politics in the global and regional contexts. The course does not presuppose the knowledge of Middle Eastern languages.

## GOVT 430 Democracy, Power, and Economic Reform

Spring. 4 credits
H. Schamis.

At a time of major political and economic reforms taking place in much of the Second and Third Worlds, and also in some of the First, fundamental questions about governance have been raised. The task before reformers is not limited to establishing a political system of individual rights and the rule of law, or of designing fair electoral systems and holding regular elections. It is also about establishing new forms of political power, or as Max Weber might put it, establishing new and effective systems of political domination. The reformers' need to carry out massive structural transformations has often implied centralizing authority, at the same time they are supposed to foster democracy. The dual challenge is thus one that much of the political development theory has tended to see as sequential rather than simultaneous: to centralize political power in order to carry out major socio-economic transformations, and to build democratic institutions which, by definition, disperse power. This seminar will examine these questions by focusing on some of the more important theoretical debates about the interrelationship between democracy and structural reform, the state and the economy, the crafting of order, and the creation of markets.

GOVT 433 Afrocentrism (also S HUM 402)

Fall. 4 credits.
M. Bernal.

The seminar will begin with a survey of African-American writings about African history from David Walker's Appeal in 1829 to
W.E.B. DuBois's The Negro (1915) and Black Folk Then and Now (1941). We shall then read from the works of "Afrocentrist" writers of history such as Chancellor Williams, Yosef ben-Jocchanen, and Cheikh Anta Diop as well as those of the sympathetic scholars St. Clair Drake and Shomarka Keita. After examining the heuristic utility of these writings we shall turn to Afrocentrism as a social, political, and pedagogical movement, reading the works of and meeting in person or on videos such figures as Molefi Ansante, Charles Finch, and Asa Hilliard and Leonard Jeffries. In this section, we shall be investigating the relationship of Afrocentrism to more directly political movements as well as the tensions between Afrocentrists and other Black intellectuals on the importance of the Nile Valley to African-Americans. The last section will consider Afrocentrism as a "bogey," discussing selections from the works of Arthur Schlesinger, Dinesh de Souza, Mary Lefkowitz and others.

## GOVT 435 Collective Action and Politics

 in Modern Europe (also History 435) Fall. 4 credits.S. Tarrow, S. Kaplan

This is an interdisciplinary seminar examining the causes, dynamics, and outcomes of social movements in modern and contemporary Europe and America. Ranging from the carnivalesque uprisings, grain seizures, and tax revolts of early modern Europe, to the revolutions of the late eighteenth century, to the ethnic, civil rights and women's collective action of recent years, these movements have deeply marked the development of contemporary states and societies. Cases will be drawn mainly from Western Europe and the United States, with ventures into Eastern Europe. Our ambition is to assess the ways in which popular politics both shaped and were shaped by the development of the modem state and economy.
[OOVT 436 Environmental Politics and Policy
4 credits. Not offered 1994-95.]

## [GOVT 443/643 Socialism and the Market

 in China4 credits. Not offered 1994-95.]
[QOVT 454 The Merodotean Moment: The Uses and Abuses of "Western Civilization" (also Comparatlve Literature 454, History 454)
4 credits. Not offered 1994-95.]

## [GOVT 458 Comparative Democratization

4 credits. Not offered 1994-95.]
[GOVT 459 Topics in Chinese Culture and Politics: Public/Private Spheres (also Society for the Humanities 419)

4 credits. Not offered 1994-95.]
[GOVT 468 Global and Domestic Dimensions of Science and Technology Policy (also SaTS 425) 4 credits. Not offered 1994-95.]

## Political Theory

Government 161 is recommended.
[GOVT 260 Social and Political Philosophy (also Philosophy 242) 4 credits. Not offered 1994-95.]

## [GOVT 361 Modern Ideologies: Liberalism and Its Critics <br> 4 credits. Not offered 1994-95.]

## GOVT 362 Politics of Sexuality (also

 Women's Studies 262)Fall. 4 credits.
A. M. Smith.

This course will serve as an introduction to lesbian, bisexual, and gay studies from a political theory perspective. In the first part of the course, we will examine Michel Foucault's conception of sexuality as a social construction that emerges as a socio-political problem only within specific historical conditions. We will turn to the historical research on sexual sub-cultures and the official regulation of sexuality that Foucault's work has inspired in the United States and Britain. In the final part of the course, we will discuss the current debates around activism and identity politics, with a specific emphasis on the links between sexuality and race.

## GOVT 364 The Selfish Individual and the Modern World

Spring. 4 credits.
N. Hirschmann.

Michael Milken and Ivan Boesky broke the law: but did they really do anything wrong? Is acting selfishly simply human nature, or is it perversion? Do we have natural obligations to others, or is everyone out for themselves? This course will consider these questions through the lens of modern political theory from Hobbes to contemporary times. We will consider the relation of the individual to society to examine different understandings of "the individual," and how they change over time. In the process, we will examine how these understandings affect the meaning of concepts such as freedom, equality, and justice, as well as the form and role of govermment. This course will follow a seminar format and rely heavily on class discussion. Enrollment limited.
[GOVT 368 Global Climate and Global Justice (also Philosophy 368)
4 credits. Not offered 1994-95.]
GOVT 369 Introduction to Feminist Political Thought (also Women's Studies 269)
Fall. 4 credits.
N. Hirschmann.

This course will provide a general introduction to feminist political thought, surveying various current issues and methodologies. The course will combine analysis of women in western political thought and the relationship of feminism to the discipline of political science; readings by contemporary feminist theorists; and consideration of what theory can contribute to practical issues such as battering, pornography, prostitution, racism, sexuality, and sexual harassment.
GOVT 370 Political Theory and Cinema (also German Studies 330)
Fall. 4 credits.
G. Waite.

This course provides an introduction to some fundamentals of current film analysis and political theory, and their relationship to one another. Our investigation has two main aspects. On the one hand, we will be interested in the work of film-makers who have been particularly concerned to reshape ideas about politics in the cinematographic medium. On the other, we will attempt to develop a way of reading political theory using techniques borrowed from cinema and
vice versa-thus forging between these two disciplines productive analogies that are not necessarily based on influence. We will study not only mainstream but also experimental and low-budget films; similarly, we will find political theory in obscure places, as well as more obvious ones. While the course has a historical perspective, the main emphasis will be on contemporary work. Our texts/films will be taken from the work of such thinkers/ film-makers as: P. P. Pasolini, J.-L. Godard, S. Eisenstein, D. Vertov, G. Romero,
R. Comman, M. von Trotte, D. Cronenberg,
T. W. Adorno, W. Wenders, R. W. Fassbinder,
A. Kluge, P. K. Dick, W. Benjamin,
G. Deleuze, M. Gorris, K. Tahimik, L. Strauss, K. Marx, J. G. Fichte, L. Althusser, R. Scott, L. Bunuel, A. Gramsci.

## GOVT 375 Visual Culture and Social Theory (also Art History 370, Comp. Lit. 368)

Spring. 4 credits.
S. Buck-Morss, H. Foster.

Introduction to critical concepts for the analysis of visual culture in specific sociohistorical contexts.

## [GOVT 376 Rethinking Marx

4 credits. Not offered 1994-95.]

## GOVT 377 Concepts of Race and Racism

 Spring. 4 credits. A. M. Smith.This course will examine the contributions of British theorists to the study of race and racism. I have also included a small selection of the texts by non-British authors-Fanon, Said, and Spivak-which have greatly influenced various British writers. Readings will be drawn from a wide range of sources: Weberian social theory, Marxist and postMarxist political theory, political debates on slavery, historians' debates on the significance of the empire for the British "masses," the "new racism" thesis, analyses of Powellism and Thatcherism, and critical approaches to the representation of race by black lesbians and gays, black feminists, and anti-racist activists.

## GOVT 462 Modern Political Philosophy (also Philosophy 346) <br> Fall. 4 credits.

R. Miller.

A study of the leading contemporary theories of justice, including the work of Rawls, Nozick, and Gauthier. We will consider the different treatment in each theory of equality, liberty and the general welfare, the different conceptions of morality on which each is grounded, and the consequences of each for current political controversies.

## [GOVT 463 Politics of Contemporary Feminist Theory <br> 4 credits. Not offered 1994-95.]

GOVT 466 Feminism and Gender Discrimination
Spring. 4 credits.
K. Abrams.

This course will introduce students to the major schools of feminist legal theory, including equality theory, difference theory, dominance theory, and essentialism. It will then use these theories as a framework for examining several areas in which the law has attempted to address gender-specific injuries. These will include the workplace (sexual harassment, regulation of fertility, work/family conflict, the family (abortion, surrogacy), and
violence against women (rape, spousal abuse, pornography). The course will emphasize analysis and critique of present political and legal responses and formulation of alternative responses. Some previous exposure to legal materials (case law, statues) is useful but not required.

## GOVT 467 Eurocentriam (also S HUM

 415)Spring. 4 credits.
M. Bernal.

The seminar will consider both "hard core" Eurocentrism, the thought and pedagogical tactics of those who believe that only Europeans could have created "Western Civilization" and the "soft core" variety held by those who maintain that only Europeans happen to have created its worthwhile qualities. It will begin with a historical survey of the emergence and development of the linked concepts of Europe and Christendom in the wake of the triumph of Islam. It will focus on the importance to these concepts of the "other" both in reality and as a projection of feared aspects of the "self." These will be seen in the writings and speeches of selfconscious imperialists and modern conservatives as well as in the analytical works of Edward Said, Tzvetan Todorov, and Samir Amin and their critics. There will also be consideration of the work of such "New Eurocentrists" as Ernst Gellner and Michael Mann. Finally, we shall look at attempts to transcend the arguments in the recent works of Henry Louis Gates and Comel West.

## GOVT 468 Global and Domestic Dimensions of Science and Technology Policy <br> Spring. 4 credits.

H. Gottweis.

This course examines the global/domestic interface of contemporary science and technology policy. The development of science and technology is increasingly shaped by national as well as transnational forces, such as strategic alliances between companies and supranational institutions like the European Community. Furthermore, many scientific and technological projects, such as the damming of rivers in India or nuclear power generation in the United State, encounter social resistance on a regional level. Is a coherent national science and technology policy possible in this field of apparently centrifugal forces? What values and "philosophies" could guide a socially responsible science and technology policy in the postCold War era? These questions will be at the center of the course. We will approach the normative questions by looking at the evolution of science and technology policy in a comparative perspective covering the U.S., Japan, Europe, and various Third World countries.
GOVT 469 Limiting War (also Philosophy 369)

Fall. 4 credits.

> H. Shue.

Modern states employ or threaten violence in several forms. This course critically examines the best arguments about limiting or prohibiting various contemporary methods of fighting, or otherwise coercing, one's enemies, arguments with conclusions ranging from pacifism to "realism." Have traditional doctrines of just war been overtaken by recent events and technologies, or is it possible to provide a reasonable justification for limiting the means or ends of future wars? In 1994 the
course focuses on two extended case-studies: nuclear weapons in the post-Cold-War world and the conduct of the Gulf War against Iraq in 1991. Discussion section to be arranged.

## International Relations

Government 181 or 281 is recommended.

## GOVT 380 The Politics of German Unification

Fall. 4 credits. M. Minkenberg.

The breakdown of the Cold War order and German unification in 1990 have produced a new phase in German and European politics. The return of the German nation-state coincided with the collapse of the Soviet hegemony in Eastern Europe and the broadening of the European integration process. This course will focus on the continuity and changes in the interaction between German and European politics. It will specifically elaborate the historical role of the national question in German politics and beyond; the international and domestic factors shaping the process of German unification in 1980/90; the impact of unification on the democratization and Westernization processes of the Bonn Republic; and the interaction of the New Germany with its European environment (European integration, Eastern Europe, immigration). In the end, students should be able to thoroughly understand the viability of and the challenges to democracy in Germany as well as the prospects for a hegemonic or dominant role of the New Germany in a changing Europe

## [GOVT 381 The Politics of Defense Spending

4 credits. Not offered 1994-95.]

## GOVT 382 International Relations of East Asia

Spring. 4 credits.
T. Christensen.

This open lecture class is offered as an alternative to Government 482, a limitedenrollment, advanced seminar with the same title. The course will discuss Japanese imperialism in the 1930s, the Cold War in Asia, and regional affairs in the post-Cold War era. The lectures will present and test competing explanations for the behavior of the great powers and local actors in the region. We will analyze the links between the security and economic components of foreign relations. We will also analyze how regional subsystems influence each other by exploring the connections between the Cold War in Europe and the Cold War in East Asia. The course will conclude with a discussion of how the demise of the Soviet Union and the rise of China may alter future regional dynamics. This course is open to all undergraduates except those who have taken or intend to take Government 482. Graduate students must obtain the instructor's permission to attend this class.
[GOVT 383 Theories of International Relations
4 credits. Not offered 1994-95.]

## [GOVT 384 War and Peace in the Nuclear

 Age (also Physics 206)4 credits. Not offered 1994-95.]

## [GOVT 385 American Foreign Policy

4 credits. Not offered 1994-95.]

## GOVT 388 International Political Economy

Spring. 4 credits.
J. Kirshner

This course examines the politics of international political economic relations. It will draw on the history of the modern international economy and explore the theories that have been used to explain its evolution. The goals of the course are to gain insights into contemporary issues and to understand how scholars of international relations and economics describe and explain problems in the global economy.

## GOVT 389 International Law

Spring. 4 credits.
J. Rabkin.

Characteristics of international law; its
theoretical foundations, principles, processes, and relationship to international politics. Emphasis on law-in-action. Attention to both traditional problems (intervention, coercion, and the scope and limits of adjudication) and contemporary trends and processes (arms control, outer space, exploitation of seabed resources, the individual in international law, and cooperative patterns of socioeconomic relations at global and regional level). Content may vary according to international events.

## GOVT 391 Chinese Foreign Policy

Fall. 4 credits.
T. Christensen.

This undergraduate lecture course will review and analyze the foreign policy of the People's Republic of China from 1949 to the present. Lectures will discuss the Cold War history of Beijing's relations with the Soviet Union, the United States, Southeast Asia, and the Third World. Various theories of foreign policy will be discussed as potential tools for understanding Chinese foreign policy behavior. The class will conclude with a discussion of the future of Chinese foreign policy in light of the end of the Cold War, changes in the Chinese economy and the post-Tiananmen legitimacy crisis in Beijing.

## [GOVT 392 International Relations of the Middle East <br> 4 credits. Not offered 1994-95.]

## GOVT 393 Introduction to Peace Studies

## Fall. 4 credits.

J. Reppy, R. Williams.

This course serves as an introduction to the study of war, peace, and peacemaking. We will study different theories of peace and war from a variety of disciplinary perspectives. The course will cover definitions of peace and war, causes of conflict, and modes of conflict prevention and resolution. The concepts will be applied to a range of historical and current conflicts. Students will prepare analyses of specific conflicts or instances of peacemaking for class presentation.

## [GOVT 396 The Past as Prelude? (also History 352) <br> 4 credits. Not offered 1994-95.]

[GOVT 397 The United States and Russia 4 credits. Not offered 1994-95.]

## GOVT 398 North-South Relations

Fall. 4 credits.
J. Kirshner.

This course examines the relations between rich and poor states in the international system. After an initial overview of theory and history, it focuses on issue areas such as
trade and financial relations, specific regional issues, and contemporary problems. The
course emphasizes both international relations and the politics of economic development in the context of the international economic system.
[GOVT 399 International Relations of the Former Soviet Union
4 credits. Not offered 1994-95.]
[GOVT 475 Topics in International Political Economy: Money and Finance
4 credits. Not offered 1994-95.]
[GOVT 478/681 Accumulation on a World Scale
4 credits. Not offered 1994-95.]
[GOVT 482 International Relations of East Asia
4 credits. Not offered 1994-95.]
GOVT 483 The Military and New Technology
Fall. 4 credits.
J. Reppy.

In conventional wisdom, military organizations are seen paradoxically both as inflexible institutions and as proponents and consumers of rapid technological change. In this seminar we will examine changes over time in the attitude of the military toward new technology and analyze competing explanations for these changes. Readings will include Michael Howard, War and European History; John Ellis, The Social History of the Macbine Gun; and Donald MacKenzie, Inventing Accuracy: An Historical Sociology of Nuclear Missile Guidance.
[GOVT 489 International Law and Regime Development
4 credits. Not offered 1994-95.]
[GOVT 491 Conflict, Cooperation, and Norm: Ethical Issues in International Affairs
4 credits. Not offered 1994-95.]

## Honors Courses

Each April a limited number of junior majors are admitted to the honors program, their work to begin the following fall. Application forms and a full description of the program may be obtained in 125 McGraw Hall.

## GOVT 494 Honors Seminar: Thesis

 Clarification and ResearchFall. 4 credits.

## Staff.

Each student works individually with a faculty member. The student initiates the tutorial by interesting a faculty member in his or her likely thesis project and by submitting to the director of undergraduate studies a form outlining the general area the thesis will treat and bearing the faculty tutor's signature. This form is due the third week of classes. The tutorial culminates in a ten-to-fifteen-page paper setting forth the central questions to be addressed by the thesis, the state of existing knowledge regarding those questions, and why they matter.
GOVT 495 Honors Thesis: Research and Writing
Spring. 4 credits. Limited to students who have successfully completed Government 494 Staff.
Students continue the work of the preceding semester typically with the same faculty tutor.

Research on the thesis is completed and writing begun. The tutorial culminates in a thesis of some sixty to eighty pages. The grade for the tutorial is determined by the faculty tutor, while the degree of honors (if any) awarded the thesis is decided by a committee of faculty members established for that purpose.

## Independent Study

Independent study, Government 499, is a one-on-one tutorial which is arranged by the student with a faculty member of their choosing. Government 499 is open to government majors doing superior work, and it is the responsibility of the student to establish the research proposal and to find a faculty sponsor. Applicants for independent study must present a well-defined program of study that cannot be satisfied by pursuing courses in the regularly scheduled curriculum. No more than 4 credits of independent study may count toward fulfillment of the major. Students who elect to continue taking this course for more than one semester must select a new theme or subject each semester. Credit can be given only for work that results in a satisfactory amount of writing. Emphasis is on the capacity to subject a body of related readings to analysis and criticism. Keep in mind that independent study cannot be used to fulfill the seminar requirement. The application form for Independent Study is available in 125 McGraw Hall and must be completed at the beginning of the semester in which the course is being taken.

## GOVT 499 Readings Fall or spring.

Fall or spring, $1-4$ credits.
Staff.

## Graduate Seminars

Qualified undergraduates are encouraged to apply for seminars listed with 600 course numbers but may only register with the permission of the instructor. Students may consult the supplement that lists graduate courses, available in the department office.

## Field Seminars

GOVT 601 Scope and Methods of Political Analysis
Fall. 4 credits.
W. Mebane

This course introduces the major analytical approaches used in contemporary political science research. We touch on broad philosophical issues concerning the nature of theory and inference, the practices of cultural and historical interpretation, and the relevance of moral values and political commitments. Several kinds of research designs, including comparative case study and quasi-experimentation, are briefly examined. The basic analytical ideas involved in statistical methods such as sampling and regression analysis are introduced, as are the basic concepts of the theory of collective choice and the elementary methods of applied game theory.

## [GOVT 602 Field Seminar in Political Methodology

4 credits. Not offered 1994-95.]
GOVT 603 Field Seminar in American Politics
Fall. 4 credits.
J. Rabkin, M. Shefter

The basic issues and institutions of American government and the various subfields of

American politics are introduced. The focus is on substantive information and theoretical analysis and problems of teaching and research.

## GOVT 605 Field Seminar in Comparative Politics

Spring. 4 credits.
J. Pontusson.

An introduction to selected theoretical problems in the study of comparative politics and to their application in empirical analysis. Basic problems are social class and politics, authority and legitimacy, participation and mobilization, economic development and democracy, authoritarian and totalitarian politics, corporatism and pluralism, and nation building and political integration.

## GOVT 606 Field Seminar in International Relations

## Fall. 4 credits

P. Katzenstein, T. Christensen.

A general survey of the literature and propositions of the international relations field. Criteria are developed for judging theoretical propositions and are applied to the major findings. Participants will be expected to do extensive reading in the literature as well as research.

## [GOVT 607 The Western Political Tradition: A Survey

4 credits. Not offered 1994-95.]

## GOVT 608 Normative and Interpretive

 MethodologiesSpring. 4 credits.
A. M. Smith and staff.

This course will present various normative and interpretive methodological approaches to issues in political science. Though the specific focus of the course will vary depending on the interests of the instructor, the general orientation of the seminar will be to expose students to the role of hermeneutic techniques and qualitative criticism in political analysis. This course will fulfill departmental requirements for the second methodology course. Topic for 1995: Approaches to Ideology.

## American Government and Institutions

[GOVT 610/410 Democratic Theory and Institutions
4 credits. Not offered 1994-95.]
[GOVT 611 The Political Economy of American Development I
4 credits. Not offered 1994-95.]
[GOVT 612 American Political Development II: Social Movements and State Expansion in the Twentieth Century
4 credits. Not offered $1994-95$.
[GOVT 613 Politics and Economics in Local Areas
4 credits. Not offered 1994-95.]

## GOVT 618 Feminist Jurisprudence

 Spring. 4 credits.K. Abrams.

This course will examine the role of law, and more generally, the role of the state, in perpetuating and remedying women's oppression. We will study several paradigmatic feminist legal theories, including equality, difference, dominance and various anti-essentialist theories (e.g., intersectional, post-structuralist). Among the questions we will consider will be: How does the law help
to construct gender? In what ways does it interact with cultural images and assumptions regarding women to perpetuate women's oppression? To what extent can a set of institutions implicated in women's oppression be used to remedy it? Can a legal system predicated on the liberal assumptions of a unitary, pre-political, autonomous self accommodate feminist accounts of social construction, constrained "choice" or decentered subjects? What methods have feminists used to argue in and about the law, and do these methods themselves have the potential to transform legal thinking? Although we will consider a number of practical applications (spousal abuse, pornography, fertility and the workplace), the course will be more theoretical in its orientation than Government 466. Among the theorists studies will be Richard Wasserstrom, Christine Littleton, Robin West, Joan Williams, Catharine MacKinnon, Patricia Williams, Martha Mahoney, Angela Harris, William Eskridge, Janet Halley, Zillah Eisenstein, Vicki Schultz, and Katherine Bartlett.

## GOVT 619 Social Movements, the State, and Public Policy

Fall. 4 credits.
T. J. Lowi, E. Sanders.

This course will examine the interaction of social movements and the American state. Focus will be on the policy process and outcomes, as well as the impact of social movements on state structure and vice versa

GOVT 620 The United States Congress Spring. 4 credits.
R. Bensel.

The United States Congress will be examined: first, as a "closed system" in which institutional arrangements decisively apportion political power; and, second, as the product of electoral and social forces outside the institution. Emphasis will be placed on the historical relationship between institutional growth and state formation, parliamentary rules as both arrangements within which the "rational choices" of legislators are played out and as deliberate, constructions and allocations of political influence, and the use of legislative behavior as evidence in the analysis of fundamental principles of politics. Because the literature on the lower chamber is generally more rich, the House of Representatives will receive greater attention than the Senate.
[GOVT 622 The Political Economy of American Development
4 credits. Not offered 1994-95.]
[GOVT 624 American Political Organizations, Institutions, and Party Systems
4 credits. Not offered 1994-95.]
[GOVT 641 Anarchy, State, and Social Order
4 credits. Not offered 1994-95.]

## Public Policy

[GOVT 626 Workshop on Law, Science and Technology (also s8TS 626)
4 credits. Not offered 1994-95.]
[GOVT 628 Politics of Technical Decisions I (also City and Regional Planning 541, Science and Technology Studies 415)
4 credits. Not offered 1994-95.]

Comparative Government
GOVT 630 Labor, Free Trade, and Economic Integration in the Americas (also ILR 638)
Fall. 4 credits. Limited to 20 students. M. Cook

This course explores the effects of the contemporary movement toward free trade and regional economic integration on the societies, economies, and political systems of countries in North and South America, with special focus on labor. The course will pay particular attention to the origins and implications of the North American Free Trade Agreement (NAFTA) but will also look at integration schemes in South America (Andean pact and Mercosur), Europe (for comparison), and at hemisphere-wide initiatives. We will examine the free trade issue from a variety of perspectives, both favorable and critical, and we will adopt a broad understanding of regional integration, one that also encompasses a host of non-trade issues. We will also seek to understand the recent reorientation of many Latin American economies within the historical context of Latin American development strategies and constraints
[GOVT 631 Comparative Labor
Movements in Latin America (also ILR 631)
4 credits. Not offered 1994-95.]

## GOVT 633 European Party Systems and Political Change

Spring. 4 credits.
M. Minkenberg, S. Tarrow.

This course is an analysis of West European party systems and major changes in voting behavior with a particular emphasis on the (re)emergence of far right parties in the 1980s and 1990s. The course is organized in two parts. First, there will be a discussion of various concepts and approaches to the study of party systems and electoral change (cleavage theory, realignment, value change, etc.). Second, with the help of these theoretical instruments, the rise of new (or old) far right parties and their effect on the party systems in Western Europe will be analyzed in several case studies.

## GOVT 634 Genetic Engineering: Politics and Society in Comparative Perspective (also S\&TS 645)

Spring. 4 credits.
H. Gottweis.

Today genetic engineering is a standard technology used in many laboratories throughout the world. Since its development, however, genetic engineering has been a passionately debated technology, creating high hopes for some and deep anxieties for others. This course will trace the conflicts and power struggles over genetic engineering from its origins to the present. We will use genetic engineering as a case to discuss some crucial issues in the relationships between science, technology, and politics: the political shaping of modern biology; the relationship between eugenics and molecular biology; the regulation of risks; the state and modern biotechnology; university-industry relationships; agriculture and biotechnology; the rise of bioethics; social movements, Green parties and technology; the socioeconomic impacts of genetic engineering; the Third World and biotechnology. We will discuss how modern sociery deals with high-risk/high-impact technologies and explore the question of adequacy of the political-legal framework of

## contemporary "risk-society."

## [GOVT 643/443 Socialism and the Market in China <br> 4 credits. Not offered 1994-95.]

GOVT 644 Sociotechnical Aspects of Irrigation (also Agricultural Economics 754, Agricultural Engineering 754, and Rural Sociology 754)
Spring. 4 credits.
N. Uphoff.

Examines irrigated agriculture and its relation to agricultural development. Emphasis on social processes within irrigation systems and interactions with the social setting, including political and administrative aspects. Provides an opportunity to examine systematically the institutional and organizational policy issues associated with the design and operation of systems of irrigated agriculture in developing countries.
[GOVT 645 Chinese Politics
4 credits. Not offered 1994-95.]
[GOVT 647 Political Anthropology: Southeast Asia
4 credits. Not offered 1994-95.]
[OOVT 648 Political Economy of Change: Rural Development in the Third World
4 credits. Not offered 1994-95.]
[GOVT 649 Agrarian Political Economy: Land, Labor, and Nature
4 credits. Not offered 1994-95.]
[GOVT 652 Southeast Asia Seminar: The Philippines (also Asian Studies 601)
4 credits. Not offered 1994-95.]

## GOVT 653 The Plural Society Revisited

 (also Asian Studies 607)Fall. 4 credits.
B. Anderson

John Furnivall's concept, invented 40 years ago, posited colonial society as one in which race (and ethnicity), class, occupation, and residence were distributed more or less isomorphically. The seminar will review the utility of the concept in the light of subsequent research on colonial Southeast Asia and its applicability to developments since the achieving of independence. It will also consider the relevance of the concept to (uncolonized) modern Thailand. The core problematic will be the relationship between classification (naming) and power.

## [GOVT 656 Comparative Political

 Economy4 credits. Not offered 1994-95.]
[GOVT 657 Comparative Democratization
4 credits. Not offered 1994-95.]

## GOVT 660 Social Movements and Politics

Fall. 4 credits.
S. Tarrow.

This is a research seminar on the relationships among politics, organized social movements, and periods of mass mobilization like those that swept through Western Europe and the U.S. in the 1960s and in Eastern and Central Europe today. The course begins with a theoretical introduction to major approaches to social movements and collective action, concentrating on the factors that induce masses of people to adopt disruptive forms of collective action. It moves from there to a
historical section focusing on cycles of protest in the recent and not-so-recent past. It continues with case materials that illustrate a series of theoretical problems in the study of movements and collective action-particularly that of the relations between protest and reform. Students will write term papers on particular cycles of protest and reform.
GOVT 692 The Administration of Agricultural and Rural Development Spring. 4 credits. N. T. Uphoff The political, bureaucratic, economic. and technical environments of administration for agricultural and rural development; the various functions involved in administration (personnel management, planning, budgeting, economic analysis, information systems); several major tasks (research, extension services, and infrastructure development); and specific problems of integrating activities, interfacing with rural populations, and utilizing external assistance. Intended primarily for persons who expect to have some future responsibilities in agricultural or rural development administration and Third World countries.

## Political Theory

GOVT 663 Political Theories of Power Fall. 4 credits.
A. M. Smith

Questions around power and power relations emerge in virtually every aspect of political science, and yet these terms are often used in quite loosely defined ways. This seminar will focus on some of the major approaches to power in political theory. For the fall semester, we will focus on Machiavelli, Hobbes, Gramsci, Nietzsche, and Foucault. The seminar will be structured as a reading course in the political theory field with a compulsory final examination

## [GOVT 664 Contemporary Democratic Theory <br> 4 credits. Not offered 1994-95.]

[GOVT 665 American Political Thought: From Madison to Malcolm X
4 credits. Not offered 1994-95.]

## [GOVT 667 Major Figures in Modern Political Theory I

4 credits. Not offered 1994-95.]

## [GOVT 668 Major Figures in Modern Political Theory II <br> 4 credits. Not offered 1994-95.]

[GOVT 669 Modern Social Theory I 4 credits. Not offered 1994-95.]
[GOVT 670 Modern Social Theory II 4 credits. Not offered 1994-95.]
GOVT 671 Graduate Seminar in Feminist Political Theory
Spring. 4 credits.
N. Hirschmann.

This graduate seminar will examine contemporary feminist theory from the perspective of political theory. We will study the work of feminist theorists who work specifically within the discipline of political science, as well as the specifically political dimensions of work not generally considered political theory. Though particular readings and topics will change from year to year in response to the most recent literature, in general the course will focus on questions of epistemology and methodology as a way to explore a variety of
issues of relevance to feminism as an academic, intellectual, and political enterprise. The course is open to undergraduates who have taken Government 463 or other courses in feminist theory, with permission of the instructor

## GOVT 672 Theories and Policies of Feminist lssues

Fall. 4 credits.
M. Katzenstein, N. Hirschmann This course will explore the intersections of theory and policy in feminist scholarship through the lense of several issues of key importance in contemporary feminist politics. The course takes as its foundation the premise that most feminist issues need to be approached from a multidisciplinary perspective to be understood fully, and that feminist theory and policy are integrally related to one another. In 1994, focusing on such issues as domestic violence, pomography, welfare, and the military, we will approach each of these issues from a variety of theoretical and empirical perspectives to understand both the political and theoretical underpinnings of existing policy as well as the political and theoretical implications of various feminist suggestions for policy change,

## [GOVT 673 Republicanism and

## Liberalism

4 credits. Not offered 1994-95.]

## GOVT 674 Theory and Practice of Nationalism

Spring. 4 credits.
S. Buck-Morss, B. Anderson.

This course will be devoted to the comparative study of the rise and transformation of nationalism according to different theoretical and philosophical traditions. The relationship of nationalism to questions of race, gender, class, and time will also be discussed on the basis of both theoretical and empirical studies.

## GOVT 675 Gramsci and Cultural Politics

 (also German Literature 685]Spring. 4 credits.
See German Studies for description

## International Relations

[GOVT 681/478 Accumulation on a World Scale
4 credits. Not offered 1994-95.]
[GOVT 683 Foreign Policy Analysis
4 credits. Not offered 1994-95.]

## GOVT 685 International Political Economy

Spring. 4 credits.
J. Kirshner.

An exploration into a range of contemporary theories and research topics in the field of international political economy. The seminar will cover different theoretical perspectives and a number of substantive problems.

## [GOVT 686 International Strategy

4 credits. Not offered 1994-95.]

## GOVT 687 International Environmental Policy (also S\&TS 688)

Spring. 4 credits.
S. Jasanoff.

This course examines the emergence of the environment as an important item on the political agendas of nations and the evolution of national and international policy responses to the environmental issues. Analytically, the course attempts to define the distinctive
characteristics of environmental policy and politics in our time and to identify the factors that promote convergences and divergences among different national approaches to the same environmental problems. The international, embracing developing as well as industrialized countries. Particular attention is given to the role of legal institutions, processes, and instruments in the resolution of environmental controversies. Among the specific issues to be considered are chemical control, risk communication, export of hazards, stratospheric ozone depletion, and global climate change.

## GOVT 688 Political Economy and National Security

Fall. 4 credits.
J. Kirshner.

This seminar considers the relationship between economics and national security. Specific topics will change from year to year but will typically include the following: the economic foundations of power, economic coercion, the economic roots of conflict, and the ways in which structural changes in the international economy shape and limit state authority.
GOVT 689 International Security Politics Fall. 4 credits.
P. Katzenstein.

Course will examine a variety of international relations theories in studying a broad range of security issues, including the causes of war, alliance formation, balance-of-power politics, security regimes, nuclear and conventional deterrence, and core-periphery relations.
GOVT 691 Normative Elements of International Relations
Fall. 4 credits.
H. Shue.

We examine selected normative elements of international affairs, divided into three interlocking clusters. First are issues about conflict, including both low-intensity military intervention and nuclear weapons. Second are questions about cooperation, especially between rich nations and poor nations. Third are debates about the authority and status of the major players in the international system: individual persons, nation-states, and international regimes. Questions include: Is the retention by some nations of nuclear weapons morally justified? Is the world economy unjust? Should national governments be pressured to respect individual human rights?

## Independent Study

This course is NOT open to undergraduates. Undergraduates wishing to conduct supervised study should register for Government 499.

## GOVT 799 Independent Study

Fall or spring. 4 credits.
Staff.
Government 799 is a course of individualized readings and research for graduate students. Topics, readings, and writing requirements will be designed through consultation between the student and the instructor. Graduate students in government who are looking to use this as an option to fulfill their course requirements should check with their chairs to be certain that the program of study is acceptable for this purpose. Applications must be completed and signed by the instructor and by the chairs of their special
committees. They are available from, and must be returned to, the graduate secretary in 125 McGraw Hall.

## GREEK

See Department of Classics.

## HEBREW

See Department of Near Eastem Studies.

## HINDI-URDU

See Modern Languages and Linguistics.

## HISTORY

I. Hull, chair, W. M. Pintner, graduate faculty representative; D. A. Baugh, director of undergraduate studies; G. C. Altschuler, S. Blumin, T. Borstelmann, S. Cochran, P. R. Dear, P. R. Hyams, J. J. John, C. Kammen, M. Kammen, S. L. Kaplan, N. Karwan Cutting, J. V. Koschmann, D. C. LaCapra, W. F. LaFeber, R. L. Moore, J. M. Najemy, M. B. Norton, G. Okihiro, C. Peterson, J. R. Piggott, R. Polenberg, W. B. Provine, M. Roldān, T. Shiraishi, J. H. Silbey, M. Steinberg, B. Strauss, D. Usner, M. Washington, R. Weil, J. H. Weiss, D. Wyatt

Emeritus: K. Biggerstaff, E. W. Fox, P. W. Gates, F. Somkin, B. Tiemey, O. W. Wolters

The popularity of history among Cornell students is due to its usefulness as preparation for graduate, professional, or law school and for any career that requires critical thinking and good writing; the reputation of the faculty for scholarship, teaching, and advising; and most of all, the intrinsic interest of the discipline. A wide variety of introductory and advanced courses is offered. The department is particularly strong in ancient, medieval, and modern European history; in American, Latin American, and Asian history; and in the history of science.

## The Major

To complete the history major, a student must fulfill the requirements listed below:

1) Complete three semesters of $a n y^{*}$ of the following courses: Introduction to Western Civilization (History 151, History 152), Europe since 1789 (History 242), Colonial Latin America (History 295), Latin America in the Modern Age (History 296), Introduction to Asian Civilization (History 190, History 191), Islamic History 600-1258 (History 254), Islamic History, 1258-1850 (History 248), Science in Westem Civilization (History 281, History 282). Students must complete (or be taking) two of the required semester courses before being admitted to the major.
*Exception: to fulfill this requirement you may use either History 152 or History 242 but not both.
2) Take history department courses totaling 40 credits and complete all these courses with a grade of $C$ or better.
3) Of the courses totaling 40 credits, take a minimum of:
a. 16 credits outside of American history and
b. 12 credits in history before 1800 .

Courses used to fulfill Requirement (1) above may also be used to fulfill Requirement (3), in respect both to (a) and (b) if applicable. A course in American history before 1800 may be used to fulfill Requirement (3b). A course before 1800 in a field other than American history can be used toward fulfillment of both Requirements (3a) and (3b).
4) Of the courses totaling 40 credits, take at least one 400 -level seminar.
The history department offers an honors program for students who wish to research and write a thesis during their senior year. In addition to writing a thesis, honors students must maintain a 3.5 average in their history courses, take the Honors Proseminar (History 400) plus an additional 400-level serninar, preferably during their junior year, and complete 44 credit hours in history. During the second term of sophomore year or early in junior year, interested students should speak to a faculty member or faculty adviser about the honors program.
Before the beginning of senior year, the candidate presents in conversation or in writing a thesis proposal to an appropriate member of the faculty of history. The faculty member who approves the proposal ordinarily becomes the thesis supervisor. If for any reason it is necessary to change supervisors, this arrangement should be confirmed no later than the fourth week after the beginning of the candidate's senior year.
Honors candidates should register in History 401, Honors Research, with their supervisors. Any exceptions to this must be approved by the Honors Committee. History 401 is a 4 -credit course that permits honors candidates to conduct research and to begin writing the honors essay. At the end of the first semester of the senior year, as part of the requirements for History 401, the student submits to the supervisor a ten-to-fifteen page overview, or, alternatively, a preliminary draft of some part of the thesis along with an outline of the whole and takes an oral examination on the broad field of history that the student has researched. The examination will be administered by a committee consisting of the student's supervisor and one other department member who will eventually serve as a reader of the thesis. The committee then recommends whether the student may proceed to enroll in History 402, Honors Thesis, during the final semester of the senior year. History 402 is a 4 -credit course that permits honors candidates to complete the honors essay and to demonstrate their understanding of the ways in which the themes explored in the thesis fit into a larger historical context.
The completed thesis is evaluated by three readers, including the two faculty members who administered the preliminary oral examination.
The rext of the honors essay may not exceed sixty pages except by permission of the chair of the honors committee and the student's
supervisor. Two copies are due during the third or fourth week of April. In May each honors candidate is given an oral examination administered by the supervisor and the examination focuses on the specific issues of the essay as well as the broad field of history in which the student has conducted research (e.g., Periclean Athens, seventeenth-century science, nineteenth-century America).
To qualify for a bachelor of arts degree with honors in history, a student must (1) sustain at least a $B+$ cumulative average in all history courses and (2) earn at least a cum laude grade on the honors essay and on the oral examination.
Cornell-in-Washington Program. History majors may apply to the Cornell-in-Washington program to take courses and undertake a closely supervised externship during a fall or spring semester.

## Course Offerings

Comparative history
History of science
American history
Latin American history
African history
Asian history
Near Eastern history
Ancient European history
Medieval, Renaissance, and early modern European history
Modern European history
Honors and research courses

## Course Numbering System

100-level courses are very general introductory courses (like 151-152, 190-191) and freshman writing seminars.
200-249-level courses are similar to freshman writing seminars, except that there is greater emphasis on subject matter and less on writing.
250-299-level courses have no prerequisites and admit freshmen. They cover a relatively broad geographical area, period of time, or subject.
300-399-level courses may have specified prerequisites or deal with more-specialized subjects than do those numbered 250-299. Admission of freshmen varies from course to course and is indicated in the course descriptions.
400-499 are upper level undergraduate courses.
600-699 and 700-799 are graduate level courses.

## Comparative History

[HIST 274 Foodways: A Social History of Food and Eating \#
Fall. 4 credits. Not offered 1994-95. Next offered 1995-96.
S. L. Kaplan.

An interdisciplinary examination of the validity of the adage "man is what he eats." Among the topics: food and nutrition, food and social structure, the politics of food control, food and modernization, taste making, and food in
religion and literature. Cases will be drawn widely across space and time, from Pharaoh's Egypt to the 1980s.]

## HIST 360 Early Warfare, East and West \#

Spring. 4 credits.
C. A. Peterson.

A study of the principal modes of warfare found both in the East and the West from ancient times up to the eighteenth century. Tactical evolution and the impact of innovations are stressed, but attention is also paid to the general social and cultural background and the role of nonmilitary factors.
[HIST 370 Resistance and Adaptation: Native American Responses to the Conquest "
4 credits. Not offered 1994-95.
M. Roldân and D. Usner.]

## [HIST 380 Social History of Western

 Technology4 credits. Next offered 1994-95.
For description see History of Science.]

## HIST 393 Images of Humanity in Medieval China (also Asian Studies 393) ©

Fall. 4 credits. Prerequisite: any course on premodern China or Chinese religions, or permission.

M W 2:30-3:20 and section W 3:35-4:25.
J. R. McRae and C. A. Peterson.

The middle period in China's history, essentially the T'ang and Sung dynasties, feature some of the highest achievements of Chinese civilization. These centuries (the seventh through the thirteenth) are distinguished by the exceptionally high levels of literature, art, religious and secular thought, and proto-scientific development, as well as by fundamental changes in state, society, and the economy. This seminar will explore the China of this age by examining the lives of several representative figures-a politician, a poet, a Buddhist monk, a Taoist priest, an emperor, an empress, a "detective" and others. The aim will be to reconstruct the inner and outer worlds of men and women perhaps not so far removed from ourselves in their basic motivations and daily concerns.

## [HIST 405 Population and History \#

4 credits. Open to sophomores. Not offered 1994-95.

> S. L. Kaplan.]
[HIST 407 Death in Past Time \#
4 credits. Not offered 1994-95.
S. L. Kaplan.]
[HIST 409 Seminar on Work in Europe and America \#
4 credits. Not offered 1994-95. Next offered 1995-96.

## S. L. Kaplan.

A comparative study of the meaning of work in different societies from premodern times to the present. Emphasis on the "representations" of work of the actors themselves who worked, as well as of those who for various critical reasons did not work. The seminar will examine not only ideology but also the organization, practice, and physical place of work. It will explore theory as well as "cases," and draw on anthropological and sociological as well as historical materials.]
[HIST 413 The History and Economics of Whaling in North America (also Agricultural Economics 454 and Society for the Humanities 413)
4 credits. Not offered 1994-95.
D. Usner, J. Conrad.]

## HIST 432 The City in History: Europe

 and America \#Fall 4 credits. Prerequisite: permission of instructor.
S. Blumin.

Reading and discussion of significant interpretations of the rise, role, and character of cities in medieval and early modern Europe and in modem Europe and America. Individual research projects.

## [HIST 451 Lord and Peasant in Europe: A Seminar in Social History \#

4 credits. Prerequisite: permission of instructor. Not offered 1994-95 S. L. Kaplan.]

## [HIST 454 The Merodotean Moment: The

 Uses and Abuses of "Western Civilization" (also Government 454) *Spring. 4 credits. Limited to 20 students. Prerequisite: permission of instructor. Not offered 1994-95.
M. Bernal, J. M. Najemy.

The basic premise of the seminar is that the concept of "Western civilization" is a problematic one in need of critical and historical analysis. The course will examine the evolution and transofrmation of this concept from antiquity to the twentieth century by focusing on selected moments (and texts in which they are represented) of actual and/or perceptual encounters with other civilizations. It will also inquire into the political uses and abuses of the idea of the West, and the literary, psychological, and anthropological dimensions of the idea's history. Readings include selections from Herodotus's Histories, Virgil's Aeneid, Augustine's City of God, The Song of Roland, Petrarch, Pico, Machiavelli, Montesquieu, Flaubert, Shelley's Hellas, Amold, Hegel's Pbilosopby of History, James Mill's History of British India, and, from the secondary critical literature, Tzvetan Todorov's 7he Conquest of America and Edward Said's Orientalism.]

## [HIST 471 Black Emancipation in

 Comparative Perspective (also Africana Studies 471; Society for the Humanities 426) \#4 credits. Prerequisite: one course in American, Afro-American, or African history Not offered 1994-95.
M. Washington.]

## [HIST 708 Seminar on the History of

 FoodNot offered 1994-95.
S. L. Kaplan.]

## History of Science

HIST 281 Science In Western Civilization (also Science and Technology Studies 281) \#
Fall. 4 credits. History 281 is not a prerequisite to 282

T R 11:40-12:55. P. Dear.
This course aims to make comprehensible both to science majors and to students of the humanities the historical structure and development of modern science and to show science as a cultural phenomenon. Changing perceptions of nature and human knowledge
from Greek Antiquity to the twentieth century form the framework for current Western views of the world, while the roots of the presentday dominance of "science" as a symbol of progress and modernity lie in an alliance between knowledge of nature and power over nature that took shape in the nineteenth century after a long period of emergence. 281 runs chronologically up to the death of Isaac Newton and focuses on the cultural traditions of Christian Europe and its selective appropriation of a Greek heritage

## HIST 282 Science in Western Civilization (also Science and Technology Studies 282)

Spring. 4 credits. History 281 is not a prerequisite to 282 .

> T R 11:40-12:55. P. R. Dear.

This course aim is to make comprehensible both to science majors and to students of the humanities the historical structure and development of modern science and to show science as a cultural phenomenon. Changing perceptions of nature and human knowledge from Greek Antiquity to the twentieth century form the framework for current Western views of the world, while the roots of the presentday dominance of "science" as a symbol of progress and modernity lie in an alliance between knowledge of nature and power over nature that took shape in the nineteenth century after a long period of emergence This course covers the eighteenth, nineteenth, and early twentieth centuries.

HIST 287 Evolution (also Biological Sciences 207 and Science and Technology Studies 287)

## Fall. 3 credits

W. Provine.

Evolution is the most central concept in biology. This course examines evolution in historical and cultural context. Aims of the course include understanding of the major issues in the history and current status of evolutionary biology, and exploration of the implications of evolution for culture. Issues range from controversies over mechanisms of evolution in natural populations to the conflict between creationists and evolutionists.

## HIST 380 Social History of Western

 TechnologySpring. 4 credits.
J. H. Weiss.

Studies in the interaction between technological changes and social changes in Western Europe and America since the eighteenth century. Readings and lectures will deal both with instances of social transformation that accompanied technological changes and with the role of technology in social thought and cultural expression. Special attention to three periods: Britain during the Industrial
Revolution, America in the nineteenth century, and America during the Vietnam War.

## HIST 415 Seminar in the History of

 Biology (also BioEs 467, BioSoc 447, S\&TS 447)
## Fall. 4 credits

T R 12:20-2:15. W. Provine Specific topic will change each semester offered. This semester the seminar will examine the "evolutionary synthesis" of the 1930s and the 1940s. We will evaluate assertions that the synthesis remains robust to the present, and assertions that the synthesis has disintegrated. Biologists, historians, sociologists, and philosophers are represented in the readings.
[HIST 465 Scientific Rhetoric in Historical Perspective (Communication 465 and Science and Technology Studies 465) Spring. 4 credits. No prerequisites. Not offered 1994-95.
P. Dear and B. Lewenstein. Exploration of the development of scientific discourse since the Scientific Revolution, with special emphasis on understanding the rhetorical purposes served by differing forms and techniques. Readings will include classics from Newton, Darwin, Einstein, and others, along with representative samples of more routine scientific communications. Students will prepare brief reports during the semester and a final term paper.]

## [HIST 482 The Origins of Modern Science 1500-1700 (also Science and Technology Studies 482) \#

 4 credits. Not offered 1994-95.P. R. Dear

A seminar focusing on the changes in the European conception of nature and of human knowledge that created modern science. A new way of perceiving the world, and a new ideology justifying its experimental manipulation, transformed the finite, earth-centered, organic universe of 1500 into the infinite, mechanical universe of Isaac Newton. The course traces these developments above all through the study of primary materials, using the writings of Copernicus, Galileo, Descartes Newton, and other lesser-known figures to discover how technical and philosophical innovations emerged from the changing worldview of early modern Europe.]
HIST 680 Seminar in Historiographical Approaches to Science (also Science and Technology Studies 680)

Fall. 4 credits.
P. R. Dear.

Examines philosophical, sociological, and methodological dimensions of recent historiography of science.

## American History

HIST 101 Introduction to American History (also American Studies 101)

Fall. 3 credits. 101 is not a prerequisite to 102.

M W F 11:15-12:05. G. C. Altschuler. A survey of U.S. history designed to introduce students to major themes and interpretations. History 101 traces the origins and evolution of the nation through 1865. Topics include Puritanism, the American Revolution, the Constitution, Jacksonian democracy, and the Civil War.

## HIST 102 Introduction to American

History (also American Studies 102) Spring. 3 credits. 101 is not a prerequisite to 102.

M W F 11:15-12:05. G. C. Altschuler. A survey of U.S. history designed to introduce students to major themes and interpretations. Covers the period from the Civil War to the present. Topics include the Reconstruction, the Gilded Age, the world wars, the 1960 s, Vietnam, and Watergate.

## [HIST 208 The Era of

Franklin D. Roosevelt
4 credits. Primarily for sophomores. Prerequisite: permission of instructor. Next offered 1994-95.
R. Polenberg.

The impact of the Great Depression and
World War II on American politics, law, and culture.]
[HIST 209 Political History of Indians in the United States \#
4 credits. Not offered 1994-95.
D. H. Usner.]

## [HIST 210 The Supreme Court and Civil

 Liberties4 credits. Primarily for sophomores. Enrollment limited to 15 students. Prerequisite: permission of instructor. Not offered 1994-95 R. Polenberg.

HIST 213 Asian American History (also Asian American Studies 213)
Fall. 4 credits.
T. Fujita Rony.

Comparative introductory history of Asian Indians, Chinese, Filipino, Japanese, and Koreans in the U.S. from about 1850 to World War II. Themes include U.S. expansionism in the Pacific, Asian migrant labor in Hawaii and the American West, the anti-Asian movement, and Asian resistance.

## [HIST 214 Seminar on American Foreign Policy

4 credits. Open to freshmen and sophomores. Not offered 1994-95.
W. LaFeber.]
[HIST 227 Historical Perspectives on Modern American Sex Roles (also Women's Studies 227)
4 credits. Limited to 20 students. Intended primarily for sophomores. Not offered 1994-95.
M. B. Norton.]

HIST 238 The Historical Development of Women as Professionals, 1800 to the Present |also Women's Studies 238 and Human Development and Family Studies 258)
Spring. 3 credits.
J. Brumberg.

The historical evolution of the female professions in America (midwifery, nursing, teaching, librarianship, home economics, and social work) as well as women's struggles to gain access to medicine, law, the clergy, and the academy. Lectures, reading, film, and discussion are geared to identifying the cultural patterns that fostered the conception of gender-specific work and the particular historical circumstances that created these different work opportunities. The evolution of professionalism and the consequences of professionalism for women, family structure, and American society are also discussed.

## [HIST 256 African-American History,

 1945-854 credits. Open to freshmen with permission. Not offered 1994-95.
M. Washington.

This course focuses on the history, culture, and literature of African-American people during the post-World War II, civil rights, and revolutionary nationalist periods. This introductory course examines key issues, themes, and events in a context of contemporary relevance. Emphasis will be on the historical evolution of the modern Black community, Black-white race relations, and the impact of modern economic and political institutions on Black life and thought.]

HIST 273 Women in American Society, Past and Present (also Women's Studies 273) \#
Fall. 4 credits.
M W 10:10-11:00 and sect. F 10:10 and 12:20. M. B. Norton.
A survey of women's experiences in America from the seventeenth century to the present. Among the topics to be discussed are
women's familial roles, the changing nature of household work, the women's rights movement, employment of women outside the home, racial and ethnic differences in women's experiences, and contemporary feminism.
[HIST 276 American Indian History, 1500-1850 \#
4 credits. Not offered 1994-95. Next offered 1995-96.
D. H. Usner.

A survey of North American Indian history from the sixteenth century to the midnineteenth century. Relations between Indian nations and with European colonies will be explored. Different cultural groups and crosscultural encounters will be compared, with emphasis on resistance and adaptation to European colonialism. The formative years of U.S. Indian policy and the experiences of Indian people through the removal era will receive close attention.]

## [HIST 277 American Indian History since

 18504 credits. Not offered 1994-95. Next offered 1995-96.
D. H. Usner

A historical study of American Indians in the United States and Canada from the midnineteenth century to the present. The active and complex role played by Inctian people in their responses to government policies and to socioeconomic changes will be emphasized. Challenges faced and initiatives taken by Indians will be traced from the early reservation years to the current era of self-determination. Cultural change and continuity within Indian communities will be closely examined.
[HIST 279 Seminar on the Cold War 4 credits. Not offered 1994-95.
T. Borstelmann.]
[HIST 303 African-American Women in Slavery and Freedom (also Women's Studies 307)
4 credits. Not open to freshmen. Not offered 1994-95.
M. Washington.

Historical exploration of African-American women from a sociopolitical perspective. Topics include women in africa, slavery and freedom, sexuality, labor, the family, feminism, and racism.]

HIST 304 American Culture in Historical Perspective, 1880-1980 (also Amer. 5t. 304)
Fall. 4 credits
M W F 1:25-2:15. M. Kammen
An introduction to American Studies and the study of American culture. Emphasis upon relationships between mass culture, popular culture, and high culture; and on the question of American exceptionalism (distinctiveness). Special attention also to the situation of subcultures, to the changing role of the media, ethnicity (pluralism), the decorative and popular arts. Mainly 1850-1980.

HIST 309 The U.S. and the Third World Fall. 4 credits.
T. Borstelmann.

This course examines the development of American relations with Asia, Africa, Latin America, and the Middle East, with particular emphasis on the post-World War II period. Connections between domestic factors in the United States and American foreign policy will be emphasized.

## HIST 311 The Structure of American Political History \#

Fall. 4 credits.
M W F 10:10-11:00. J. H. Silbey
Examines the course of American politics from the eighteenth century to the Gilded Age,
focusing on the development of American political culture, nature of decision making, popular and legislative voting behavior, and the role of interest groups, political parties, and political elites in shaping our political history.
[HIST 312 The Structure of American Political History
4 credits. Not offered 1994-95
J. H. Silbey.

Examines the course of American politics from 1865 to the present, focusing on the nature of decision making, popular and legislative voting, behavior, and the role of interest groups, political parties, and political elites in shaping our political history.]

## [HIST 313 U.S. Foreign Relations, 1750-1912 \#

Fall. 4 credits. Open to freshmen with permission of instructor. Not offered 1994-95. W. LaFeber.

Examines policy and policymakers from Benjamin Franklin to Woodrow Wilson. Emphasis is placed on domestic events that shaped foreign policy.]

## [HIST 314 History of American Foreign

 Policy, 1912 to the PresentSpring. 4 credits. Not offered 1994-95 T. Borstelmann.

Students examine the emergence of the United States as a world power in the twentieth century. The course focuses on the domestic sources of foreign policy and the assumptions of the major policymakers (Wilson through Clinton). Important themes include the American response to a revolutionary world since 1912, the role of American racial views in the making of foreign policy, and the increasingly dominant role of the president in the making of U.S. foreign policy.]

## HIST 318 American Constitutional Development

Spring. 4 credits
M W 10:10-11:00 and sect. F 10:10 and 12:20. M. B. Norton.
A study of the major themes of the constitutional history of the United States. Among the topics to be considered are the drafting of the Constitution, the Marshall and Taney courts, the constitutional crisis caused by slavery and emancipation, the rise of substantive due process, the expansion of civil rights and liberties for women and men in the twentieth century, and the contemporary court.

## [HIST 319 The Frontier in American

 Thought and Culture4 credits. Not offered 1994-95. Next offered 1995-96.
D. H. Usner

As a kind of place and a cluster of symbols, the West has deeply influenced ideology and intellectual life in the United States. Using fiction, art, popular culture, and social sciences as primary texts, this course examines how concepts about race and class, society and environment, national destiny and development were fused into various forms of a frontier mythology.]
[HIST 321 Colonial North America to 1763 \#
4 credits. Next offered 1995-96. M. B. Norton.

A survey of European settlement in North America and the Caribbean, emphasizing the interactions of Europeans, Indians, and Africans; economic development; gender relations; religious and political change; and the impact on the colonies of internal and external conflicts.]
[HIST 325 Age of the American Revolution, 1763-1815 "
4 credits. Not offered 1995-96.

## M. B. Norton

An examination of the process by which the thirteen English colonies became an independent and united nation, with emphasis on political thought and practice, social and economic change, and cultural development Attention will be paid to the impact of the American Revolution on women, Blacks, and Indians as well as on white males.]
[HIST 326 The Nation of Trial
4 credits. Not offered 1994-95.
M. Washington.]
[HIST 327 American Frontier History Before 1850 \#
Fall. 4 credits. Not offered 1994-95
D. H. Usner

An overview of European exploration and colonization in North America, life on different colonial-Indian frontiers, and territorial expansion by the United States. Topics include the ideological and material frameworks of expansionism, the political and social dimensions of interethnic and imperial rivalry, and the formation of U.S. Indian and land policies. Themes of human migration, commercial development, and environmental change are emphasized.]

## [HIST 328 American Frontier History: The West since $\mathbf{1 8 5 0}$

Spring. 4 credits. Plus sections. Not offered 1994-95.
D. H. Usner.

An examination of the American West, both as place and myth, from the mid-nineteenth century to the present. Conquest of Indian territories, class and ethnic struggles, frontier ideology, and western politics are among the topics. The course comparatively studies agricultural, mining, and other frontier societies. The role of govemment and science in transforming western environments is closely explored, toward an understanding of recent farm, energy, and other land-use policies in the West.]
[HIST 330 The Age of Jackson, 1815-1850 (also Amer. St. 330) \#
4 credits. Not offered 1994-95.
J. H. Silbey.?
[HIST 331 The American Civil War and Reconstruction 1850-1877 (also Amer. St. 331) \#
Fall. 4 credits. Not offered 1994-95. J. H. Silbey.

An analysis of the factors leading up to the breakup of the Union, the impact of the war in North and South, and the problems of restoration and reconstruction of the seceeded states.]

HIST 332 The Urbanization of American Society: 1600-1860 (also Amer. St. 332) \#

Fall. 4 credits
S. Blumin.

America was born in the country and moved to the city. This course examines the transformation of America from a rural to a rapidly urbanizing society and culture, from the first European settlements to the era of the Civil War. It is also a history of the city itself, as a human community, and as a crucible of cultural contact and change.

HIST 333 The Urbanization of American Society: 1860-2000 (also Amer. St. 333)

Spring. 4 credits. 332 is not a prerequisite to 333.
S. Blumin.

America was bom in the country and moved to the city. This course examines the transformation of America from the urbanizing society and culture of the mid-nineteenth century to the thoroughly metropolitan nation of the present (and near future). It is also a history of the city itself, as a human community, a crucible of cultural contact and change, and a focus of public policy
HIST 335 African-American History from Slavery to Freedom *
Fall. 4 credits. Not open to freshman
T R 10:10-11:25. M. Washington. Introductory course on African-Americans from 1619 to 1865 . Emphasis will be on life in bondage, the free black communities, and racism. Other topics include African cultural heritage, the slave trade, religion, the family, and the black freedom struggle

## [HIST 336 The American Ethos of

 Entrepreneurialism: Capitalism and Soclety in Developing America, 1607-1877 (also Amer. St. 336) \#Fall. 4 credits. Not offered 1994-95. Next offered 1995-96
S. Blumin.

An examination of American society in the context of capitalist development, and of capitalism as a social phenomenon. The transformation of pre-industrial colonies into an industrializing nation; the development of social classes; the emerging ethos of free enterprise.]
[HIST 337 Entrepreneurialism and Organization in the Age of the Corporation: Capitalism and Society In Modern America, 1840-2000 (also Amer. 5t. 337)
Spring. 4 credits. Not offered 1994-95. Next offered 1995-96.

## S. Blumin.

An examination of American society in the context of capitalist development and of capitalism as a social phenomenon. The rise of corporate capitalism; class, "mass", and the ethos of enterprise in twentieth-century American society.]

## HIST 340 Recent American History,

 1929-1960Fall. 4 credits. Prerequisite: Not open to freshmen.

T R 11:40-12:55. R. Polenberg.

Topics include radicalism and reform in the New Deal; Franklin Roosevelt and World War II; the Holocaust and the atomic age; the Cold War and civil liberties; individualism and conformity in the 1950s.

HIST 341 Recent American History, 1960 to the Present
Spring. 4 credits. Not open to freshmen.
T R 11:40-12:55. R. Polenberg
Topics include the Supreme Court and civil rights; Kennedy, Johnson, and social reform; the Vietnam War and Watergate; the Carter,
Reagan, and Bush presidencies; and class, race, and ethnicity in modern America.

HIST 345 The Intellectual and Cultural Life of Nineteenth-Century Americans (also Amer. St. 345 and Religious Studies 345) \#
Fall. 4 credits
R. L. Moore.

An examination of the development of cultural and intellectual diversity in the United States. Particular emphasis will be placed on religious pluralism.

HIST 346 The Modernization of the American Mind (also Amer. St. 346)
Spring. 4 credits.
R. L. Moore.

American thought and culture from 1890 to the present. Emphasizes the intellectual impact of major political and economic events and the adaptation of social ideas and values to new conditions
[HIST 359 American Families in Historical Perspective (also Amer. St. 359, HDFS 359 and Women's Studies 357)
Spring. 3 credits. Prerequisite: HDFS 150 or one 200 -level social science or history course. S-U grades optional. Human ecology students must register for HDFS 359. Not offered 1994-95.
J. Brumberg

This course provides an introduction to and overview of problems and issues in the historical literature on American families and the family life cycle. Reading and lectures demonstrate the pattern of American family experience in the past, focusing on class, ethnicity, sex, and region as important variables. Analysis of the private world of the family deals with changing cultural conceptions of sexuality, sex roles, generational relationships, stages of life, and life events Students are required to do a major research paper on the history of their family, covering at least two generations, and demonstrating their ability to integrate life-course development theory, data drawn from the social sciences, and historical circumstances.]
[HIST 370 Resistance and Adaptation: Native American Responses to the Conquest *
4 credits. Not offered 1994-95.
M. Roldān and D. Usner.]

## [HIST 375 The African-American

 Workers, 1865-1910: The Rural and Urban Experience (also ILRCB 385) \#3 credits. Prerequisite: juniors and seniors, or permission of instructor. Not offered 1994-95 N. Salvatore

Examines the history of blacks in America from Emancipation through the experience of the first generation born after slavery, with a focus on the work experience. Topics will include the restructuring of work during

Reconstruction; the relationship between work and black organizational developments; between black and white workers; and the nature of work in the agricultural south and in cities throughout the nation.]

## [HIST 376 The African-American

 Workers, 1910-the present: Race, Work, and the City (also Industrial and Labor Relations 386)3 credits. Prerequisite: juniors and seniors, or permission of instructor. Not offered 1994-95. N. Salvatore

This course will examine the history of blacks in America from the start of the Great Migration through the 1970s, with a focus on the work experience. Topics will include the effect of relationship between black and white workers as influenced by depression and two world wars; and an examination of the effect of the Civil Rights movement on the economic circumstances of black workers.]

## HIST 411 Undergraduate Seminar in

 American Political HistorySpring. 4 credits. Prerequisite: permission of instructor.
W. LaFeber and J. Silbey.

Topic for 1995: American politics and foreign policy in the Age of Jackson, Polk, Seward, and Lincoln, 1830-1870.
[HIST 412 Undergraduate Seminar in Asian American History (also Asian American Studies 412)
Spring. 4 credits. Not offered 1994-95. G. Okihiro.

A reading and research seminar that will cover various topics in Asian American history.]

## HIST 414 Motivations of American

 Foreign PolicySpring. 4 credits. Prerequisite: Permission of instructor.
W. LaFeber.
[HIST 418 Undergraduate Seminar in the History of the American South
4 credits. Not offered 1994-95.
J. H. Silbey.]

## HIST 419 Seminar in American Social

 HistorySpring. 4 credits. Prerequisite: permission of instructor.
S. Blumin.

Topic for 1995: Politics and everyday life in nineteenth-century America: an inquiry into the meanings of politics and political participation in an expanding democracy.

## HIST 421 Cultural Stratification in

 Historical PerspectiveSpring. 4 credits. Prerequisite: permission of instructor.

M 2:30-4:30. M. Kammen.
The emergence of popular, middlebrow, and mass culture, along with the discourse among cultural critics concerning all three in relation to traditional high culture. The underlying context will concern the changing uses of leisure in twentieth-century America and conflicting attitudes toward cultural taste-levels in a democratic society.
[HIST 426 Undergraduate Sominar in Early American History (also Women's Studies 426) *
4 credits. Not offered 1994-95.
M. B. Norton.]
[HIST 428 Undergraduate Seminar in

## American Frontier History

4 credits. Not offered 1994-95.
D. H. Usner.]
[HIST 429 Undergraduate Seminar in Indians of Eastern North America * Spring. 4 credits. Not offered 1994-95. Next offered 1995-96.
D. H. Usner.

A seminar examining the history of Native Americans in the eastern woodlands from colonial times to the present. The cultural and economic participation of Indians in the evolution of frontier societies will be examined. Major topics include fur-trade networks, political relations, removal, and the persistence of Indian communities in eastern states.]

## HIST 432 The City in History: Europe and America \#

Fall. 4 credits. Prerequisite: permission of instructor.
S. Blumin.

Reading and discussion of significant interpretations of the rise, role, and character of cities in medieval and early modern Europe, and in modern Europe and America. Individual research projects.

## [HIST 439 Undergraduate Seminar in

 Reconstruction and the Now South \#4 credits. Prerequisite: senior standing (in history) or permission of instructor. Not offered 1994-95.
M. Washington.

This course focuses on the American South in the nineteenth century as it made the transition from Reconstruction to new forms of social organization and patterns of race relations. Reconstruction will be considered from a sociopolitical perspective, concentrating on the experiences of the freedpeople. The New South emphasis will include topics on labor relations, economic and political changes, new cultural alliances, the rise of agrarianism, and legalization of Jim Crow.]
HIST 440 Undergraduate Seminar in Recent American History (also Jewish Studies 450)
Spring. 4 credits. Prerequisite: permission of instructor.

T R 1:25-2:40. R. Polenberg.
Topic: Benjamin N. Cardozo, and the American Judicial Tradition.
[HIST 442 Popular Culture in the United States \#
4 credits. Prerequisite: one year of course work in American history. Not offered 1994-95.
R. L. Moore.]
[HIST 458 Female Adolescence in Historical Perspective (also Women's Studies 438 and Human Development and Family Studies 417) "

Fall. 3 credits. Not offered 1994-95. J. Brumberg.]

HIST 461 "Multiculturalism" (also S. Hum 408)

Fall. 4 credits.
W 2:30-4:25. G. Okihiro.
Seminar on multiculturalism and its apparent polarities such as Eurocentrism and
Afrocentrism; unity and diversity; official and vernacular; integration and transformation. The neo-conservative challenge and radical critique. Also, ethnic studies and the university, including debates around "value-
free" versus "politicized" research and pedagogy, and particularity versus interdisciplinary in the organization of knowledge.

## [HIST 484 Seminar in the History of

 American Labor: Race, Work, and the City (also ILR 304)4 credits. Open to juniors and seniors only with the permission of the instructor. Not offered 1994-95. Next offered 1995-96. N. Salvatore.

The seminar will examine the interplay of race, ethnicity, and the urban industrial economy during this century. We will explore the urban African-American world, its changing composition, work experiences, and associational life and study the impact of such social and economic forces as world war, migration, and government policy on black urbanites. To enroll in the course, it is necessary to see Professor Salvatore during preregistration.]

## [HIST 486 Seminar on the 1960s

Spring. 4 credits. Not offered 1994-95.
T. Borstelmann.

This course will explore the issues and developments of the most turbulent and significant decade in recent U.S. history Major topics will include the civil rights movement, the Kennedy and Johnson administrations, the Vietnam War, the anti-war movement, the counterculture, the women's liberation movement, the media, and the Nixon administration. A substantial research paper will be required.]
HIST 500 Undergraduate Research Seminar (also American Studies 500) 8 credits each term.
J. H. Silbey and others.

Offered in Cornell-in-Washington Program. An intensive research and writing experience utilizing the extensive resources of Washington, D.C.
[HIST 608 African-American Women 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
M. Washington.

A reading and discussion topics seminar focusing on the experiences of AfricanAmerican women in nineteenth-century America, including the Caribbean. Topics include women and labor, abolitionism, women's rights, sexuality and race relations, education and racial uplift, black women's literature, marriage and family.]

## HIST 610 Afro-American Historiography <br> Fall. 4 credits.

M. Washington.

Reading and discussion course focusing on the way historians write and interpret the Black experience in America. Students will be concerned with individual historians, various schools of thought, and historical approaches.

## HIST 613 Seminar on American

 Diplomatic HistoryFall. 4 credits.
T. Borstelmann

A reading and research seminar in twentiethcentury American diplomatic history, emphasizing the Cold War period. Discussion will focus on interpretive approaches to U.S. foreign policy and on U.S. relations with the Third Worid since 1945. A research paper is required.

## [HIST 614 Seminar on American

 Diplomatic History4 credits. Not offered 1994-95.
T. Borstelmann.]

HIST 617 Seminar in American Cultural Mistory

## Fall. 4 credits.

## R. L. Moore.

A reading and research seminar covering selected topics in nineteenth-century America. Topic for 1994: American Pragmatism.

## [HIST 618 Seminar in American Cultural

 HistoryNot offered 1994-95.
R. L. Moore.

A reading and research seminar covering selected topics in nineteenth-century America.]

## [HIST 620 Seminar in American History

4 credits. Not offered 1994-95.
M. Kammen.]
[HIST 621 Graduate Seminar in American History
4 credits. Not offered 1994-95.

> M. Kammen.

The focus of this year's seminar is the historian's vocation viewed in historical perspective. Members will read primary and secondary texts (including biographies and autobiographical essays) in an effort to comprehend historical knowledge as a defining experience for individuals, communities, ethnic groups, and nations. Some European but mainly American materials will be used.]
[HIST 624 Graduate Seminar in American Indian History
Fall. 4 credits. Not offered 1994-95.
D. H. Usner.

Major works in historiography are discussed, emphasizing their relationship to social science methods and theories and to other areas of American history. A research paper is required.]
HIST 626 Graduate Seminar in the History of American Women (also Women's Studies 626)
Spring. 4 credits.
M 2:30-4:30. M. B. Norton.
A reading and research seminar intended primarily for graduate students. Major works in American women's history will be carefully scrutinized, and each student will prepare a lengthy research paper.
[HIST 627 Graduate Seminar in Early American History
4 credits. Not offered 1994-95. M. B. Norton.]
[HIST 633 Seminar in NineteenthCentury American History
4 credits. Prerequisite: permission of instructor. Not offered 1994-95. J. H. Silbey.]
[HIST 634 Seminar in NineteenthCentury American History
Spring. 4 credits. Not offered 1994-95. J. H. Silbey.

A research seminar intended primarily for graduate students exploring society, culture, and politics of the United States between 1815 and 1896.]
HIST 640 Graduate Seminar in Recent American History
Fall. 4 credits. Prerequisite: permission of instructor.
R. Polenberg.

HIST 683 Seminar in American Labor History (also ILR 783)
Fall. 3 credits.
N. Salvatore.

A reading and research seminar for graduate students emphasizing recent work in nineteeth- and twentieth-century labor and social history. A research paper is required.

## HIST 710 Colloquium in American

 HistorySpring. 4 credits. Required of all first-year American history graduate students.

T 3:30-6:00. M. Kammen.
Examination of the major approaches, periods, issues, and modes of interpreting American history. Readings include recent "classics" of American scholarship from diverse subfields and genres.

## Latin American History

[HIST 295 Colonial Latin America \# \# Fall. 4 credits. Not offered 1994-95.
M. Roldān.

Survey of Latin America from the rise of preColumbian civilizations through the European conquest, the establishment of the Spanish and Portuguese colonial societies, imperial rivalries in the New World, the background of the independence movements, and the achievement of political independence.]

## HIST 296 Latin America in the Modern Age 둥

Spring. 4 credits.
M. Roldân.

Survey of the Latin American nations from independence to the present. Major themes include the persistence of neocolonial economic and social institutions, the development of nationalist and populist politics, revolutionary movements of the twentieth century, and United States-Latin American relations.
[HIST 347 Agrarian Societies in Latin American History ©
4 credits. Not offered 1994-95.
T. H. Holloway.

The development of rural patterns of wealth, status, and power, focusing on the role of country people in the larger society. Topics include disruption of the conquest, evolution from encomienda to hacienda, rise of plantation agriculture and export enclaves, decline of Indian communities, peasant protest, and land reform and development programs of the recent past.]
HIST 348 Contemporary Brazil © Spring. 4 credits.
T. H. Holloway.

With some historical background, the course focuses on the twentieth century. Topics include the import-substituting growth model, contradictions leading to military rule 1964-1985, transition to competitive politics, debt, ecology, regional and social disparities. Some comparisons are made to other Latin American countries.
[HIST 370 Resistance and Adaptation: Native American Responses to the Conquest \#
4 credits. Not offered 1994-95.
M. Roldãn and D. Usner.]

HIST 424 Art and Politics in TwentiethCentury Latin America ©
Fall 4 credits. Prerequisite: permission of the instructor. (History 296 suggested.) M. Roldăn.

This seminar will examine the intersection of art and politics in Latin America and the role of both in constructing culture, ideology, and national/personal identity from the period of the Mexican Revolution through the military dictatorships of the late twentieth century. Topics will include the Mexican muralists and the Revolution (but including Frida Kahlo) working class and immigrant culture in Argentina and the tango; samba as a vehicle for social and political protest in Brazil; the (re) construction of gender and political self in the writings of Latin American women in exile; and the inscription of violence on public spaces and private bodies through graffiti and torture in the late twentieth century.

## HIST 445 Prostitutes and Patriots:

 Urban Culture and the Construction of Citizenship in Latin America, 1880-1950 (also History 645)Spring. 4 credits. Prerequisites: History 295 and/or 296 suggested. Permission of instructor required. Enrollment limited to 15. M. Roldan.

The growth of industry and commerce in Latin American cities attracted migrants and European immigrants (many of them young women) in search of economic opportunity and freedom from the restrictions of rural society. The "invasion" of a once elitedominated urban space by individuals of mixed ethnic or low status, and the rise of an industrial working class spurred debate about the rights and duties of "citizens" and the limits of participation in urban political and economic life. Ambivalence over the dangers and pleasures of urban culture were frequently expressed through the double trope of the prostitute/patriot-one symbolizing corruption and moral decadence and the other statesmenship and scientific progress. The course examines changing notions of the private/public dichotomy, the policies devised to regulate people's sexuality and behavior and popular participation in urban and national life

## [HIST 449 Race and Class in Latin

 American HistorySpring. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
T. Holloway.

This seminar focuses on ethnic interaction and class formation in the historical development of Latin American societies considering the roles of Native Americans, Europeans, and Africans. Each unit will be approached as an analysis of the historical origins of contemporary patterns, and comparisons will be made among units, in a search for underlying and overarching themes.]

## [HIST 475 Bandits, Deviants, and Rebels

 in Latin America4 credits. Prerequisite: permission of instructor. Not offered 1994-95.

## M. Roldân.]

HIST 645 Prostitutes and Patriots: Urban Culture and the Construction of Citizenship in Latin America 1880-1950 (also History 445)
Spring. 4 credits. Prerequisites: History 295 and/or 296 suggested. Permission of instructor required. Enrollment limited to 15 . M. Roldan.

The growth of industry and commerce in Latin American cities attracted migrants and European immigrants (many of them young women) in search of economic opportunity and freedom from the restrictions of rural
society. The "invasion" of a once elitedominated urban space by individuals of mixed ethnic or low status, and the rise of an industrial working class spurred debate about the rights and duties of "citizens" and the limits of participation in urban political and economic life. Ambivalence over the dangers and pleasures of urban culture were frequently expressed through the double trope of the prostitute/patriot-one symbolizing corruption and moral decadence and the other statesmenship and scientific progress. The course examines changing notions of the private/public dichotomy, the policies devised to regulate people's sexuality and behavior and popular participation in urban and national life.
[HIST 649 Seminar in Latin American History
Not offered 1994-95.
T. H. Holloway.]

## African History

[HIST 390 Southern African History © \# 4 credits. Not offered 1994-95.
G. Okihiro.

Southern African history from foundations to union, or from the earliest human inhabitants to 1910. Major themes will include the peopling of southern Africa, interaction and change among the San, Khoikhoi, and Bantuspeaking peoples, the arrival and expansion of Europeans, African state systems, and the economic transformation of the 1870 s and 80 s leading to the South African war and union.)

## Asian History

[HIST 190 Introduction to Asian Civilizations *
Spring. 4 credits. Not offered 1994-95 J. R. Piggott, D. K. Wyatt.

An introduction to the distinctive cultures of China, India, Japan, and Southeast Asia that features an intensive examination of selected topics and periods of particular significance in the history of each.]

## [HIST 191 Introduction to Modern Asian

 Mistory (2)Fall. 4 credits. Not offered 1994-95.
J. V. Koschmann and T. Shiraishi. The history of Asia in modern times, focusing on the nineteenth- and twentieth-century history of major Asian countries/regionsIndian subcontinent, Island Southeast Asia (especially Indonesia), China, and Japan-in a larger, world and regional, historical perspective. English translations of memoirs, novels, short stories, and other documents are used to assess Asian perspectives, priorities, and ideas.]
[HIST 243 China and the West before Imperialism ©
3 credits. Open to freshmen and sophomores. Prerequisite: permission of instructor. Limited to 15 students. Not offered 1994-95.
C. A. Peterson.]

## HIST 293 History of China up to Modern

 Times ©Fall. 4 credits.
C. A. Peterson.

A survey of the principal developments in the history of China from the earliest times to the eighteenth century that also undertakes a topical introduction to Chinese culture and civilization, in part by the use of visual materials.
[HIST 294 History of China in Modern Times ©
Spring. 4 credits. Not offered $1994-95$. Next offered 1995-96.
S. Cochran.

A survey that concentrates on the rise of the last imperial dynasty in the seventeenth and eighteenth centuries, the upheavals resulting from domestic rebellions and foreign imperialism in the nineteenth century, and the twentieth-century efforts to achieve social mobilization and political unity.]

## HIST 297 Premodern Japan: Historical

 Perspectives (0)Fall. 4 credits.
J. R. Piggott.

This course explores the premodern civilization of Japan from a variety of historical perspectives. A textbook, readings from primary sources and literature and several historical essays will be assigned. Students gain familiarity with the high points of premodern Japanese history and consider a number of comparative questions about Japan's premodern evolution compared with that of other parts of the world. (Graduate students should enroll in History 497. They will attend the lectures of History 297 and participate in their own colloquium.)

## HIST 298 State, Society, and Culture in Modern Japan <br> Spring. 4 credits.

J. V. Koschmann.

A survey of Japan from the mid-eighteenth century to the present, with special attention to changing configurations of institutional structure, knowledge, action, and conceptions of history. Japanese works in translation will be read and discussed in addition to secondary sources.

## HIST 322 Warrior Government and

 Culture in Medieval JapanSpring. 4 credits.
J. Piggott.

This course traces warrior institutions and culture from the Heian period (794-1185) through the medieval ages. The story of warrior development opens a broad window into premodern society. Students will read a variety of original sources in translation as well as analytical essays. Preliminary consultation with the instructor is advised.

## [HIST 326 From Medieval to Early

 Modern in Japan4 credits. Not offered 1994-95.
J. R. Piggott.]
[HIST 352 The Past as Prelude? Japan in Asia, Germany in Europe (also Government 396)
Fall. 4 credits. Not offered 1994-95.
P. Katzenstein, V. Koschmann, T. Shiraishi. As capitalist "late developers" that turned to facism and militarism, were defeated and occupied by the Allies after World War II, and grew rapidly into affluent democracies in the postwar era, Germany and Japan have also both come to assume problematical positions of economic leadership among former enemies in Europe and Asia. By investigating, in parallel, the history and current circumstances of each nation's interaction with its neighbors, the course poses timely questions related to national identity, political and economic conflicts, and regionalism in changing intemational environments.]

HIST 360 Early Warfare, East and West \#
Spring. 4 credits.
For description see Comparative History
HIST 393 Images of Humanity in Medieval China (also Asian St. 393) 둥

Fall. 4 credits. Permission required.
J. R. McRae and C. A. Peterson.

For description see Comparative History.
HIST 395 Southeast Asia to the Eighteenth Century \#
Fall. 4 credits.
D. K. Wyatt.

A survey of the earlier history of Southeast Asia, concentrating particularly on regional movements of economic, social, cultural, and political change and using, to the extent possible, readings in primary sources.

## HIST 396 Southeast Asian History from the Eighteenth Century

Spring. 4 credits.
T. Shiraishi.

A survey of the modern history of Southeast Asia with special attention to the formation of modern states (colonial as well as national), changing economic and social structure, and consciousness. Primary texts will be read in translation whenever feasible.
HIST 420 Japan in the Year 1000: The Tale of Genji in Historical Perspective (\#
Spring. 4 credits.
J. R. Piggott.

The tale of Genji is a classic of premodern Japanese literature that provides readers a broad view into Japan's courtly society at a time when many of the elements of Japan's classical tradition were taking form. Additional primary source readings and secondary sources provide insight into the countryside beyond the capital as well.

## HIST 448 Gender and Family in Classical Japan

Fall. 4 credits.
J. Piggott.

An inquiry into structures of family and gender from the eighth to the fourteenth centuries. Themes will include kinship and family, state formation, and gender construction, and those interested in these themes in comparative perspective are invited to enroll. "Breadth" reading, primary source materials, and comparative reading placing Japan in an East Asian context will be assigned. Previous study of some aspect of premodern Japan is recommended.

HIST 460 Seminar in Islamic History: Muhammad and the Rise of Islam (also Near Eastern Studies 418 and Religious Studies 418) ©
Spring. 4 credits
D. Powers.

This course will focus in the life of the Prophet Muhammad and first century of Islamic history, with special attention to methodological issues relating to the study of this period. Three literary forms-all available in English translation-will serve as the basis for discussion: The Qur'an, the biography of the Prophet (Sira), and the sayings of the Prophet (Hadith). Knowledge of Arabic is desirable but not required.
[HIST 466 The Taiheikí: A Japanese Epic as History and Literature (also Society for the Humanities 426) © 4 credits. Not offered 1994-95. Next offered 1995-96.
J. Piggott, K. Selden.]

HIST 489 Undergraduate Seminar in Modern Japanese Mistory 숭
Spring. 4 credits. Prerequisites: History 298 or equivalent, and permission of instructor. J. V. Koschmann.

Topic for Spring 1995: Japan in the 1930s: Ultranationalism, militanism, and emperorsystem facism.
HIST 492 Undergraduate Seminar in Medieval Chinese History *
Spring. 4 credits. Prerequisite: History 293 or permission of instructor.
C. A. Peterson.

Topic for spring 1995: China and Eurasia in premodern times.
[HIST 493 Self and Society in Late
Imperial and Twentieth-Century China 상
4 credits. Prerequisite: History 191 or 394 or permission of instructor. Not offered 1994-95. S. Cochran.]
[HIST 494 The Japanese in Asia © 4 credits. Not offered 1994-95.
J. V. Koschmann, T. Shiraishi.

Japanese perceptions of Asia and Japan's economic, cultural, and political relations with the countries of East and Southeast Asia since the nineteenth century.]

## [HIST 495 Japanese Kingship in Comparative Perspective: Premodern East Asia 융

4 credits. Not offered 1994-95. Next offered 1995-96.
J. R. Piggott.)

HIST 497 Colloquium in Premodern Japanese History © \#
Fall. 4 credits.
J. R. Piggott.

This graduate course explores the premodern civilization of Japan from a variety of historical perspectives. Students will attend History 297 lectures and participate in a special weekly colloquium.
[HIST 499 Problems in Modern Chinese History (also History 694)
Spring. 4 credits. Prerequisite: History 294 or permission of instructor. Not offered 1994-95. Next offered 1995-96.
S. Cochran.

This course gives each student an opportunity to select one research topic and work on it throughout the semester. Knowledge of Chinese and other foreign languages is not required, but background in Chinese studies is needed.]

## HIST 609 Modern Japanese Studies: The Formation of the Field in History and Literature (also Asian Studies 609)

4 credits.
V. Koschmann and B. DeBary.

The course will provide both a historical introduction to and critical analysis of the constitution of modern Japan studies as a "field" of postwar academic inquiry. While reading texts particularly influential in the early and contemporary formation of the field, we will consider such questions as the domestic and international contexts in which Japanese studies has been institutionalized
and maintained, and the relationship between "Japan" as object of area studies discourse and "Japan" as represented in American journalism, popular culture, and politics. Interdisciplinary and team-taught, the course will aim to introduce students to a range of methodologies and approaches developed in historical and critical works, problematizing assumptions in each case. Possibilities for crossdisciplinary research (along lines recently undertaken in areas such as feminist criticism and cultural studies, for example), will also be explored.

## [HIST 691 Chinese Historiography and

 Source Materials4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
C. A. Peterson.]

## [HIST 693 Problems in Modern Chinese

 HistoryFall. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95. Next offered 1995-96.
S. Cochran.]
[HIST 694 Problems in Modern Chinese History (also History 499)
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95. Next offered 1995-96.
S. Cochran.]

## HIST 695 Early Southeast Asia:

 Graduate ProseminarFall. 4 credits.
D. K. Wyatt.

Introduction to the history of Southeast Asia for graduate students. Students will be expected to attend the lectures and complete the readings for History 395, and they will meet separately as a group to further explore selected topics.

## HIST 696 Modern Southeast Asia: Graduate Proseminar

Spring. 4 credits
T. Shiraishi.

Introduction to the modern history of Southeast Asia for graduate students. Students will be expected to attend the lectures and complete the readings for History 396, and they will meet separately as a group to further explore selected topics.

## [HIST 697 Seminar in Southeast Asian

 Paleography4 credits. Not offered 1994-95.
D. K. Wyatt.]

## HIST 791-792 Seminar in Medieval Chinese History

791, Fall; 792, Spring. 4 credits each term.
Prerequisite: permission of instructor.
C. A. Peterson.
[HIST 793-794 Seminar in Modern Chinese History
793, fall; 794, spring. 4 credits each term. Prerequisite: permission of instructor. Not offered 1994-95.

> S. Cochran.]
[HIST 795 Seminar in Modern Southeast Asian History
Fall. 4 credits. Permission of the instructor. Not offered 1994-95.
T. Shiraishi.

The seminar examines nineteenth- and twentieth-century southeast history. Organizational meeting on Wednesday, 2:30-4:00 in the first week.]

## [HIST 796 Seminar in Southeast Asian

 HistorySpring. 4 credits. Prerequisite: reading knowledge of relevant languages. Not offered 1994-95. Next offered 1995-96.
D. K. Wyatt.]
[HIST 798 Seminar in Japanese Thought Spring. 4 credits. Prerequisite: reading knowedge of Japanese. Not offered 1994-95. J. V. Koschmann.]

## Near Eastern History

[HIST 248 Islamic Mistory: 1258-1914 (also NES 258 and Religious Studies 258 ©\#
Spring. 3 credits. Not offered 1994-95. L. Peirce.]
[HIST 254 Islamic History: 600-1258 (also NES 257 and Religious Studies 257)

Fall. 3 credits. Not offered 1994-95. Next offered 1995-96.
D. Powers.

A survey of Islamic History from the lifetime of the Prophet to the Mongol conquest of Baghdad. Topics to be covered will include the emergence of Islam as a major world religion; the impact of the Arab conquests on the Mediterranean world; political, military, and cultural contacts between the Islamic Near East and Western Europe.]
[HIST 315 Queen of Cities: Byzantine Constantinople, Ottoman Istanbul (also NES 350, Class 352, Rel St. 352)

Spring. 4 credits. Not offered 1994-95.
T R 11:40-12:55. L. Peirce and C. Rapp. This course studies the city of Constantinople/ Istanbul as both imperial capital and urban community. We will trace the evolution of the city from its foundation by Constantine the Great as New Rome, through its role as the political and religious center of the Byzantine Empire, to its reinterpretation and reinvention as Istanbul, the capital of the Ottoman Empire. The course seeks to examine the historic unity of the city by examining continuity and change across the traditional boundaries or religion, ethnicity and political system.]

HIST 317 Politics and Culture in Late Medieval Central Asia and the Near East (also NES 353)
Fall. 4 credits.
T R 11:40-12:55. L. Peirce
This course explores the phenomenon of the "military patronage state." This term has been used to describe the combination of a ruling class organized for conquest and conspicuous cultural patronage characteristic of the states established by the Mongols, Timurids, Mamluks, and early Ottomans. Two other notable features of these states that we shall examine are the close ties that existed between rulers and sufi saints and the prominence of women in politics and cultural production. Wherever possible, readings will emphasize primary sources in translation.
HIST 372 Introduction to Islamic Law (also MIST 652, NES 351, NES 651, REL ST 350)
Spring. 4 credits.
T R 1:25-2:40. D. Powers.
After surveying the historical development of Islamic Law, the seminar will focus on the structure and function of the Islamic legal system in the fourteenth and fifteenth centuries, using legal documents, judicial
opinions, and court cases (all in English translation!) to elicit major themes and issues

## [HIST 378 Between Islam and the West

 (also NES 354)Spring. 4 credits. Enrollment limited to 25 students. Not offered 1994-95.
D. Menashri.]
[MIST 437 Sexuality, Society, and the State in the Near East (also NES 456, NES 657, HIST 657 and Women's Studies 455, Women's Studies 655)
Spring. 4 credits. Not offered 1994-95. L. Peirce.]
[HIST 446 Ottoman History, 1300-1923 (also NES 458)
Fall. 4 credits. Not offered 1994-95. L. Peirce.]

HIST 652 Introduction to Islamic Law (also HIST 352, NES 351, NES 651, REL ST 350)
Spring. 4 credits.
TR 1:25-2:40. D. Powers.
After surveying the historical development of Islamic Law, the seminar will focus on the structure and function of the Islamic legal system in the fourteenth and fifteenth centuries, using legal documents, judicial opinions, and court cases (all in English translation!) to elicit major themes and issues.

## Ancient European History

HIST 151 Introduction to Western Civilization "
Fall. 4 credits. B. Strauss.

History 151 deals with the political, social, economic, cultural and intellectual development of Europe and the Ancient Near East from the dawn of civilization to the Reformation. Readings are selected from original sources (in translation) and accounts by

## modern historians.

## [HIST 265 Ancient Greece from Homer to

 Alexander the Great \#4 credits. Open to freshmen. Not offered 1994-95. Next offered 1995-96. B. Strauss.

A survey of Greece from the earliest times to the end of the Classical period in the late fourth century B.C. The course focuses on the Greek genius: its causes, its greatness, its defects, and its legacy. The Heroic Age, the city-state, ancient democracy, and the intellectual ferment of the Greek Enlightenment are the main topics of study. Readings in translation from Homer, Aristophanes, Sophocles, Herodotus, Thucydides, Plato, Aristotle, and from the evidence of ancient inscriptions, coins, art, and architecture.]

## [HIST 268 A History of Rome from

 Republic to Holy Clty $\stackrel{\#}{*}$4 credits. Open to freshmen. Not offered 1994-95.
B. Strauss.

A survey of Rome from the founding of the Republic to the end of the Western Empire. The focus is on the Roman conquest of the Mediterranean world and on the cultural reconquest of Rome by the vanquished. Roman politics, peasant society, Imperialism, and propaganda are the main topics of the first half. The government of the Caesars, society during the Roman peace, and the fertile interaction of Romans, Jews, and Greeks that produced Christianity are the main topics of the second. Readings in translation
include Cicero, Polybius, Livy, Tacitus, Plutarch, and Saint Augustine.]

## [HIST 452 The Tragedy of Classical Athens, 462-404 B.C. \#

4 credits. Prerequisite: History 265 or permission of instructor. Not offered 1994-95. B. Strauss.

The nature of Athenian democracy, society, and culture in the "golden age" of Athens. The course will examine the influence of Athenian political life on the great tragedians of the age and the influence of tragedy on the Athenians' conception of their character and history. Readings from Herodotus,
Thucydides, Aeschylus, Sophocles, Euripides, Aristophanes, Plato, Aristotle, and Plutarch.]

## [HIST 453 Crisis of the Greek City-State,

 415-336 B.C. \#4 credits. Prerequisite: History 266 or permission of instructor. Not offered 1994-95. B. Strauss.]
[HIST 455 The Family and Politics in Ancient Greece and Rome "
4 credits. Prerequisite: History 265, 268, or 461 or permission of instructor. Not offered 1994-95.
B. Strauss.]
[HIST 461 The Greco-Roman World in Late Antiquity and Early Byzantine Times, A.D. 306-565 *
Not offered 1994-95. Next offered 1995-96.J

## HIST 463 Oender and Politics in the Roman World (also CLASS 463)

Fall. 4 credits.
M 2:30-4:30. J. Ginsburg.
An undergraduate seminar examining the relationship between gender and politics in the late Roman Republic and early Empire. Among the questions this course will address are: Was politics the exclusive domain of men in Roman society (as is generally assumed) or does a broader definition of politics and an understanding of the various forms political activity in ancient Rome might take allow a place for women in Roman political life? What role does gender have in Roman political discourse and ideology? Why do issues such as family, marriage, and sexuality become subjects of political debate and legislation?
HIST 473 Roman Society and Politics under the Julio-Claudlans (also CLASS 480)
Spring. 4 credits. Prerequisite: Classics 212, History 268, or permission of instructor. J. Ginsburg.

For description, see Classics 480 .
[HIST 630 Topics In Ancient History
Fall. 4 credits. Not offered 1994-95.
B. Strauss.]

## Medieval, Renaissance, and Early Modern European History

HIST 152 Introduction to Western Civilization "
Spring. 4 credits.
R. L. Moore and M. Steinberg.

For description see Modern European History.
HIST 257 English History from AngloSaxon Times to 1485 *

## Spring. 4 credits.

M W F 11:15-12:05. P. R. Hyams.
A survey of the government, social organization, and cultural and religious experience of the English people. Particular stress is laid on
land settlement, the unification of the realm, the emergence of state institutions such as Parliament, and changes in economic organization (manors, towns and commerce). The approach will be comparative within a context of contemporary European developments. The course offers students who wish to work on their writing skills an opportunity to do so, especially in the second paper.

## [HIST 259 The Crusades \# ©

4 credits. Not offered 1994-95.
P. R. Hyams.]

HIST 263 The Earlier Middle Ages (also Religious Studies 263) \#
Spring. 4 credits. M W F 12:20-1:10. J. J. John. A survey of medieval civilization from ca. 300 to ca. 1100 dealing with religious, intellectual, political, and economic developments in Western Europe.

## HIST 264 The High Middle Ages \#

Fall. 4 credits.
M W F 11:15-12:05. P. R. Hyams.
A survey of medieval civilization 1100-1400, dealing with political, economic, religious, and intellectual developments in Western Europe. Special attention will be paid to the interaction of different kinds of history and to the historian's understanding of literature and its use as a primary source. Lectures and class discussions.

## [HIST 349 Early Modern England

4 credits. Not offered 1994-95. Next offered 1995-96.
R. Weil.

This course will explore the crises of political, religious, and epistemological authority that plagued England in the sixteenth and seventeenth centuries. We will examine the political and cultural impact of the Protestant Reformation, the nature of Tudor despotism and Stuart absolutism, the construction of a rhetoric of political dissent around issues of sexuality and corruption, competing understandings of the social order and social control, the Puritan Revolution and the invention of liberalism. Emphasis on close reading of contemporary sources, from autobiography and drama to political theory.]

## HIST 350 The Itallan Renaissance \#

 Fall. 4 credits.> J. M. Najemy.

An exploration of intellectual, cultural, religious, and political developments in Italy from the crisis of the communes in the time of Dante and Marsilius, through the several stages of Italian humanism from Petrarch to Alberti to Pico, down to the generation of Machiavelli and Castiglione. The course will seek to problematize the notion of a
"Renaissance" in the period's ambivalent attitudes toward history, learning, culture, language, and the role of intellectuals in politics and society. Emphasis will be placed on the close reading of primary sources and on issues of interpretation.

## [HIST 351 Machiavelli \#

Spring. 4 credits. Not offered 1994-95. J. M. Najemy.

This course will present Machiavelli in a variety of historical and interpretive contexts. European and Italian politics in the early sixteenth century; the decline of the Florentine republic and the rise of the Medicean principate; Machiavelli's own career in government and his, and the republic's, crisis in 1512-13; the intellectual traditions of

Renaissance humanism, political thought, and the revival of antiquity; vernacular literary currents and popular culture; and the remarkable generation of political figures, writers, and theorists with whom Machiavelli associated and corresponded. Emphasis will be placed on a close reading of the major works (include the letters, The Prince, the Discourses, Mandragola, and selections from The Art of War and the Florentine Histories, all in translation) and a critical examination, in the light of that reading, of some major modern interpretations of Machiavelli.]
[HIST 361 The Culture of Renaissance I (also Mistory of Art 350 and
Comparative Literature 361)
Fall. 4 credits. Not offered 1994-95.
C. Lazzaro, J. Najemy

An interdisciplinary exploration of some major themes of Renaissance society and culture from the fourteenth to the sixteenth centuries Using the perspectives of history, art history, and literature, the course will investigate the representation in primary texts and works of art (and with the aid of selected modern criticism) of Renaissance discourses of antiquity and authority, education and learning, religion and lay culture, politics, gender and family, love and eros, and crosscultural encounters. Most of the attention will be to Italian history and culture, but with some comparisons to other European contexts. Readings include selections from Petrarch, Boccaccio, Alberti, Machiavelli, More, Erasmus, Pietro Aretino, and Vasari. Artists range from Ambrogio Lorenzetti to Mantegna, Durer, Titian, and others. Two lectures and a required discussion section each week. (Undergraduates must preregister for one of the sections.)]

## [HIST 364 The Culture of the Renaissance II (also Comparative Literature 362 and English 325)

Spring. 4 credits. Not offered 1994-95.
C. Kaske, W. Kennedy.]
[HIST 365 Medieval Culture, 400-1150 (also Religious Studies 365) \#
Spring. 4 credits. Prerequisite: History 263 or permission of instructor. Not offered 199495. Next offered 1995-96.
J. J. John.

Intellectual and cultural developments in the age of monasticism, from St. Augustine and St. Benedict to St. Anselm and St. Bernard of Clairvaux.]

## HIST 366 Medieval Culture, 1100-1300 \#

Spring. 4 credits. Prerequisite: History 264 or permission of instructor.

T R 2:55-4:10. J. J. John.
The origin and development of the universities will be studied as background for a consideration of the scholastic mentality and its influence on the art, literature, philosophy, science, script, and theology of the period. Readings from Abelard, Hugh of St. Victor, Bonaventure, Thomas Aquinas, Dante, and others.

## [HIST 368 Marriage and Sexuality in Medieval Europe \# (also Wom St. 368)

Spring. 4 credits. Not offered 1994-95. Next offered 1995-96.
P. R. Hyams.

Few topics generate heat so readily as gender relations and sexuality. Behind the current controversies lie decisions made in the first Christian centuries, and firmed up in the
course of the Middle Ages; these still affect all of us, believers and unbelievers alike. This course studies Western attempts to deal with the problem of sexuality up to about 1500 . The class will first clarify the church's normative rules of law and theology. Armed with this framework, it will then turn to more specific topics, including homosexuality prostitution, rape/abduction and sexuality in medieval literature. The goal is to be able to compare the ideal model with the reality, and thus to assess the product the medieval church passed on to Western culture and ourselves. No formal prerequisite, though some prior knowledge of medieval European history is desirable.]
HIST 369 The Mistory of Florence in the Time of the Republic, 1250-1530 \# Spring. 4 credits J. M. Najemy.

Florentine politics and society from the communal period through the age of Dante, the rise and decline of the guild republic, the age of civic humanism, and the rise of the Medici to the time of Machiavelli. Economic structures and social classes, corporate politics, family history, and political and historical ideas are considered in the context of the emergence and transformation of republican government.
[HIST 371 History of England under the Tudors and Stuarts \#
4 credits. Not open to freshmen except by permission of instructor. Not offered 1994-95.]

## [HIST 374 War, Trade, and Empire,

 1500-1815 \#Spring. 4 credits. Not offered 1994-95 D. A. Baugh

Maritime enterprise, imperial policy, and naval power in the age of expansion. The rise and decline of the Portuguese and Spanish empires are considered, but the emphasis is on English, French, and Dutch rivalry in the Atlantic and Caribbean.]

## [HIST 377 Gender in Early Modern

 Europe (also Women's Studies) © Spring. 4 credits. Enrollment limited to 30. Not offered 1994-95. Next offered 1995-96 R. Weil.An inquiry into how masculinity and femininity were defined in early modern Europe. Questions to be explored include; What purpose did gender distinctions serve in this particular society? To what extent were men and women able to shape and redefine the meaning of their gender? How was their ability to do so affected by such events as the Reformation and the French Revolution?]

## [HIST 405 Population and History

 Not offered 1994-95.]HIST 408 Feudalism and Chivalry: Secular Culture in Medieval France, 1000-1300
Spring. 4 credits. No prerequisites; History 263 or 264 would help

W 7:30-9:30 p.m. P. R. Hyams.
An upper-level seminar on the main currents of noble lay culture in France, which led European fashions in love, warfare, entertainment, and environment through most of the period. There will be heavy emphasis on contemporary sources (in English), including lively and complete readings from epic literature (the Song of Roland), lives, and chronicles.
[HIST 409 Seminar on Work in Europe and America
4 credits. Not offered 1994-95.
For description see Comparative History.]
[HIST 427 Power and Society in Early Medieval Europe and Japan
Fall. 4 credits. Prerequisite: a course in medieval European or Japanese historical studies, or permission of instructor. Not offered 1994-95.
P. Hyams, J. Piggott

This seminar will focus on structures, processes, and practices of society in early medieval Europe and Japan. It will provide a forum for discussion of the ways in which, in some very different societies, Europeans and Japanese handled power. We will also be interested in comparing historiographical methodologies employed and issues considered by historians of these societies.
The nature of power and authority and characteristic organizational practices, including kingship, land tenure, status systems, and religious and military structures; the formation of ideology through art, ritual, literature, and law; and various means of linking center and periphery in these societies will be topics for discussion.l
[HIST 436 Conflict Resolution in Medieval Europe \#
4 credits. Not offered 1994-95. Next offered 1995-96
P. R. Hyams.]

## HIST 447 Crusaders and Chroniclers

Fall. 4 credits.
W 7:30-9:30 p.m. P. Hyams.
An intensive reading seminar offering a natural progression from History 259 The Crusades. It will examine contemporary accounts of the crusading movement in English translation. The twin goals are to follow select themes of crusading history to a deeper level than is possible in History 259 and to study medieval historiography through whole chronicles and other primary sources.
[HIST 451 Lord and Peasant in Europe: A Seminar in Social History
Not offered 1994-95.]
[HIST 461 The Greco-Roman World in Late Antiquity and Early Byzantine Times, A.D. 306-565 \#
4 credits. Prerequisite: History 263, 265, or 268 or permission of instructor. Next offered 1995-96.

## B. Strauss.]

## HIST 468 Undergraduate Seminar in

 Renaissance HistorySpring. 4 credits.
J. M. Najemy.

A comparative critical examination of the major European theorists of politics and the idea of the state from the interpreters of Aristotle in the thirteenth and fourteenth centuries, chiefly Marsilius of Padua, to the fifteenth-century civic humanists, and to Machiavelli and other sixteenth century writers. Readings include both primary texts and secondary criticism.
[HIST 469 Emergence of the English State, 1530-1730 \#
4 credits. Not offered 1994-95.
D. Baugh.]
[HIST 481 The English Revolution Spring. 4 credits. Not offered 1994-95 R. Weil.

Between 1640 and 1660, England experienced two decades of civil war and revolution and embarked on a fascinating series of attempts to reorganize political and religious life. Women and the lower classes emerged as actors on the political stage, radical religious sects flourished, and the nature of authority was questioned in both the family and the state. This course will explore the political, cultural, religious and social dimensions of the English Revolution, using mostly primary sources.]

## [HIST 496 Theorizing the Public Sphere (also Comparative Literature $\mathbf{4 9 6}$ and German Studies 496)

Fall. 4 credits. Not offered 1994-95 P. Hohendahl.

The recent translation of Jurgen Habermas's The Structural Transformation of the Public Sphere into English has renewed the debate about the nature and significance of the public and publicity, about public communication and the media. This discussion has centered around the history of the public sphere in modern society and its relevance for contemporary culture and politics. The seminar discussion will deal with contemporary as well as historical topics, among them the significance of class, gender, and race for the construction of the public sphere, the possibility of shared cultures in advanced industrial societies, and the character of public communication under the conditions of the new media. The reading will focus on three seminal texts, namely Hannah Arendt's The Human Condition (1958), Jurgen Habermas's The Structural Transformation of the Public Sphere (1962), and Oskar Negt's/Alexander Kluge's Public Sphere and Experience (1972). The discussion will also include readings from Richard Sennett and Reinhart Koselleck. Finally, special attention will be given to the recent debate about the history and function of the public sphere, which was collected in Craig Calhoun's volume Habermas and the Public Sphere (1992) with contributions (among others) by Thomas McCarthy, Nancy Fraser, Mary P. Ryan, Geoff Eley, and Jurgen Habermas.]

## [HIST 651 Old English Literature in Its Historical Context

Spring. 4 credits. Not offered 1994-95 T. D. Hill, P. R. Hyams.

This graduate course, cross-listed with English 710, might equally be known as "Anglo-Saxon England: History and Literary Context." It studies the written sources for major questions of Anglo-Saxon history in their literary and cultural context. It concentrates on important texts extant in both Latin and Old English. Comparison can illuminate the resources and intentions of writers, compilers, and copyists, the literary and linguistic culture of England, and the ways in which historians might most fruitfully study such texts. Bede's Ecclesiastical History, and Battle of Maldon and Aelfric's Collequies, and selections from the AngloSaxon chronicle, Beowulf, laws, homilies and wisdom literature will all come under scrutiny One goal is to reclaim for European religious history a corpus of material that historians neglect because it is in Old English.]

## [HIST 653 Medieval England-Britain-

 Europe \#4 credits. Not offered 1994-95.
P. R. Hyams.]

HIST 663 Graduate Seminar in Renaissance History
Fall. 4 credits. Open to undergraduates with permission of instructor.
J. M. Najemy.

HIST 664-665 Seminar in Latin Paleography
664, fall; 665 , spring. 4 credits each term. TBA. J. J. John.

HIST 666 Seminar in Medieval History
Fall. 4 credits.
TBA. J. J. John.
[HIST 670 Political Culture in Early Modern Europe 룽
4 credits. Not offered 1994-95. R. Weil.]

## Modern European History

HIST 152 Introduction to Western Civilization (1600 to the end of World War II) \#
Spring. 4 credits.
M W 10:10-11:00 and sect. R. L. Moore and M. Steinberg.
This course offers a comparative perspective on the development of modern states, societies, and cultures in Europe and North America. Topics considered include the Protestant Reformation, economic organization, comparative revolutions, and the politics of race and immigration.

## [HIST 218 The Russian Military Effort and Foreign Policy \#

3 credits. Not offered 1994-95.
W. M. Pintner.]

## HIST 229 A History of European

 ChildhoodFall. 4 credits.
M W F 1:25-2:15. N. Karwan Cutting. Surveys the history of childhood in Europe from the mid-seventeenth century to the present. Comparisons are made across Western, Eastern, and Mediterranean European societies. The course delineates those cultural, demographic, religious, political, and economic factors that shaped childhood, both in periods of transition and in times of violent instability. Changing perceptions of childhood are treated in the context of, for example: religious conflict, urbanization, developments in science and technology, war, and occupation. (All readings are in English.)
[HIST 242 Europe since 1789 \# Fall. 4 credits. Not offered 1994-95.
M. P. Steinberg.

An introduction to major themes, problems, and interpretations in the making of modern Europe from the industrial and French revolutions of the late eighteenth century to the collapse of the Soviet Union and the second unification of Germany in 1989-90. Focus is on the varying forms of revolution and political movements, on the interaction of politics and culture, on the interplay of public and private life. Readings include primary works in social and political theory as well as literature]

## [HIST 252 Russian History to 1800 *

4 credits. Not offered 1994-95.
W. M. Pintner.

The origin and development of the fundamental social, political, economic, and cultural institutions that have determined the nature of contemporary Russian society.]
[HIST 253 Russian Mistory since 1800
Spring. 4 credits. First preference will be given to students who have taken History 252 if enrollment is limited. Not offered 1994-95. W. M. Pintner.

Nineteenth- and twentieth-century Russia, with emphasis on the major social, political, and economic changes that have transformed Russia since the mid-nineteenth century.]

## HIST 258 English History from the

 Revolution of 1688 to the Present \# Fall. 4 credits.T R 1:25-2:40. D. A. Baugh.
An introductory course encompassing political, social, economic, cultural and intellectual development of Europe and the Ancient Near East from the dawn of civilization to the Reformation. Readings are selected from original sources (in translation) and accounts by modern historians.

## HIST 290 Twentieth-Century Russia and the Soviet Union

Spring. 4 credits.
B. Walker.

This course surveys the major social, political, economic, and cultural developments in Russian and Soviet history from the turn of the century to the present day.

## HIST 353 Nineteenth-Century European

 Intellectual History \#
## Fall. 4 credits.

T R 10:10-11:25. D. LaCapra.
The focus is on social and cultural thought in France, Germany, and England. Topics include reactions to the French Revolution and industrialization; the definition of conservative, liberal, and radical perspectives; and the relation between literature and social thought. Readings include Tocqueville, Mill, Hegel, Marx, Flaubert, Dostoevsky, Nietzsche, and Durkheim.

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[HIST 354 Twentieth-Century European Intellectual History (also Comparative Literature 340)
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4 credits. Not offered 1994-95.

## D. LaCapra.]

HIST 355 The Old Regime: France in the Seventeenth and Eighteenth

## Centuries

Spring. 4 credits.
S. L. Kaplan.

A systematic examination of the social structure, economic life, political organization, and collective mentalities of a society that eclipsed all others in its time and then, brutally and irreversibly, began to age. France, in European perspective, from the wars of religion through the age of Voltaire
[HIST 356 The Era of the French Revolution and Napoleon \# 4 credits. Not offered 1994-95. Next offered 1995-96.
S. L. Kaplan.

A study of the failure of the traditional system, its dismantling and replacement in France, and the international consequences. Focus will be on the meaning of the revolutionary experience, the tension between the desires to destroy and to create, and the implications of the Revolution for the modern world.]

## [HIST 357 Survey of German History,

 1648-1890 "Fall. \& credits. Open to freshmen with permission of instructor. Not offered 1994-95. I. V. Hull.

An examination of the social, political, intellectual, and diplomatic history of the

German states from the devastation of the Thirty Years' War, through absolutism, the bourgeois revolutions of 1848, and the struggle for unification, to the beginning of the modern industrial state.]

## [HIST 358 Survey of German History,

 1890 to the Present4 credits. Open to freshmen with permission of instructor. Not offered 1994-95.
I. V. Hull.

The "German problem" is examined. Major topics include tensions caused by rapid industrialization presided over by a preindustrial, political elite; origins of World War I; growth of anti-Semitism; social dislocations of World War I; failure of the socialist revolution of 1918-1919; unstable Weimar democracy and the rise of nazism; the Nazi state; World War II; and the two Germanies.]

## [HIST 362 European Cultural History, 1815-1870

4 credits. Not offered 1994-95.
M. P. Steinberg.]

HIST 363 European Cultural History, 1870-1945
Spring. 4 credits.
M. P. Steinherg.

This course will focus on problems of modernity, identity, and ideology in Germany, France, and England. Works of Wagner
Nietzsche, Manet, George Eliot, Freud, and Benjamin will be analyzed in cultural and political contexts.
HIST 379 War and Society: The Origins of the First World War, 1870-1919 \#
Spring. 4 credits. Open to freshmen with permission of instructor.

M W F 11:15-12:05 and sect. I. V. Hull, W. M. Pintner, D. Baugh.

The First World War destroyed the European world: its hegemony in international politics, its international balance, its social and economic structures, its intellectual certainties. This course examines the long-term and immediate causes of this cataclysm, with special focus on the relations between the various countries' domestic politics and their foreign policies, the changing balance of power, economic rivalries, imperialism, the growth of extreme nationalism, and the arms race. It ends by considering why the war was so long and destructive and why, afterwards, no one could put the pieces back together again.

## HIST 380 Social History of Western Technology

Spring. 4 credits.
For description see History of Science.
HIST 381 The Social and Cultural Construction of Printed Pictures in Europe (16th-18th Centuries)
Spring. 4 credits.
M W F 1:25-2:15. N. E. Karwan Cutting. Pictures, printed on paper from wood blocks or metal plates, provided illiterate as well as literate men, women, and children with views of their world and their past, their leaders and their enemies, their saints and their martyrs throughout early modern Europe. This course addresses how these images were manufactured and emphasizes the history of a littleknown workforce, often anonymous and popular. Secondly, it introduces a variety of analytical interpretations that both
contextualize the printed picture as an historical document and suggest the range of approaches in recent historical literature.

Drawing upon original sources in the Cornell University Library, topics include the dissemination of early printed pictures, representations of scholars, saints, and demons in Reformation prints, the printers of engraved images, the gendering of images in pictures and texts, the status and professional rivalries among engravers, Enlightenment illustrations, and political caricature during the French Revolution, as well as the over-arching problems of visual propaganda and censorship. French, German, and English printed pictures will be emphasized. All required readings are in English.
HIST 383 Europe, 1900-1945
Fall. 4 credits.
J. H. Weiss

An investigation of the major developments in European politics between 1900 and the end of the Second World War. Emphasis on the rise and fall of democratic political systems and their alternatives. Topics include the reorientation of liberalism and socialism, the transforming effects of war and depression, the dynamics and diplomacy of fascism, the European response to the economic and ideological influence of America and the Soviet Union, the changes in Eastern Europe during the interwar years, and the interaction between politics and social structure.
[HIST 384 Europe, 1945-1968
Fall. 4 credits. Not offered 1994-95. Next offered 1995-96.
J. H. Weiss.

A political and social history of Europe between the fall of fascism and the political crises of 1968 . Emphasis on the comparative study of the elaboration of democratic institutions and ideologies. Topics include the origins and course of the Cold War in Western and Eastern Europe, Gaullism and Christian Democracy, the emergence of welfare states, liberal-democratic and Communist culture, the end of colonial empires in the West, opposition movements in Eastern Europe, and the general upheaval of 1968.]

## [HIST 385 Europe in 20th Century: 1968-

 1990Spring. 4 credits. Not offered 1994-95. Next offered 1995-96.
J. Weiss.

The major political developments in Europe between the upheavals of 1968 and the collapse of Communist regimes. Topics will include the effects of economic turndown in 1973-1974; the response to terrorism; regionalist movements; new ethnic minorities and their opponents; Socialist governments in southern Europe; the arrival of democracy in Spain, Portugal, and Greece; new dynamics in the European Community; the rise of Thatcherism; the war scare of the 1980s; and the final phase of the Cold War.]
[HIST 405 Population and History 4 credits. Not offered 1994-95.]

## [MIST 406 The People in the French Revolution \#

Spring. 4 credits. Not offered 1994-95. Next offered 1995-96.
S. L. Kaplan.

The Revolution was nothing if not a mass event. Mass action played a critical part in shaping its course. The "re-invention" of France affected the population down to each village and demanded decisions from virtually every adult. This course will focus on the people as actors: their collective memory,
their ideologies, their repertoire of intervention, the formation of a popular political culture. It will examine the encounters between the people (in their multiple incarnations) and the revolutionary elites who sought to articulate and appropriate the Revolution. A major theme will be the tension between the ambitions to achieve liberty and equality.]

## HIST 409 Seminar on Work in Europe

 and America4 credits. Not offered 1994-95.
For description see Comparative History.]
HIST 435 Collective Action and Politics in Modern Europe (also Government 435)

## Fall. 4 credits.

S. L. Kaplan, S. Tarrow

This is an interdisciplinary seminar examining the causes, dynamics, and outcomes of social movements in modern and contemporary Europe and America. Ranging from the camivalesque uprisings, grain seizures, and tax revolts of early modem Europe, to the revolutions of the late eighteenth century, to the ethnic, civil rights, and women's collective action of recent decades, these movements have deeply marked the development of contemporary states and societies. Cases will be drawn mainly from Western Europe and the United States, with ventures into Eastern Europe. Our ambition is to assess the ways in which popular politics both shaped and were shaped by the development of the modern State and economy.

## [HIST 441 Seminar in the European

 Enlightenment *4 credits. Prerequisite: permission of instructor. Not offered 1994-95.

## I. V. Hull.]

## [HIST 450 Seminar in European Imperialism \#

4 credits. Open to upper-level undergraduates. Prerequisite: permission of instructor. Not offered 1994-95.
I. V. Hull.]

【HIST 451 Lord and Peasant in Europe:
A Seminar in Social History
4 credits. Not offered 1994-95.1
[HIST 456 Seminar in European Cultural History
Spring. 4 credits. Not offered 1994-95 M. P. Steinberg.]

【HIST 457 Seminar in European Fascism 4 credits. Prerequisite: permission of instructor. Not offered 1994-95. I. V. Hull.]

HIST 459 The Making of the English Ruling Class *
Fall. 4 credits.
M 2:30-4:30. D. A. Baugh.
Perspectives on the landed aristocracy's continuing domination of politics and society. Topics include politics and political culture, social philosophy, aristocratic mores, the condition of the poor, and the role of London. Readings are drawn from modern historians and from the period.
[HIST 464 Russian Social History
Spring. 4 credits. Prerequisite: one semester of Russian history or permission of instructor. Not offered 1994-95.
W. M. Pintner.

Examines the development of major social groups throughout Russian history in the
sixteenth and twentieth centuries and compares them to similar groups in other societies.]

## HIST 467 Seminar in Modern European

 Political HistorySpring. 4 credits. Permission of the instructor required.
J. H. Weiss.

Topic for 1994: The Politics of the European past. The course will investigate the role of historical memory and commemoration in contemporary European political history, with some attention to the American case, and considerable use of evidence from the cinema. How was public memory shaped by political conflict? How did events such as the French Revolution, Nazi genocide, and the antifascist Resistance become sites of the struggle to influence the present?
[HIST 470 Social and Cultural History of Contemporary Europe
4 credits. Prerequisite: one course on contemporary Europe or permission of instructor. Not offered 1994-95. Next offered 1995-96.
J. H. Weiss.

Topic: the "other Europe": language, culture and nation among the minority peoples of Europe. A comparative investigation of the development of the cultural and historical identity of non-dominant European ethnic groups and their relation to the formation and policies of European national states: the Basques, the Welsh, the Catalans, the Bretons, the Occitans, the Gaelic Irish, the Faroese, the Gypsies, the Romansh, and others. The course will combine historical, literary, and sociolinguistic approaches.]

## [HIST 474 Topics in Modern European Intellectual History

Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.

## D. LaCapra.]

[HIST 476 Documenting the Depression: Film, Literature, and Memory
4 credits. Prerequisite: permission of instructor. Not offered 1994-95. Next offered 1995-96.
J. H. Weiss.

Social and intellectual history of Britain and America in the 1930 s with special attention to modes of documentary expression and to subjects lending themselves to treatment by film or oral history: work, popular culture, changes in urban and rural communities, family life, and poverty.]
[HIST 477 Seminar on the Politics of the Enlightenment \#
Spring. 4 credits. Not offered 1994-95. Next offered 1996-97.
S. L. Kaplan.

An inquiry into the historical origins of European (especially French) political, social, and economic thought, beginning in the 1680s, at the zenith of Louis XIV's absolutism, and culminating in the French Revolution a century later. Emphasis is on the relation of criticism and theory to actual social, economic, religious, and political conditions. An effort is made to assess the impact of enlightened thought on the eighteenth-century world and to weigh its implications for modern political discourse. Readings in translation from such authors as Bayle, Montesquieu, Voltaire, Rousseau, Diderot, and others as well as from modern scholarly and polemical literature.]
[HIST 478 Seminar in Eighteenth-Century French Social History
4 credits. Not offered 1994-95.
S. L. Kaplan.]

HIST 480 Twentieth-Century Britain
Spring. 4 credits. Open to sophomores, juniors, and seniors.

M 2:30-4:30. D. A. Baugh A seminar course, focusing on political and social history. The main emphasis is on the two world wars and their role in British economic and imperial decline. The course also looks at some great personages-Lloyd George, Churchill, and Bevin-and the major political and social transitions, taking departure from Edwardian era.

## [HIST 485 The Historical Origin of the

 Post-Soviet Successor States4 credits. Not offered 1994-95
W. M. Pintner.]

## HIST 490 Social and Cultural History of

 the Soviet IntelligentsiaFall. 4 credits. Prerequisites: a course in Russian/Soviet history, literature, or politics, or consent of the instructor

T 2:30-4:30. B. Walker
This seminar examines the formation and history of the Soviet educated elite, with particular attention to its relations with Soviet power. Members of this group under discussion include writers, lawyers, educators, engineers, scientists, students, and others.

## [HIST 498 German Cultural and Social

 Theory, 1870-19454 credits. Prerequisite (for undergraduates) History 363 or instructor's permission. Not offered 1994-95
M. P. Steinberg]

HIST 605 Graduate Seminar in European Cultural and Intellectual History (also German Studies)
Fall. 4 credits.
M. P. Steinberg.

The topic this semester will be the construction of history, memory, and identity, among German Jewish intellectuals in the period of the Weimar Republic. Concentrated readings of Franz Rosenweig, Walter Benjamin, Leo Strauss, and Ernst Kantorowicz, and possibly others according to student interest.
[HIST 635 The Gates to Modernity: From Karlsbad to the 1848 Revolution (also German Studies 635)
4 credits. Anchor course. Not offered 1994-95.
P. U. Hohendahl.

The seminar will focus on Germany's entry into the modern age represented by authors such as Heine, Büchner, Feuerbach, and Marx The course will deal with the cultural, political, and social consequences of the Enlightenment, among them the democratization of literature and culture, the politicization of philosophy, and the emancipation of underprivileged groups (women and working class). The readings will trace the formation of bourgeois culture and its contradictions as they are articulated by the writers of Young Germany, the Left Hegelians, and radical literati of the 1840 s . In addition to the authors mentioned above, readings will be taken from the works of Bettina von Arnim, Borne, Grabbe, Hebbel, and Fanny Lewald.]
[HIST 655 Seminar in Eighteenth-Century British History
4 credits. Not offered 1994-95
D. A. Baugh.]
[HIST 656 Seminar in NineteenthCentury British History
4 credits. Not offered 1994-95
D. A. Baugh.]
[HIST 661 Graduate Seminar in Twentieth-Century German History
4 credits. Prerequisite: permission of instructor. Not offered 1994-95 IV. Hull.]
[HIST 671 Seminar in the French Revolution
Not offered 1994-95
S. L. Kaplan.]

HIST 672 Seminar in European Intellectual Nistory
Fall. 4 credits.

> D. LaCapra.

HIST 673 Seminar in European Intellectual History
Spring. 4 credits.

## D. LaCapra.

## [HIST 674 Graduate Seminar in German

 History, 1770-1918Fall and spring. 4 credits each term. Not offered 1994-95.
I. V. Hull.

This course explores selected topics in the political, social, and cultural history of Germany from 1770 to 1918 . It is designed to introduce graduate students to the history and historiography of modern Germany and to allow those with sufficient preparation to pursue directed research during the semester.]
[HIST 675 After the Divide: German Critical Theory of the Seventies and Eighties (also Comparative Literature 675 and German Studies 675)

4 credits. Not offered 1994-95.
P. U. Hohendahl.

The death of Theodor W. Adorno in 1969 marked the end of classical Critical Theory During the following decade his students and disciplines moved in different and conflicting directions. In this country only the project of Jurgen Habermas has received serious and consistent attention. However, the German configuration of the 1980s is considerably more complex. The seminar examines the writings of H. M. Enzensberger, Habermas, O. Negt, A. Kluge, P. Burger, A. Wellmer, and C. Dahlhaus. Their works range from the social and political theory to aesthetic theory, as well as literary and music criticism.]
[HIST 677 Seminar in Russian History Spring. 4 credits. Not offered 1994-95. W. M. Pintner.J

## HIST 678 Seminar in Modern European

 Social HistorySpring. 4 credits. Permission of instructor required.
J. H. Weiss.

Topic: Social hierarchies and social solidarity Studies in the history of stratification since 1815
[HIST 679 Seminar in European Social History
Not offered 1994-95.
S. L. Kaplan.!

HIST 750 European History Colloquium
Fall and spring. 4 credits, each term.
Fall: S. Kaplan, B. Strauss; spring:
J. Najemy, M. Steinberg.

A research colloquium designed for European history graduate students. The colloquium will offer a form for students to present papers and to discuss the work of visiting scholars.

## Honors and Research Courses

Note: History 301-302 are not regular courses for which students may sign up at will. They are personal arrangements between an instructor and a particular student. Students must first gain the consent of a particular instructor to work with them.
HIST 301 Supervised Reading
Fall or spring. 2 credits. Open only to upperclass students. Prerequisite: permission of instructor.

## HIST 302 Supervised Research

Fall or spring. 3 or 4 credits. Open only to upperclass students. Prerequisite: permission of instructor.

## HIST 400 Honors Proseminar

Fall and spring. 4 credits. Limited to 15 students. For prospective honors candidates in history. Prerequisite: permission of a member of the Honors Committee is required to register.

Fall: M. Kammen; Spring: S. L. Kaplan. An examination of major approaches to historical inquiry and analysis. Masterworks of historical writing (traditional as well as recent) will be discussed. There will be one short essay and a longer paper (a study of the work of one major historian). The readings will be drawn from all time periods and diverse cultures.

## HIST 401 Honors Guidance

Fall or spring. 4 credits. Prerequisites: History 400 and permission of instructor.

## HIST 402 Honors Research

Fall or spring. 4 credits. Prerequisites: History 400 and permission of instructor.
HIST 703-704 Supervised Reading 703, fall; 704, spring. 4 credits each term. Limited to graduate students. Prerequisite: permission of instructor.

## HIST 709 Introduction to the Graduate Study of History

Fall. 4 credits. Required of all first-year graduate students.

M 4:00-6:00. I. V. Hull, M. B. Norton. The course is designed to introduce entering graduate students to crucial issues and problems in historiography that cut across various areas of specialization.

## HISTORY OF ART

C. Lazzaro, chair; K. Barzman, J. E. Bernstock, R. G. Calkins, H. Foster (graduate faculty representative), P. I. Kuniholm, L. L. Meixner (director of undergraduate studies), S. J. O'Connor, A. Ramage, S. Reiss,

## M. W. Young.

The Department of the History of Art provides a broad range of introductory and advanced courses in Western (European and American) and non-Western art (particularly East and Southeast Asian), from ancient times to the
present. Courses have various emphases: archaeology, artists, styles, themes, iconography (the study of subject matter), patronage, social history, and theoretical perspectives. The department offerings reflect the interdisciplinary nature of the subject and the importance of critical theory in interpreting works of art. The resources of the Herbert F. Johnson Museum of Art frequently serve as the focus for discussion sections and paper assignments.

## The Major

The major in history of art enables students to acquire a familiarity with the art of many different cultures and a deeper knowledge of selected periods and places. The major strengthens visual skills, analytic and interpretive ones, and reading and writing abilities. Students wishing to major in the history of att should complete two courses at Cornell in the department by the end of their sophomore year. One of the two courses required for entry into the major must concern material that is either predominantly before
1500 A.D. or non-Western. These two courses are prerequisites for the major and may not be counted toward fulfillment of the major requirements (grade of C or above is required for admission). Prospective majors should consult with the director of undergraduate studies. The major has requirements to ensure both breadth and depth, but it is also flexible enough to be tailored to each student's interests. In their junior and senior years, majors work closely with their advisers to determine their own course of study.

## Requirements for the Major

The major in History of Art requires 36 credits, of which 30 must at the 300 -level or higher.
Majors should acquire a broad familiarity with the history of art in several chronological and geographical areas (in Western art: ancient, medieval, Renaissance and baroque, and modern; and in non-Western art: Chinese, Japanese, Southeast Asia, or other areas that are occasionally taught in the department). The department does not offer a sweeping survey of Western art, because such a course provides only a very superficial knowledge, but it encourages students to gain experience with several areas in the history of art. The major requires at least one course in an area from ancient through baroque art, one course in modern art, and one in non-Western art.

Majors must in addition develop a thorough knowledge of at least two and preferably three areas in the history of art. By studying them on progressively more advanced levels, students will also acquire facility with the tools and methods of the discipline of art history. The major requires two sequences of courses, each in a different area. A sequence is two courses in the same area, the second at a higher level than the first, as in a 200-and $300-$ level course or a 300 - and 400 -level course. One seminar ( 400 - or 500 -level course) is also required for the major.
Majors will acquire an understanding of different approaches in the history of art, such as connoisseurship, iconography, and various methods informed by poststructuralist theories for the analysis of works of art. Majors are required to take the proseminar, which is a survey of methods and historiography, normally taken in the fall of their junior year. They are also encouraged to take at least one additional course that will develop their knowledge and skills in one method of the
study of art (as in museum issues and dendrochronology) or their understanding of critical discourses (art criticism since the nineteenth century, psychoanalytic, marxist, feminist, and postmodern criticism).
The history of art is intrinsically interdisciplinary and various other disciplines are necessary complements for understanding of works of att in their historical and cultural contexts. Therefore, majors are encouraged to take related courses in history of architecture, history, literature, critical theory, studio art, etc. Majors are also encouraged to study foreign languages related to their principal interests in art, particularly if they are considering graduate study. In addition to the 36 credits, the major also requires two courses in related areas, approved by the adviser, or two additional courses in the department.

## Honors

To become a canclidate for the degree of Bachelor of Arts with honors in the history of art, a student must have a cumulative average of $\mathrm{B}+$ for all courses taken in the department and a cumulative average of $B$ in all arts and sciences courses. Application to write an honors thesis should be made to the director of undergraduate studies during the second term of the junior year. The application must include a summary of the proposed project, an endorsement by a faculty sponsor, and a copy of the student's transcript. In the senior year the honors candidate will include in his/ her course load, History of Art 600 and 601. These courses address the research and writing of the senior thesis under the direction of the student's project adviser.

## Course Numbering System

100-level courses are all freshman writing seminars
200-level courses are introductions to the major subdivisions of Western and nonWestern ant and they often have large enrollments.
300-level courses are more specialized, and some have the introductory course in the appropriate area as a prerequisite. Freshmen are advised to take the introductory courses unless they already have substantial background in the history of art.
400-level courses are upper-level seminars, primarily for undergraduates, although graduate students in the history of art and other fields also take them.
500-level courses are primarily graduate seminars, which undergraduates may also take.

## Freshman Writing Seminars

For Freshman Writing Seminar offerings in the History of Art, see the John S. Knight Writing Program's special brochure. These courses may be used as freshman electives but not to satisfy the distribution requirement.

## Courses

ART H 202 Survey of European Art: Renaissance to Modern \#
Summer only. 3 credits.

## Staff.

The major traditions and movements in western European art from the Renaissance to the Modern period. Painting, sculpture, and architecture.

ART H 220 Introduction to Classifical Archaeology (also Classics 220) *
Spring. 3 credits
J. Coleman.

For description, see Classics 220.
[ART H 221 Introduction to Art History: Minoan-Mycenaean Art and Archaeology (also Classics 221 and Archaeology 221) \#
3 credits. Note: Students may not obtain credit for both this course and Classics 319 Not offered 1994-95
J. Coleman.]
[ART H 224 Archaeology in Action I (also Classics 232 and Archaeology 232) *

Fall. 3 credits. Prerequisite: permission of instructor. Not offered fall 1994-95
P. I. Kuniholm.]
[ART H 225 Archaeology in Action II (also Classics 233 and Archaeology 233) \#

Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1994-95
P. I. Kuniholm.]

ART H 230 Introduction to Art History: Monuments of Medieval Art (also Religious Studies 230) \#
Spring. 3 credits.
R. G. Calkins.

An introduction to the approaches to art history through a study of selected works of art from the Middle Ages: architecture, sculpture, painting, manuscript illumination, metalwork, and ivory

## ART H 245 Introduction to Art History:

 Renaissance and Baroque Art \#Fall. 3 credits.
K. Barzman

A survey of selective works of European painting, sculpture, and architecture from 1400 to 1700 . The forus is on major artists, workshop methods, style, meaning, patronage, and the function of art in a range of social contexts. The course also covers the methods of art history currently practiced in Renaissance and Baroque studies from connoisseurship and iconography to deconstructive approaches drawing on psychoanalysis and semiotics. This course is committed to improving student writing as well as teaching how to look at works of art.

ART H 260 Introduction to Art History: The Modern Era
Fall. 3 credits. Not open to students who have taken History of Art 261.
J. E. Bernstock

A discussion of the most important developments in European art from 1780 to 1940. The emphasis is on major movements and artists such as Romanticism (Delacroix), Realism (Courbet), Impressionism (Monet), Post-Impressionism (van Gogh, Cezanne), Cubism (Picasso), Fauvism (Matisse), and Surrealism (Miro)

ART H 261 Introduction to Art History: Modern Art
Summer only
Staff.
An introduction to the major artists and masterpieces of the nineteenth and twentieth centuries, presented through lecture, video, and class discussion. Central figures include the Impressionists and the Cubists. Students also work with images on view at the Herbert F. Johnson Museum of Art

ART H 262 Introduction to Art History: The Modern Era Seminar
Fall. 1 credit. Concurrent enrollment in Art H 260. Enrollment is limited.

Staff.
A weekly seminar that may be taken in conjunction with History of Art 260 to provide further exploration of selected developments in modern art. The class involves extensive discussion and a term paper related to the seminar topic
ART H $\mathbf{2 6 5}$ Art from 1940 to 1990
Spring. 3 credits.
J. E. Bernstock

Major artists and movements in the United States since 1940, beginning with Jackson Pollock and Abstract Expressionism, and continuing through recent developments in art. Attention is devoted to the critical reception that artists have received and to the artists' statements themselves

## ART H 267 Art from 1940 to 1990:

 SeminarSpring. 1 credit. Prerequisite: concurrent enrollment in Art H 265. Enrollment is limited.
Staff.

A weekly seminar that may be taken in conjunction with History of Art 265 to provide further exploration of selected developments in contemporary art. The class involves extensive discussion and a term paper related to the seminar topic.

## ART H 280 Introduction to Art History:

 Apporaches to Asian Art ©Fall. 3 credits.
S. J. O'Connor.

Designed to introduce students to the varied responses of the Asian artist in different social and geographical contexts. By selective focus and emphasis rather than broad survey, the student will gain some familiarity with the Javanese shadow-puppet theater, high-fired ceramics, Chinese landscape painting, Buddhist sculpture and painting of Thailand, Indian miniature paintings, and Japanese prints. A number of class sessions will meet in the Herbert F. Johnson Museum of Art.

ART H 309 Dendrochronology of the Aegean (also Classics 309 and Archaeology 308)
Fall and spring. 4 credits. Prerequisite: permission of instructor. Limited to 10 students.
P. I. Kuniholm.

Participation in a research project of dating modern and ancient tree-ring samples from the Aegean and Mediterranean. Supervised reading and laboratory work. A possibility exists for summer fieldwork in Greece or Turkey.
[ART H 312 Hispanic Aesthetics: Visual Vernacular (also HASP 312)
3 credits. Not offered 1994-95.]
[ART H 320 The Archaeology of Classical Greece (also Classics 320) \#
4 credits. Prerequisite: History of Art 220 or Classics 220 or permission of instructor. Not offered 1994-95.
A. Ramage.]

## [ART H 322 Arts of the Roman Empire

 (also Classics 350) \#4 credits. Prerequisite: History of Art 220 or permission of instructor. Not offered 1994-95 A. Ramage.]
[ART H 323 Painting in the Greek and Roman World (also Classics 323)
4 credits. Not offered 1994-95. A. Ramage.]

ART H 325 Greek Vase Painting (also Classics 325) \#
Fall. 4 credits. Prerequisite: previous enrollment in a History of Art or Classics course or permission of the instructor. A. Ramage.

A stylistic and iconographical approach to an art in which the Greeks excelled. The course will be arranged chronologically from the early (eleventh century B.C.), anonymous beginnings to the "personal" hands of identifiable masters of the fifth and fourth centuries B.C. Styles other than those of Athens will be stressed.

ART H 326 Greek Cities and Towns (also Classics 326) \#
Spring. 4 credits. Prerequisite: History of Art 220 or Classics 220
J. Coleman.

For description, see Classics 326
[ART H 327 Greek and Roman Coins (also Classics 327) \#
4 credits. Not offered 1994-95.
A. Ramage-]

ART H 328 Greeks and Their Neighbors (also Classics 322) *
Spring. 4 credits. Prerequisite: History of Art/Classics 220, or History of Art/Classics 221, or permission of the instructor. A. Ramage.

A study of the archaeological and other evidence for the interaction between Greek civilization and the eastern and western Mediterranean from the thirteenth to the fourth centuries B.C. The course will focus on Greek relationships with Egypt, the Levant, Anatolia, and the Etruscans in the post-Bronze period.

## [ART H 329 Greek Sculpture (also Classics 329) * <br> 4 credits. Not offered 1994-95.]

ART H 332 Architecture in the Middle Ages (also Architecture 382, Religious Studies 332) *
Fall. 4 credits.
R. G. Calkins.

A survey of medieval archirecture from the Early Christian period to the Late Gothic (A.D. 300-1500). Considerable emphasis will be placed on the development of structural systems and upon the form, function, and meaning of important medieval buildings.

## [ART H 333 Early Medieval Art and

 Architecture \#4 credits. Not offered 1994-95 R. G. Calkins.]
[ART H 334 Romanesque Art and Architecture \#
4 credits. Not offered 1994-95.
R. G. Calkins.]

ART H 335 Gothic Art and Architecture (also Religious Studies 335) "
Spring. 4 credits. R. G. Calkins

The architecture, sculpture, painting, stained glass, and manuscript illumination from 1140 to about 1450, primarily in France, but with reference to important manifestations of the Gothic style in England, Germany, Bohemia, and Italy.

## [ART H 336 Prelude to the Italian

 Renaissance (also Religious Studies 336) "4 credits. Not offered 1994-95.
R. G. Calkins.]
[ART H 337 The Medieval Illuminated Book \#
4 credits. Not offered 1994-95.
R. G. Calkins.]
[ART H 341 Flemish Painting \#
4 credits. Not offered 1994-95]

## [ART H 342 Medieval and Renaissance

 German Art \#4 credits. Not offered 1994-95.
R. G. Calkins.]

ART H 343 Italian Renaissance of the Fifteenth Century \#
Fall. 4 credits. Recommended: History of Art 245 or any Renaissance history or literature course

## C. Lazzaro

This course examines the painting, sculpture and architecture of the fifteenth century in Italy, including the works of Brunelleschi, Ghiberti, Donatello, Masaccio, Botticelli, Mantegna and many others. The development in Florence of a new style with an altered relationship to the visible world and influenced by the art and thought of classical antiquity is studied in its historical and cultural context. The course further examines the moral and political dimensions of this art, the transformation of its style and aims, and its transmission to other city-states in north and central Italy. Newly popular genres, among them portraiture and tomb sculpture, and subjects, such as secular and mythological themes, are considered as representations of this society's structures and values. Effective writing and critical thinking are stressed in student papers
[ART H 344 Italian Renaissance of the Sixteenth Century: Leonardo, Michelangelo, and Raphael
4 credits. Prerequisites: one or more of the following courses: History of Art 245, 343, 350,351 , or permission of the instructor. Not offered 1994-95.
S. Reiss.]
[ART H 345 Rome, Florence, and Venice in the Sixteenth Century "
4 credits. Not offered 1994-95

## C. Lazzaro.]

ART H 348 Renaissance Art in Northern Europe: The Sixteenth Century \# Spring. 4 credits.
S. Reiss.

This course will examine the painting, sculpture, and printmaking of Northem Europe in the sixteenth century. The principal emphasis will be on art produced in the Netherlands, Germany, and France. Topics to be considered include conditions of patronage in different regions of Northern Europe, the impact of Italian traditions, and the development of specifically northern forms of artistic expression in religious and secular art, as well as in landscape, portraiture, and genre painting. Artists to be considered include Bosch, Bruegel, Durer, Grunewald, and the painters and sculptors of the School of Fountainebleu.
[ART H 350 The Culture of the Renaissance I (also History 361 and Comparative Literature 361) *
4 credits. Each student must enroll in a
section. Not offered 1994-95.
C. Lazzaro, J. M. Najemy.]
[ART H 351 The Culture of the Renaissance II (also Comparative Literature 362, English 325, and History 364)
4 credits. Not offered 1994-95.
C. Kaske, W. Kennedy.!
[ART H 354 European Painting of the Seventeenth Century *
4 credits. Not offered 1994-95.]
ART H 355 Art as Spectacle: The Italian Baroque \#
Spring. 4 credits. Prerequisite: History of Art 245 or permission of instructor. K. Barzman.

This course casts the Italian Baroque as a society of spectacle. Lectures and discussions will focus on frescoes, public sculpture. architecture, and the re-organization of urban space in Italian cities from the end of the Council of Trent (1563) through the papacy of Clement XII (1740). Emphasis will be placed on spectacular display, on the forms of address intended to guide and impress the viewer, and the various institutions and individuals served by this kind of cultural production.

## [ART H 357 European Art of the Eighteenth Century <br> 4 credits. Not offered 1994-95.]

ART H 360 Painting and Everyday Life in Nineteenth-Century America (also American Studies 360) \#
Fall. 4 credits. Prerequisite: History of Art 230, 245, or any 300 level History of Art course.
L. L. Meixner.

Nineteenth-century American paintings were carefully constructed to project an image of "exceptionalism," DeTocqueville's term for the social harmony and material abundance he considered unique to the New World. Embedded in these icons of national cohesion, however, were signs of race, class, and political conflict that we will decode through interdisciplinary methods. Our topical units include New England portraiture and the merchant economy, Hudson River landscape and corporate (railroad) patronage, images of African-Americans and Reconstruction, images of Native Americans, the West, and Manifest Destiny, domestic interiors and gender issues. Through these, we will challenge the assumption that American art celebrated democracy, and instead consider far more conflicted attitudes. Our key artists include John S. Copley, George Caleb Bingham, Winslow Homer, Lily Martin Spencer, Mary Cassatt. Thomas Eakins. Blending the form and content of democratic aesthetics, our readings include art historical texts and others by Poe, Emerson, and Whitman

## [ART H 361 The Social History of Nineteenth-Century European Painting \#

4 credits. Prerequisite: One of the following: History of Art 230, 245, 354, 360 or permission of instructor. Not offered 1994-95.
L. L. Meixner.]

ART H 362 Impressionism and Society
Spring. 4 credits. Prerequisite: One of the following: History of Art 230, 245, 354, 360 or permission of instructor.
L. L. Meixner.

This course discusses French Impressionism as it relates to nineteenth-century public life. Chief artists include Manet, Cassatt, Morisot, Degas, Pissarro, Monet, Seurat, ToulouseLautrec, and Van Gogh. Images are interpreted as cultural products of the Third Republic, with close attention to cafe and brothel society, middle-class leisure, japonisme and imperialism, workers' movements, and Le Bon's theory of crowds. Woven into historical discussions are more theoretical considerations of utopia, capital, pathology, and the public body. Overarching issues of class, gender, and power in urban Paris will be addressed through the writings of Baudelaire, Benjamin, Pollock, Jameson, and Zola.

## [ART H 364 American Art 1900-1940

4 credits. Not offered 1994-95.]
[ART H 366 Problems in Modernism: "Primitivism"
4 credits. Prerequisite: History of Art 260 or permission of instructor. Not offered 1994-95 H. Foster.]
[ART H 367 Problems in Modernism: "High" and "Low" Culture (also Comparative Literature 366)
4 credits. Prerequisite: History of Art 260 or permission of instructor. Not offered 1994-95. H. Foster ]

ART H 370 Visual Culture and Social Theory (also Government 375 and Comparative Literature 368)

## Spring. 4 credits.

H. Foster, S. Buck-Morss.

This course is designed as an introduction to some of the key concepts at work in the most innovative analyses of visual culture todayfrom new art histories through feminist critiques to cultural studies. Among other topics we will consider modern ideas of the aesthetic, Marxian and Freudian notions of the fetish, psychoanalytic accounts of the gaze, and feminist definitions of spectatorship in relation to sexuality. Lectures will include general expositions of such concepts as well as specific applications of them; there will also be section discussions.
ART H 371 Architectural History of Washington, D.C.
Fall or spring. Variable credit. Only for students in the Cornell-in-Washington program. Only for non-architects.

## P. Scott.

A historical and critical survey of the architecture of Washington. Attention will be given to the periods, styles, architects, and clients-public and private-of the notable buildings and to the urbanscape of the nation's capital. The vocabulary of architectural analysis and criticism will be taught. Field trips required.
[ART H 376 Painting and Sculpture in America: 1850-1950
4 credits. Not offered 1994-95.
[ART H 380 Introduction to the Arts of China et
4 credits. Not offered 1994-95.
M. W. Young]
[ART H 381 Buddhist Art in Asia ©\# 4 credits. Not offered 1994-95.
S. J. O'Connor.]
[ART H 383 The Arts of Early China © 4 credits. Not offered 1994-95. M. W. Young.]

ART H 384 The Arts of Japan ©
Fall. 4 credits.
M. W. Young.

A general introduction to the arts of Japan, intended to summarize the achievements of the Japanese in such areas as architecture, gardens, painting, and sculpture. Although the course will follow a general chronological pattern, the arts will be approached topically, with special concentration on developments in the later periods of Japanese history, with particular emphasis on the arts related to Zen Buddhism. The rea ceremony, ceramics, and the minor arts will receive special attention through study of the Herbert F. Johnson Museum collection. The course will begin with an examination of Japan's earliest pottery traditions and end with a consideration of the wood-block prints of the nineteenth century. The museum collection will be used for written assignments.
[ART H 385 Chinese Painting \# \#
4 credits. Prerequisite: History of Art 383.
Not offered 1994-95.
M. W. Young.]
[ART H 386 Art of South Asia \# \#
4 credits. Not offered 1994-95.
S. J. O'Connor.]
[ART H 389 Japanese Painting \# \#
4 credits. Not offered 1994-95.]

## ART H 390 Introduction to the History of Islamic Art (also Near Eastern Studies 391) © \# <br> Fall. 4 credits.

E. S. Wolper.

This course is designed to be an introduction to the key issues in the formation and definition of the field of Islamic Art. The course analyzes recent changes in scholarly approaches to Islamic Art. Special emphasis is placed on the tension between separate national traditions and the concept of an older, more traditional, unified Islamic Art. Specifically, the course focuses upon the emergence of Spain, Turkey, and Iran as sites of indigenous and localized forms of Islamic Art. Lectures and discussions will provide a general introduction to the important monuments of Islamic art and a critique of how these monuments are understood and valued by competing scholarly traditions.

## ART H 396 The Arts of Southeast

## Asia 할

Spring. 4 credits.
S. J. O'Connor

The arts of Southeast Asia will be studied in their social context since in traditional societies art plays a role in most of the salient occasions of life. Special emphasis will be devoted to developments in Cambodia, Thailand, and Bali. Among topics covered will be the shadow puppet theater of Java, ceramics, architecture, and sculpture.

## Seminars

Courses at the 400 and 500 level are open to upperclass students, majors, and graduate students. All seminars involve the writing and presentation of research papers. Enrollment is limited to 15 students, and permission of the
instructor is required. Students may repeat courses that cover a different topic each semester.

## ART H 400 Proseminar for Art History Majors: The History and Practice of Art History

Fall. 4 credits. Prerequisite: History of Art majors only. Enrollment is limited.
K. Barzman.

Limited to majors in the department, this seminar focuses on methods and historiography. We will consider the various practices of ant history employed over the years in the analysis and interpretation of cultural production. Readings will focus on classic texts and major authors responsible for codifying these approaches. Papers will call upon students to put methods into practice and to think critically about their interpretive moves.

## ART H 401 Independent Study

Fall or spring. 2-4 credits. May be repeated for credit. Prerequisite: permission of a department faculty member.

Hours to be arranged. Staff Individual investigation and discussion of special topics not covered in the regular course offerings, by arrangement with a member of the department.

## ART H 402 Independent Study

Fall or spring. 2-4 credits. May be repeated for credit. Prerequisite: permission of a department faculty member.

Hours to be arranged. Staff. Individual investigation and discussion of special topics not covered in the regular course offerings, by arrangement with a member of the department.

## ART H 407 Seminar on Museum Issues

Fall. 4 credits. Prerequisite: permission of instructor. Limited enrollment. All classes will meet in the Johnson Art Museum Study Gallery.
M. W. Young, F. W. Robinson.

This undergraduate seminar will utilize the resources of the Johnson Art Museum and is designed to give students with a strong art history background the opportunity to work closely and directly with original objects from the museum's major collections. The course will focus on the broad issue of art and connoisseurship and will address critically the question of what determines quality in the work of art. Topics to be covered in the weekly sessions will include methods of attribution, fakes and forgeries, technique and media, restoration and conservation. Some sessions will involve curatorial staff of the museum. Frequent reports and a significant final paper will be expected of all participants. Enrollment is limited, and permission of the instructor is necessary before the first meeting. Students interested in this course should indicate so by notifying the department directly at the time of pre-registration.
[ART H 423 Ceramics (also Classics 423 and Archaeology 423) "
4 credits. Prerequisite: permission of instructor. Not offered 1994-95. A. Ramage.]
[ART H 424 Sardis and the Cities of Asia Minor (also Archaeology 432 and Classics 432)
4 credits. Not offered 1994-95
A. Ramage.]
[ART H 425 Seminar on the Bronze Age Architecture of Asia Minor \# 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
P. I. Kuniholm.]

ART H 427 Seminar on Roman Art and Archaeology (also Classics 435) \# Spring. 4 credits. Prerequisite: permission of instructor.
A. Ramage.

Topic for spring 1995: Art in the Cities of Asia Minor. The Romans in Asia Minor brought great prosperity to old and new centers which was expressed in civic buildings and lavish sculptural decoration. We shall look for the interplay of public and private as well as that of local and imperial in our investigations.
[ART H 434 The Rise of Classical Greece (also Classics 434) \#
4 credits. Recommended: Classics 220 or History of Art 220, Classics 221 or History of Art 221, or permission of instructor. Not offered 1994-95.
P. I. Kuniholm.]
[ART H 448 Studies in Sixteenth-Century European Art *
4 credits. Prerequisite; permission of instructor. Not offered 1994-95.
C. Lazzaro.]
[ART H 449 Problems in Interpretation of Italian Renaissance Art \#
4 credits. Prerequisite: permission of instructor. Not offered 1994-95. C. Lazzaro.]
[ART H 450 Women in Italian Renaissance Art (also Women's Studies 451) \#
4 credits. Prerequisite: permission of instructor. Not offered 1994-95. C. Lazzaro.]

ART H $\mathbf{4 5 1}$ Prints of the Fifteenth through the Seventeenth Century \# Spring. 4 credits, Prerequisite: permission of instructor. C. Lazzaro.

This seminar has several aims: to introduce students to prints-the techniques, styles, and issues of connoisseurship-and to the major printmakers of the period, including Marcantonio Raimondi, Durer, and Rembrandt; to give students first-hand experience with works of art in the Johnson Museum; and to consider the social and cultural issues raised in the medium of prints and through their unique visual language. These issues include the social hierarchies of class and gender (including witches), moral concerns and religious devotion, the construction and transmission of notions of antiquity and classicism, and the representation of the urban and rural environment. Students will give brief presentations on prints in the collection and longer ones of their own research projects on these and related topics.

## ART H 456 Seminar In Baroque Art \#

 Spring. 4 credits. Prerequisite: permission of instructor.K. Barzman.

Topics for 1994: Academies of Art and the Early Modern State. This seminar will examine the historical circumstances within which academies emerged in Western Europe (Italy, France, England) with particular attention to cultural politics; the formulation of programs of study within prevailing epistemological frameworks; the various practices
promoted within academies and their theoretical underpinnings; and works of art as expressions of academic discourse on truth, nature, and the body.
[ART H 461 Fin-de-siècle Cultures in Europe, England, and America * 4 credits. Prerequisite: permission of instructor. Auditing is not permitted. Not offered 1994-95.
L. L. Meixner.]

ART H 462 Topics in Early Modernism 4 credits. Prerequisite: permission of instructor. Auditing is not permitted. Not open to freshmen or sophomores.
L. L. Meixner

Resisting definition, post-impressionism is the complex term used to describe art between the nineteenth and twentieth centuries. Our purpose is to seek the threads connecting the diverse figures of the fin-de-siecle epoch, and thereby move toward an understanding of the common concerns of early modernists. We will investigate Picasso's Blue and Rose periods, early Matisse, the Symbolists at Pont Aven, Munch, Ensor, Toulouse-Lautrec, Van Gogh, Seurat, and Nabis, and Cezanne. Consumer culture, anarchy, socialist movements, mysticism, Freudian thought, and medieval revivalism provide our social context; also considered are the important roles of literary figures including lbsen, Strindberg, Mallarme, Poe, and James.

## ART H 463 Studies in Modern Art

Fall. 4 credits. Prerequisite: permission of instructor. No auditing permitted.
J. E. Bernstock.

Topic for 1994: Modern Sculpture. Developments in modern sculpture will be explored from their beginnings in the late nineteenth century. A wide range of styles, media, and content will be studied. The focus will be on major sculptors, such as Auguste Rodin, Constantin Brancusi, Henry Moore, David Smith, Alberto Giacometti, Louise Nevelson, George Segal, Donald Judd, Robert Morris, Eva Hesse, Richard Serra, and others.

## ART H 464 Studies in Modern Art

Spring. 4 credits. Prerequisite: permission of instructor. Auditing is not permitted.
J. E. Bernstock

Topic: to be announced.

## [ART H 466 Women Artists (also Women's Studies 404)

4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
J. E. Bemstock.]
[ART H 470 Postmodernist Art and Criticlsm (also Comparative Literature 474)
4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
H. Foster.]
[ART H 476 Seminar in American Art 4 credits. Not offered 1994-95.]
[ART H 477 Impressionism in America and France \#
4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
L. L. Meixner.]
[ART H 478 Post-Impressionism in France
4 credits. Not offered 1994-95
L. L. Meixner.]
[ART H 481 The Arts in Modern China 4 credits. Not offered 1994-95.
M. W. Young.J

ART H 482 Ceramic Art of China and Southeast Asia ; \#
Spring. 4 credits. Prerequisite: permission of instructor.

> S. J. O'Connor.

Chinese ceramics were a staple of the traditional trade of Asia for one thousand years. High-fired ceramics were also produced in Thailand and Vietnam to supply the brisk demand in maritime Southeast Asia The Johnson Museum collection will be studied within the context of trade patterns and trading sites in the South China Seas.
[ART M 483 Chinese Art of the T'ang Dynasty ©
4 credits. Not offered 1994-95.
M. W. Young.]
[ART H 484 Studies in Japanese Art and Architecture ©
4 credits. Not offered 1994-95.]

## [ART H 485 The Ceramic Arts of Japan ( \# <br> 4 credits. Not offered 1994-95.]

[ART H 486 Studies in Chinese Painting ©
4 credits. Not offered 1994-95. M. W. Young.]
[ART H 488 Traditional Arts of Southeast Asia (2)
4 credits. Not offered 1994-95. S. J. O'Connor.]

ART H 489 Miniature Paintings and Drawings of India ©
Fall. 4 credits. Prerequisite: permission of instructor.
S. J. O'Connor.

The seminar will focus on the miniature paintings created in both the Mughal and Rajput courts. Although each tradition has characteristic perceptual features and thematic preoccupations, artists and patrons moved between courts and there was also a remarkable degree of interchange and reciprocal influence. The cultural and political ambience will be explored.
[ART H 491 Japanese Prints *)
4 credits. Not offered 1994-95.]

## [ART H 496 History of Art Criticism

4 credits. Prerequisite: History of Art 260 or any 300-level course in modern art or literature, or permission of instructor. Not offered 1994-95.
H. Foster.]

ART H 520 Seminar in Classical Archaeology (also Classics 630 and Archaeology 520)
Spring. 4 credits. Prerequisite: permission of instructor.
P. I. Kuniholm.

Selected problems in Aegean Prehistory, including the Anatolian Neolithic, Bronze Age, and the rise of Classical Greece.
ART H 531 Problems in Medieval Art and Architecture (also Religious Studies 531)

Fall. 4 credits. Prerequisite: permission of instructor.
R. G. Calkins.

Topic for 1994: Methods of Medieval Architectural history
[ART H 540 Seminar in Renaissance Art 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
C. Lazzaro.]
[ART H 564 Problems in Modern Art: Post-1940 American Art
4 credits. Not offered 1994-95.]
[ART H 570 Theories of Modernism Topic: "The Shock of the New"? (also Comparative Literature 672) 4 credits. Prerequisite: permission of instructor. Not offered 1994-95. H. Foster.]
[ART H 580 Problems in Asian Art 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
S. J. O'Connor.]

## ART H 591-592 Supervised Reading

 591, fall; 592, spring. 4 credits. May be repeated for credit. Limited to graduate studentsStaff.
[ART H 594 Feminist Theory and the History of Art
4 credits. Prerequisite: permission of instructor. Not offered 1994-95.

## K. Barzman.]

[ART H 595 Methodology Seminar 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
H. Foster.]

## [ART H 596 Problems in Art Criticism

 4 credits. Not offered 1994-95S. J. O'Connor.]

## ART H 600 Honors Work

Fall or spring. 4 credits. Intended for senior art history majors who have been admitted to the honors program.

Hours to be arranged. Staff.
Basic methods of art historical research will be discussed and individual readings assigned, leading to the selection of an appropriate thesis topic.

## ART H 601 Honors Work

Fall or spring. 4 credits. Prerequisite: History of Art 600.

Hours to be arranged. Staff.
The student under faculty direction will prepare a senior thesis.

## INDONESIAN

See Department of Modern Languages and Linguistics.

## FALCON Program

J. U. Wolff, 307 Morrill Hall, 255-0733.

## ITALIAN LANGUAGE AND LINGUISTICS

See Department of Modern Languages and Linguistics.

## ITALIAN LITERATURE

See Department of Romance Studies.

## JAPANESE

See Departments of Asian Studies and Modern Languages and Linguistics.

## JAVANESE

See Department of Modern Languages and Linguistics.

## KHMER (CAMBODIAN)

See Department of Modern Languages and Linguistics.

## KNIGHT, JOHN S., WRITING PROGRAM

See John S. Knight Writing Program, p. 527.

## LATIN

See Department of Classics.

## LINGUISTICS

C. Rosen, director of undergraduate studies (311 Morrill Hall, 255-0722). See Department of Modern Languages and Linguistics.

## MATHEMATICS

P. Kahn, chair, F. Akman, E. Babson,
G. Bailey, D. Barbasch, L. Billera, J. Bramble,
K. Brown, L. Brown, J. Cao, S. Chase,
Z. Q. Chen, M. Cohen, R. Connelly,
R. K. Dennis, R. Durrett, E. Dynkin, C. Earle,
J. Escobar, R. Farrell, L. Gross, M. Gross,
J. Guckenheimer, A. Hatcher, D. Henderson,
S. Hersonsky, P. Holmes, J. Hubbard,
J. Hwang, H. Kesten, D. Kozen, R. C. Liu,
G. Livesay, M. Morley, A. Nerode, R. Platek,
T. Rishel, O. Rothaus, A. Schatz, S. Sen,
R. Shore, R. Sjamaar, J. Smillie, A. Solomon,
B. Speh, M. E. Stillman, R. Strichartz,
B. Sturmfels, M. Sweedler, M. Terrell,
R. Terrell, P. Thurston, K. Vogtmann,
L. Wahlbin, X. Wang, B. H. West, J. West,
A. C. Zitronenbaum. (Emeritus: W. Fuchs,
L. E. Payne, A. Rosenberg)

Mathematics is the language of modern science; basic training in the discipline is essential for those who want to understand, as well as for those who want to take part in, the important scientific developments of our time. Acquaintance with mathematics is also extremely useful for students in the social sciences and valuable for anyone interested in the full range of human culture and the ways of knowing the universe in which we live.

The Department of Mathematics faculty has strong groups specializing in algebra, number theory, real and complex analysis, Lie groups, topology and geometry, logic, probability and statistics, mathematical physics, and applied mathematics. Related departments at Cornell have specialists in computer science, operations research, linear programming, and game theory, and courses in these topics can
be integrated readily into the mathematics major.
The department offers a rich variety of undergraduate courses, and many of its beginning graduate courses are suitable for advanced undergraduates as well. Under some conditions, a student may carry out an independent reading and research project for college credit under the supervision of a faculty member.
Members of the department are available to discuss with students the appropriate course for their levels of ability and interest, and students are urged to avail themselves of this help.
Students who want to take any of the courses numbered 300 or above are invited to confer, before registering, with the instructor concerned. The level of a course is indicated by the first digit of the course number: roughly, 1,2 , indicate underclass courses; 3, 4, upperclass courses; 5,6, graduate courses. The subject matter of courses is often indicated by the second digit: 0 , general; 1,2 , analysis; 3, 4, algebra; 5,6, topology and geometry; 7, probability and statistics; 8, logic; 9 , other.
Midterm grades, when required, will be $S$ or $U$ only, except in special circumstances. In all 600 -level courses, all grades will be S-U only, with the exception of 690 . In courses with numbers below 600 , students will receive letter grades, with the exception of nonmathematics majors who have requested an S-U grade.

## Advanced Placement

Secondary school students are strongly urged to take one of the two advanced placement examinations of the College Entrance Examination Board in their senior year. Freshmen who have had some calculus but who have not taken an advanced placement examination should take the placement examination in mathematics offered at Comell just before the beginning of classes in the fall. It is most important that anyone with any knowledge of calculus carefully read "Advanced Placement," p. 5.

## The Major

The mathematics major adapts to a number of purposes. It can emphasize the theoretical or the applied. It can be appropriate for professionals and nonprofessionals alike. It can be broad or narrow. Questions concerning the major should be brought to a departmental representative.
Prerequisites: The traditional prerequisites are Mathematics 221-222 or 293-294. A unit on infinite series is required. Such a unit is offered in Mathematics 112, 122, and 192. Normally students will be admitted to the major only when they have grades of B - or better in all sophomore-level mathematics courses they have taken. Alternative prerequisites are Mathematics 213,231 , normally with grades of $\mathrm{B}+$ or better.

## Requirements

There are five requirements for the major:

1) Computer Science 100. Students are urged to take this course before the end of the sophomore year.
2) Two courses in algebra. Eligible courses are Mathematics 431 or 433,432 or 434 or 332, 336.
3) Two courses in analysis. Eligible courses are Mathematics 411 or 413,412 or 414 , 418,420 or $421,422,423,427,428$.
4) Further high-level mathematical courses. Any one of the following is sufficient:
a) four additional Mathematics courses numbered 300 or above.
b) (Concentration in Computer Science) five additional courses from i) and ii) below, of which at least one is from i) and three are from ii)
i) Mathematics courses numbered 300 or above
ii) Computer Science courses numbered 310 or above
c) (Concentration in Operations Research)
five additional courses from iii) and iv) below, of which at least one is from iii) and three are from iv)
iii) Mathematics courses numbered 300 or above
iv) courses in Operations Research and Industrial Engineering, typically out of $320-361$ (excluding 350) and/or out of 431-472.
These three alternatives do not exhaust the possibilities. For example, one very frequent double major is Economics/Math, in which case a suitable individual program can be put together in consultation with the student's adviser.
5) One course dealing with mathematical models. Any course from outside mathematics with serious mathematical content and dealing with scientific matters, provided the course has not been used toward satisfying the previous requirement, e.g., Physics 208, 213, or 217 (but not 112 or 207 ), or Computer Science 211 (if Computer Science option not used above). Students may consider courses from biology, chemistry, economics, and other fields; they should consult their adviser.
A course may be counted toward the mathematics major only if a grade of C - or better is received for that course.
Major advisers can alter these requirements upon request of an advisee, provided the intent of the requirements is met. (The requirements for Mathematics majors declared before July 1, 1994 are slightly different from what is stated here, particularly in respect to Requirement 4).

## Honors Program

The Department of Mathematics awards honors (cum laude) and high honors (magna cum laude and summa cum laude) to graduating mathematics majors who have demonstrated outstanding ability in the major program.
The awards are determined by the Mathematics Major Committee in the latter part of the semester prior to graduation. Normally, one requirement for honors is participation in the Honors Seminar (Math 401) for one semester,
or independent study at a high performance level. The committee will also be looking for excellent performance in mathematics courses, particularly in challenging courses at the 400 level or beyond. Students interested in honors should consult their major advisers concerning suitable courses.
To be considered for high honors, a student usually will be expected to write a Senior Thesis, and present it orally to the department. This project is carried out during the senior year under the supervision of a member of the Mathematics department faculty. Students interested in high honors should consult their major advisers and the Mathematics major director during the second semester of their junior year.

## Teacher Education in Science and Mathematics (TESM)

Students at Cornell may pursue teaching credentials in biology, chemistry, earth science, general science, mathematics, and physics. TESM is a university program jointly conducted by the departments of education and mathematics. Although TESM offers options for undergraduate and graduate study, most students enroll in a five-year program, which combines an undergraduate major in mathematics or one of the sciences with a one-year Master of Arts in Teaching (MAT). Students from any college at Comell are eligible to apply to the program as undergraduates. Students who complete their undergraduate studies and their student teaching are eligible for provisional teaching certification from the State Education Department, effective for five years. Students completing the graduate program can earn the master's degree required for permanent certification.
For more information, contact the TESM Student Support Specialist at 255-9255 or the program coordinator, D. Trumbull (Education) 255-3108 or, in Mathematics, A. Solomon 255-3894.

## Distribution Requirement

Virtually all Mathematics courses can be used to satisfy the Group 4 (Mathematics or Computer Science) Distribution Requirement I (for students through the class of 1995) or the Quantitative and Formal Reasoning part of Distribution Requirement II (beginning with students in the class of 1996). Explicit exceptions are noted in the beginning of the Arts and Sciences section of the Courses of Study.

## Basic Sequences

## Precalculus

## Description

1) Algebra and trigonometry to prepare students for calculus
2) Algebra, analytic geometry, elements of calculus

## Course

 NumbersMathematics
$109^{*}$ or Agriculture and Life Sciences $5^{*}$

Agriculture and Life Sciences 115**
**Students who want a second semester of mathematics after ALS 115 may take Mathematics 105 or if they need more calculus, 111.

## Calculus

## Description

1) Standard three-semester sequence for students who do not expect to take advanced courses in mathematics
2) Calculus for engineers (also taken by some

191-192-293-294 physical science majors)
3) Prospective mathematics majors and others who expect to take advanced courses in mathematics: many sequences are possible. For example, 111-112-221-222; or 121-122-221-222; or the engineering sequence 191-192-293-294; or a mix of the above. There is no specifically "approved" basic sequence for mathematics majors. Students should consult with their advisers for each individual case.
Mathematics 191 may be substituted for 111 in sequences 1 and 2. Sequences 2 and 3 are two-year sequences that include some linear algebra.
Students who take sequence 1 may learn some linear algebra by taking Mathematics 231. A student whose performance in 112 is exceptional may switch to sequence 2 and take 221.

## Special-Purpose Sequences

## Description

1) Finite mathematics and calculus for biology majors
2) Other possible finite mathematics and calculus sequence
Students who want to take two semesters of calculus are advised to take the first two semesters of one of the three calculus sequences. It is also possible to follow Mathematics 106 with 112 or 122.
Switching between calculus sequences is often difficult, especially at the 200 level. Students should not attempt such a switch without consulting the associate chair.

## Courses with Overlapping Content

Because the department offers many courses with overlapping content, students must choose their courses carefully to ensure that they will receive credit for each course they take. Listed below are groups of courses with similar content. Students will receive credit for only one of the courses in each group.

## 106, 111, 191

112,122 , and 192

213 and 294
213 and 222
221, 293, and 231
332 and 432
372 and 472
420 and 421

## Fees

In some courses there may be a small fee for computer lab use or for photocopying materials to be handed out to students.

## Undergraduate Course Offerings

Foundation courses: $105,106,107,109,111$, 112, 121, 122, 191, 192, 213, 221, 222, 293, 294 History of Math: 101, 403, 503
General Courses: 103, 104, 117, 123, 150, 151, $200,227,401,405,408,490,508,690$
Analysis: 411, 412, 413, 414, 418
Applied Mathematics and Differential Equations: 420, 421, 422, 423, 425, 427, 428
Algebra: $231,332,336,431,432,433,434$, 436
Geometry and Topology: 150, 151, 356, 451, 452, 453, 454, 455
Probability and Statistics: 171, 372, 471, 472, 473
Mathematical Logic: 481, 483, 486, 487

## MATH 101 History of Mathematics

Summer. 4 credits. Prerequisite: three years of high school mathematics.
The history of the main ideas of mathematics from Babylonian, Egyptian, and Greek times to the present day.

## MATH 103 Mathematical Explorations

Fall or spring. 3 credits. This course may be used to satisfy the distribution requirement in mathematics.
This course is for students who wish to experience how mathematical ideas naturally evolve. The homework will consist in the students actively investigating mathematical ideas. The course will emphasize ideas and imagination as opposed to techniques and calculations. Topics will vary depending on the instructor. Some assessment will be done through writing assignments.

## [MATH 104 Mathematics and Art

Fall. 3 credits. Does not satisfy the mathematics distribution requirement; for graduation credit only. Not offered 1994-95.
The impact of mathematical ideas on the arts and the impact of the arts on mathematical ideas through the ages, with a special emphasis on theories of perspective in the visual arts. The course will be cooperatively taught by a mathematician and an art historian. There will be both mathematical and artistic assignments based on the theories, and assignments of readings from the original texts.]

## MATH 105 Finite Mathematics for

 BiologistsFall or summer. 3 credits. Prerequisite: three years of high school mathematics, including trigonometry and logarithms.
Mathematical modeling, sets, functions, and graphing (including use of $\log$ and semi-log paper). Probability (with some applications to genetics). Matrices, systems of linear equations, and Markov chains. Examples from biology are used.
*Mathematics 109 and ALS 5 do not carry credit for graduation.

MATM 106 Calculus for Biologists
Spring. 3 credits. Prerequisite: Mathematics 105 or 109 or ALS 115 or permission of instructor. (A strong background in functions is required.) Mathematics 111 , rather than 106, is recommended for those planning to take 112.*
Introduction to differential and integral calculus, partial derivatives, elementary differential equations. Examples from biology are used.

## MATH 107 Mathematics for the Social Sciences

Fall. 3 credits
This course consists of an introduction to several topics in mathematics such as: permutations and combinations, probability theory, matrices, limits, derivatives, exponential and logarithmic functions. The goal is to enable a social science student to understand some principles and applications of mathemat ics. Fall 1994 enrollment is restricted to ILR students.

## MATH 109 Precalculus Mathematics

Summer. 3 transcript credits only; cannot be used toward graduation.
This course is designed to prepare students for Mathematics 111. Algebra, trigonometry, logarithms, and exponentials are reviewed.

MATH 111 Calculus
Fall, spring, or summer. 4 credits. Limited to 22 students a section. Prerequisite: Mathematics 109 or three years of high school mathematics, including trigonometry.* Plane analytic geometry, differentiation and integration of algebraic and trigonometric functions, applications of differentiation, logarithmic and exponential functions.

## MATH 112 Calculus

Fall, spring, or summer. 4 credits. Limited to 22 students a section. Prerequisites: Mathematics 106 or 111 with a grade of C or better. Those who do well in Mathematics 111 should take 122 instead of 112 , unless they plan to continue with 213.
Methods and applications of integration, plane curves and polar coordinates, vectors and solid analytic geometry, introduction to partial derivatives, infinite series.

## [MATH 117 Foundations of Calculus

 Spring. 3 credits. Prerequisite: Mathematics 111 or 106 or equivalent. May be used toward the mathematics distribution requirement. Intended for nonscientists who will not need the conventional second-semester calculus course. (May also be used by future math or science majors who would like to deepen their understanding before going on in calculus.) Not offered 1994-95.This course delves into the questions concerning limits and infinite processes that puzzled scholars for over two thousand years. Students study anew the real number system, the theory of limits, continuity, differentials, derivatives, and the definite integral. The pedagogical method is partly historical, viewing the development of these interlocked topics from the time of the ancient Greeks (Zeno's paradoxes, the discovery of irrationals Eudoxus' Method of Exhaustion, and the work of Archimedes) through the seventeenthcentury work of Fermat, Newton, and Leibniz and into modern times. Readings of excerpts

[^4]from original manuscripts are compared with the descriptions of the same material given in a standard beginning calculus book.]

## MATH 121 Modern Calculus

Fall. 4 credits. Limited to 22 students per section. Prerequisite: Three years of high school mathematics, including calculus. This is a first-semester honors course in calculus intended for students who have had calculus in high school. The course material will be the same as that in Math 111, but it will be covered in greater depth

## MATH 122 Calculus

Fall or spring. 4 credits. Prerequisite: one semester of calculus with a high performance or permission of the department. Students planning to continue with Mathematics 213 are advised to take 112 instead of this course." Differentiation and integration of elementary transcendental functions, the techniques of integration, applications, polar coordinates, infinite series, and complex numbers, as well as an introduction to proving theorems. The approach is more theoretical than in Mathematics 112

## MATH 123 Analytic Geometry and Calculus

Summer. 4 credits. Prerequisite: High school mathematics through trigonometry and plane analytic geometry
The honors section of Math 111. Covers the same topics more deeply (at the level of Apostol's Calculus).

## MATH 150 From Space to Geometry

 Spring. 3 credits.Over the centuries mathematicians have interpreted the concept of "space" in numerous ways. This course will survey some of these approaches from the time of Euclid to the later perspective of non-Euclidean systems. We will evaluate the impact of these viewpoints on such concepts as distance, angle measurement, straightness and curvature, dimension, and surface. We will make and analyze models to get a feel for the concepts and to assess the relevance of various approaches to geometry

## [MATH 151 The Geometry of Tilings, Polyhedra, and Structural Engineering

Spring. 3 credits. Not offered 1994-95 An introduction to topics in geometry, including the classification of tilings by the group of symmetries that act on them, examples of artists such as Escher, the aperiodic tilings of R. Penrose, the study of polyhedra, Euler's formula, regular polyhedra, linkages that draw straight lines, "Buckminster Fuller's" geodesic domes, and tensegrities. Emphasis will be on the geometric ideas involved, with formal proofs studied only as needed for overall understanding.]

## MATH 171 Statistical Theory and

 Application in the Real World Fall or spring. 4 credits. Prerequisites: high school mathematics.This introductory statistics course will discuss techniques for analyzing data occurring in the real world and the mathematical and philosophical justification for these tech niques. Topics include population and sample distributions, central limit theorem, and statistical theories of point estimation,

See the list of courses with overlapping content at the end of the introduction
confidence intervals, and testing hypotheses, the linear model, and the least squared estimator. The course concludes with a discussion of tests and estimates for regression and analysis of variance (if time permits). The computer will be used to demonstrate some aspects of the theory, such as sampling distributions and the Central Limit Theorem. In the lab portion of the course, students will learn and use computer-based methods for implementing the statistical methodology presented in the lectures. (No previous familiarity with the computer is presumed.)

## MATH 191 Calculus for Engineers

 Fall. 4 credits. Limited to 25 students per section. Prerequisite: three years of high school mathematics, including trigonometry.One section will be taught with computer experimentation, and will carry an extra credit.
Plane analytic geometry, differential and integral calculus, and applications.

## MATH 192 Calculus for Engineers

 Fall, spring, or summer. 4 credits. Prerequisite: Mathematics 191.*Methods of integration, hyperbolic functions, polar coordinates, infinite series, complex numbers, introduction to partial derivatives, introduction to surface and volume integrals

## [MATH 200 Basic Concepts of Mathematics

Summer. 3 credits. Prerequisite: a good knowledge of high school mathematics, including trigonometry. Not offered 1994-95 Discussion of basic ideas in mathematics drawn from algebra and topology. An example of the problems treated is the proof of the impossibility of trisecting an angle by ruler and compass. Suitable for teachers, prospective teachers, and high school students with a strong interest in mathematics.]

## MATH 213 Calculus

Fall or spring. 4 credits. Prerequisite: Mathematics 112, 122, or 192.*
Vectors, vector-valued functions, line integrals. Multivariable calculus, multiple integrals. Firstand second-order differential equations with applications. Introduction to numerical methods, series solutions, systems of differential equations, elementary partial differential equations.

MATH 221 Linear Algebra and Calculus Fall or spring. 4 credits. Prerequisite: two semesters of calculus with a grade of B or better, or permission of instructor." Linear algebra and differential equations. Topics include vector algebra, linear transformations, matrices, linear differential equations, as well as an introduction to proving theorems.

## MATH 222 Calculus

Fall or spring. 4 credits. Prerequisite Mathematics 221.*
Vector differential calculus, calculus of functions of several variables, multiple integrals.
*See the list of courses with overlapping
content at the end of the introduction.

## [MATH 227 Mathematical Model Modeling

Spring. 4 credits. Prerequisite: Mathematics 111 or 106 or equivalent. May be used to satisfy the mathematics distribution requirement. Not intended for upperclass science majors. Not offered 1994-95.
Mathematical modeling is the process of bringing mathematical methods to bear on problems arising in the real world. In this course students will study selected mathematical models, learn general modeling techniques, and gain experience in constructing original mathematical models and comparing their predictions with reality, both to appreciate the usefulness of mathematical models and to be aware of their limitations.]

## MATH 231 Linear Algebra

Spring. 3 credits. Prerequisite: Mathematics 111 or equivalent.*
Vectors, matrices, and linear transformations, affine and Euclidean spaces, transformation of matrices, and eigenvalues.

MATH 293 Engineering Mathematics Fall, spring, or summer. 4 credits. Prerequisites: Mathematics 192 plus a knowledge of computer programming equivalent to that taught in Engineering Common Courses 100. In exceptional circumstances, Mathematics 192 and 293 may be taken concurrently.* Introduction to physical vectors, linear algebra and matrix theory, inner product spaces. May include computer use in solving problems.

## MATH 294 Engineering Mathematics

Fall, spring, or summer. 4 credits. Prerequisite: Mathematics 293.*
Systems of linear ordinary differential equations, introduction to ordinary differential equations. Vector fields and vector calculus. Introduction to boundary-value problems and Fourier series. May include computer use in solving problems.

## MATH 332 Algebra and Number Theory

Fall. 4 credits. Prerequisites: one year of calculus and one course from Mathematics 221, 231, and 294. Mathematics 332 does not satisfy prerequisites for courses numbered 500 and above."
Various topics from modern algebra and number theory, usually including rings, fields, and finite groups. Motivation and examples are derived mostly from geometry, arithmetic, and congruence problems on the integers.

## MATH 336 Applicable Algebra

Spring. 4 credits. Prerequisites: Mathematics 221, 294, or 231.
An introduction to concepts and methods of abstract algebra that are of importance in science and engineering. Applications of the theory to concrete problems will be stressed. Each year the course will treat aspects usually chosen from the following topics: partially ordered sets, lattices, graph theory, and Boolean algebras; finite machines and languages; applications of groups, fields, and modular arithmetic, such as Latin squares, elementary coding theory, or fast Fourier transform; difference equations. Additional topics may be chosen by the instructor.
*See the list of courses with overlapping content at the end of the introduction.

MATH 356 Groups and Geometry
Spring. 4 credits. Prerequisites: Math 221222, or Math 293-294, or Math 213 and 231 Groups were introduced in the nineteenth century as the set of symmetries of an algebraic or geometric object, and this viewpoint is a central one in modern mathematics. This course studies Euclidean and non-Euclidean (especially hyperbolic) geometry in terms of the groups of symmetries of the relevant spaces. Prior knowledge of groups is not a prerequisite. Groups of transformations. Subgroups and cosets. Homomorphisms and isomorphisms of groups. Orbits and fixed points. Frieze groups and wallpaper groups and associated tesselations of the Euclidean plane. Geometry and trigonometry of the hyperbolic plane. Tesselations of the hyperbolic plane.

## [MATH 372 Elementary Statistics

Fall. 4 credits. Not offered 1994-95.
Prerequisites: one year of calculus, and Computer Science 100 or 101 or 108 or permission of instructor. A terminal course for students who will take no further courses in statistics.*
Introduction to the principles underlying modern statistical inference, to the practical application of statistical techniques, and to the rationale underlying the choice of statistical methods in various situations. Topics in probability that are essential to an understanding of statistics. Homework involves statistical analysis of data sets on hand calculators and on a computer by means of packaged programs.|

## MATH 401 Honors Seminar: Topics in Modern Mathematics

Spring. 4 credits.
This course is a participatory seminar primarily aimed at introducing senior and junior mathematics majors to some of the challenging problems and areas of modern mathematics. The seminar will help students develop research and expository skills in mathematics, which is important for careers in any field that makes significant use of the mathematical sciences (i.e., pure or applied mathematics, physical or biological sciences, business and industry, medicine). The content will vary from year to year.

MATH 403 History of Mathematics
Spring. 4 credits. Prerequisites: two courses in mathematics above 300, or permission of instructor.
Survey of the development of mathematics from antiquity to the present, with an emphasis on the achievements, problems, and mathematical viewpoints of each historical period and the evolution of such basic concepts as number, geometry, construction, and proof. Readings from original sources in translation. Students will be required to give oral and written reports.

## MATH 405 Mathematical Exposition

Fall. 3 credits.
A seminar in mathematics and its applications to other fields. Students are asked to have had at least two years of college-level mathematics. Course work will consist of discussions, written projects, and student talks. The content of these discussions, projects, and talks will vary, to be determined by the instructor in consultation with the students.

See the list of courses with overlapping
content at the end of the introduction.

MATH 408 Mathematics in Perspective Spring. 4 credits. Prerequisite: consent of instructor (intended for senior mathematics majors and other students with strong mathematics backgrounds).
The purpose of this course is for students to step back and to form an overview of the mathematics they have learned.

MATH 411-412 Introduction to Analysis 411, fall; 412, spring. 4 credits each term. Prerequisite: Mathematics 222. Students who need measure theory and Lebesgue integration for advanced probability courses should take Mathematics 413-414 or arrange to audit the first few weeks of Mathematics 521. Undergraduates who plan to attend graduate school in mathematics should take 413-414. An introduction to the theory of functions of real variables, stressing rigorous logical development of the subject rather than technique of applications. Topics include Euclidean spaces, the real number system, continuous and differentiable functions, Riemann integral, uniform convergence and approximation theorems, Fourier series, calculus in several variables, and differential forms.

MATM 413-414 Introduction to Analysis 413, fall; 414, spring. 4 credits each. Prerequisite: Mathematics 222.
Honors version of Mathematics 411-412. Metric spaces are included in Mathematics 413 , and 413 proceeds at a faster pace than 411. The second semester includes an introduction to the Lebesgue integral.

MATH 418 Introduction to the Theory of Functions of One Complex Variable Spring. 4 credits. Prerequisite: Mathematics 222 or 294 or 213 . May be offered only in alternate years.
A rigorous introduction to complex variable theory. Complex numbers. Differential and integral calculus for functions of a complex variable, including Cauchy's theorem and the calculus of residues. Elements of conformal mapping.

## MATH 420 Applicable Analysis

Fall or spring. 4 credits. Prerequisites: high level of performance in Mathematics 294; or 221 and 222; or permission of instructor. Graduate students who need mathematics extensively in their work and who have had solid courses in calculus and complex variables should take Mathematics 515-516 With less preparation they should take Mathematics 420 (or 421)-422-423.* Ordinary differential equations in one and higher dimensions: qualitative, analytic, and numerical methods, with physical applications. Some important partial differential equations (heat equation, wave equation, and vibrating membrane) and their connections with Fourier series and the Laplacian. Vector calculus and Stokes Theorem, with applications to electromagnetism. Mathematics 420 has substantial overlapping content with Mathematics 421, but more strongly emphasizes the mathematical properties of solutions of ordinary differential equations and the approximation to such solutions by numerical and computer methods.

[^5]MATH 421 Applicable Analysis
Fall, spring, or summer. 4 credits. Prerequisites: high level of performance in Mathematics 294, or 221 and 222, or 213 and 231 Graduate students who need mathematics extensively in their work and who have had solid courses in calculus and complex variables should take Mathematics 515-516 With less preparation they should take Mathematics 420 (or 421)-422-423.* A survey of the techniques of classical analysis that are of primary use in applications to the physical sciences and engineering, especially boundary value problems for partial differen tial equations. Review of theorems of Green, Gauss, and Stokes, etc. Sequences and infinite series. Fourier series and orthogonal functions. Ordinary differential equations. Solution of partial differential equations by separation of variables. Mathematics 421 has substantial overlapping content with Mathematics 420 .

MATH 422 Applicable Analysis
Fall, spring, or summer. 4 credits. Prerequi site: Mathematics 420 or 421 Complex variables, Fourier transforms, Laplace transforms. Additional topics may include: An introduction to generalized functions. Applications to partial differential equations

## MATH 423 Applicable Analysis

Spring. 4 credits. Prerequisite: Mathematics 420 or 421 ; however, students who have not taken 422 should talk to the instructor before taking this course
Normed vector spaces. Elementary Hilbert space theory. Projections. Fredholm's alternative. Eigenfunction expansions. Applications to elliptic partial differential equations and to integral equations.

## MATH 425 Numerical Solutions of Differential Equatlons

Spring. 4 credits. Prerequisites: Mathematics 222 or 294, one course numbered 300 or higher in mathematics, or permission of instructor
Methods and basic theory for the numerical solution of ordinary and partial differential equations. Linear muitistep methods, RungeKutta methods, and the problem of stiffness for ordinary differential equations. Finite difference methods and Galerkin finite element methods for partial differential equations. Homework will involve use of a computer.

## MATH 427 Introduction to Ordinary Differential Equations

Fall. 4 credits. Prerequisite: Mathematics 222 or 294 or permission of instructor. Covers the basic existence, uniqueness, and stability theory together with methods of solution and methods of approximation. Topics include singular points, series solutions, Sturm-Liouville theory, transform methods, approximation methods, and application to physical problems.

## MATH 428 Introduction to Partial Differential Equations

Spring. 4 credits. Prerequisite: Mathematics 222 or 294 or permission of instructor. Topics selected from first-order quasilinear equations, classification of second-order equations, with emphasis on maximum principles, existence, uniqueness, stability Fourier series methods, approximation methods.

[^6]MATH 431-432 Introduction to Algebra 431, fall or spring or summer; 432, spring. 4 credits each. Prerequisite: Mathematics 221 or 231. Undergraduates who plan to attend graduate school in mathematics should take 433-434.*
431: An introduction to linear algebra, including the study of vector spaces, linear transformations, matrices, and systems of linear equations; quadratic forms and inner proctuct spaces; canonical forms for various classes of matrices and linear transformations; determinants. 432: an introduction to various topics in abstract algebra, including groups, rings, fields, factorization of polynomials and integers, congruences, and the structure of finitely generated modules over Euclidean domains with application to canonical forms of matrices.

MATH 433-434 Introduction to Algebra
433, fall; 434, spring. 4 credits each. Prerequisite: Mathematics 221 or 231 Honors version of Mathematics 431-432. Mathematics 433-434 will be more theoretical and rigorous than 431-432 and will include additional material such as multilinear and exterior algebra

## [MATH 436 Applications of Abstract

 AlgebraSpring. 4 credits. Not offered 1994-95. Prerequisites: Linear algebra (Math 231 or higher); Math 336 is not a prerequisite; familiarity with elementary algebra or number theory such as Math 332 would be helpful The course is intended for students who would like to learn modern algebra and its applications outside of mathematics. There will be at least as much emphasis on applications as the relevant modern algebra. Frequently, the applications involve or were made possible by the advent of computers. Students who already know the modern algebra covered in the course may still find the applications to be of interest. Specific topics will be chosen by the instructor. The algebra typically includes items drawn from: elementary number theory, polynomials and ring theory, monoids and group theory, real closed fields, algebraic combinatorics, Groebner bases, algebraic geometry, field theory. The applications and related ropics typically include items drawn from: complexity theory, coding theory, encryption, discrete and fast Fourier transform, primality testing, factoring integers and polynomials, root counting and isolation, solving systems of polynomial equations, formal language theory and automata.
Math 336 and 436 may overlap in choice of material. Where they overlap, the coverage in Math 436 will be of greater depth appropriate to a 400 -level course. Students cannot get credit for both Math 336 and Math 436.]

MATH 451 Euclidean and Spherical Geometry
[Fall] and spring. 4 credits. Prerequisite Mathematics 221 or 231 or permission of instructor. [Not offered fall 1994.]
Topics from Euclidean and spherical (nonFuclidean) geometry. A non-lecture, seminarstyle course organized around student participation.

[^7]MATH 452 Classical Geometries
Fall. 4 credits. Prerequisites: Mathematics 221 or its equivalent.
This is an introduction to hyperbolic, spherical, and projective geometry-the classical geometries that developed as Euclidean geometry was better understood. For example. the historical problem of the independence of Euclid's fifth postulate is understood when the existence of the hyperbolic plane is realized. Straightedge (and compass) constructions and stereographic projection in Euclidean geometry can be understood within the structure of projective geometry. Topics in hyperbolic geometry include models of the hypertoolic plane and relations to spherical geometry. Topics in projective geometry include homogeneous coordinates and the classical theorems about conics and configurations of points and lines. Optional topics include principles of perspective drawing, finite projective planes, orthogonal Latin squares, and the cross ratio

MATH 453 Introduction to Topology Fall. 4 credits. Prerequisites: Mathematics 411 and 221 , or permission of instructor. Basic point set topology, connectedness, compactness, metric spaces, fundamental group. Application of these concepts to surfaces such as the torus, the Klein bottle, the Moebius band

## MATH 454 Introduction to Differential

 GeometrySpring. 4 credits. Prerequisites: Mathematics 222 or 294 , plus at least one mathematics course numbered 300 or above. Mathematics 453 is not a prerequisite.
Differential geometry of curves and surfaces. Curvature, geodesics, differential forms Introduction to $n$-dimensional Riemannian manifolds. This material provides some background for the study of general relativity; connections with the latter will be indicated.

## MATH 455 Applicable Geometry

Fall. 4 credits
In general, this course will cover various applicable topics to be chosen from among the geometry of convex bodies, polyhedra, algebraic curves and surfaces, rigid polyhedra, crystallographic patterns, projections and similar topics. Computational aspects of geometry will be included where appropriate.

## MATH 471 Basic Probability

Fall. 4 credits. Prerequisite: Mathematics 221. May be used as a terminal course in basic probability. Intended primarily for those who will continue with Mathematics 472 Topics include combinations, important probability laws, expectations, moments, moment-generating functions, limit theorems. Emphasis is on diverse applications and on development of use in statistical applications See also the description of Mathematics 571.

## MATH 472 Statistics

Spring. 4 credits. Prerequisite: Mathematics 471 and knowledge of linear algebra such as taught in Mathematics 221. Some knowledge of multivariate calculus helpful but not necessary.*
Classical and recently developed statistical procedures are discussed in a framework that emphasizes the basic principles of statistical

[^8]inference and the rationale underlying the choice of these procedures in various settings. These settings include problems of estimation, hyporhesis testing, large sample theory.
[MATH 473 Further Topics in Statistics Fall. 4 credits. Prerequisite: Mathematics 472 or 574. Not offered 1994-95.
More detailed discussion of some of the topics not covered at length in Mathematics 472.
Design and analysis of experiments. Multi-
variate analysis. Nonparametric inference; robustness. Sequential analysis. For corresponding subject matter taught in more detail, see description of Mathematics 573 and 675.1

MATH 481 Mathernatical Logic (also Philosophy 431)
Spring. 4 credits. Prerequisite: Mathematics 221
Propositional and predicate logic. Classical proof procedures. Completeness and compactness. Decidability and undecidability. The Godel incompleteness theorem. Elements of set theory.

## MATM 483 Intensional Logics and Alternatives to Classical Logics (also Philosophy 436)

Spring. 4 credits. Prerequisite: one previous course on logic or permission of the instructor.
Review of derivations and models for logic; introduction to the abstract theory of consequence-relations, derivations and Kripke models for classical normal modal logics (including Soundness and Completeness Theories). Time permitting: logics of subjunctive conditionals, relation of modal and intuitionistic logic.

## MATH 486 Applied Logic (also Computer Science 486\}

Spring. 4 credits. Prerequisites: Mathematics 222 or 294 , Computer Science 100, and some additional course in mathematics or Computer Science 381.
Propositional and predicate logic, compactness and completeness by tableaux. Equational logic. Herbrand Universes, the resolution method, and unification. Rewrite rules and equational logic. Knuth-Bendix method and the congruence closure algorithm and lamda-calculus reduction strategies. Restrictions on resolution and their completeness. Introduction to automatic theorem proving. Topics in Prolog, Lisp, or ML on microcomputers or, possibly, exposure to a larger system such as Nuprl. Input resolution and Prolog. Applications to expert systems and program verification.

## [MATH 487 Applied Logic II

Spring. 4 credits. Not offered 1994-95. Prerequisite: Mathematics 221 or equivalent. Intuitionistic propositional and predicate logic. Natural deduction and tableaux as proof procedures. Curry partial application structures. Their polynomial extensions as lambda calculi. Typed and untyped lambda calculi, cartesian closed categories. Heyting semantics of constructions as interpretations in partial combinatory structures, Kleene realizabilities. Curry-Howard isomorphisms. Intuitionistic first order arithmetic and Godel's system T. Intuitionistic higher order logic and polymorphism. Weak and strong nomalizations for simple and polymorphic calculi. Application to consistency proofs. Term extraction as the context for understanding compilers and interpreters for applicative
languages such as LISP, NUPRL, MIRANDA, etc.]

## MATH 490 Supervised Reading and Research

Fall, spring, or summer. 1-6 credits. Supervised reading and research by arrangement with individual professors. Not applicable for material currently available in regularly scheduled courses.

## Graduate Courses

Students interested in taking graduate courses in mathematics should consult the department for further course details, times, and possible changes in courses as described below.

## [MATH 503 History of Mathematics

4 credits. Prerequisites: Mathematics 511 and 531. Intended for graduate students in the mathematical sciences. Not offered 1994-95. This course will be devoted to the history of mathematics in the nineteenth century from the original sources, with emphasis on the history of the foundations of analysis and of the foundations of commutative algebra. Typical authors in algebra who will be studied are Lagrange, Ruffini, Gauss, Abel, Galois, Dirichlet, Kummer, Kronecker, Dedekind, Weber, M. Noether, Hilbert, Steinitz, Artin, and E. Noether. Typical authors in analysis who will be studied are Cauchy, Fourier, Bolzano, Dirichlet, Riemann, Weierstrass, Heine, Cantor, Peano, and Hilbert. If time permits, a sketch will be given of the history of probability and statistics from Bernoulli to Pearson. Students will be required to read and explain one important nineteenth-century paper.]

## MATH 508 Mathematics for Secondary

 School TeachersFall, spring, or summer. 1-6 credits. Prerequisite: secondary school mathematics teacher, graduate standing, or permission of instructor. May not be taught every semester. An examination of the principles underlying the content of the secondary school mathematics curriculum, including connections with the history of mathematics and current mathematics research.

## MATH 511-512 Real and Complex Analysis <br> 511, fall; 512, spring.

511: measure and integration, functional analysis. 512: complex analysis, Fourier analysis, and distribution theory.

## MATH 513-[514] Topics in Analysis

 513, fall; [514, spring, not offered 1994-95].
## MATH 515-516 Mathematical Methods in

 Physics515, fall; 516, spring. 4 credits each. Intended for graduate students in physics or related fields who have had a strong advanced calculus course and at least two years of general physics. A knowledge of the elements of finite dimensional vector space theory, complex variables, separation of variables in partial differential equations, and Fourier series will be assumed. The course overlaps with parts of Mathematics 421-422423. Undergraduates will be admitted only with permission of instructor. Mathematics 515 is a prerequisite for 516 .
Topics designed to give a working knowledge of the principal mathematical methods used in advanced physics. A brief discussion of some basic notions: metric space, vector space, linearity, continuity, integration. Generalized functions (Schwartz distributions). Fourier
series and Fourier integrals. Saddle point method. Linear operators. Differential operators and integral operators, the equations and eigenvalue problems connected with them and the special functions arising from them. Elements of group theory. The rotation group and its representations.

## [MATH 517 Dynamical Systems

Fall. Not offered 1994-95.
Topics: Existence and Uniqueness Theorems for ODEs. Poincare-Bendixon theorem and global properties of two dimensional flows. Limit sets, non-wandering sets, chain recurrence, pseudo-orbits and structural stability. Linearization at equilibrium points: stable manifold theorem and the HartmanGrobman theorem. Generic properties: transversality theorem and the Kupka-Smale theorem. Examples: expanding maps and Anosov diffeomorphisms. Hyperbolicity: the horseshoe and the Birkhoff-Smale theorem on transversal homoclinic orbits. Rotation numbers: Herman's theorem. Characterization of structurally stable systems.]
[MATH 518 Smooth Ergodic Theory
Spring. Not offered 1994-95.
Topics: Invariant measures. Entropy. Hausdorff dimension and related concepts. Hyperbolic invariant sets: Stable manifolds, Markov partitions and symbolic dynamics. Equilibrium measures of hyperbolic attractors. Ergodic theorems. Pesin theory: stable manifolds of non-hyperbolic systems. Liapunov exponents: relations between entropy, exponents and dimensions.]
MATH 519-520 Partial Differential Equations
519, fall; 520, spring
Basic theory of partial differential equations.
MATH 521 Measure Theory and Lebesgue Integration
Fall.
Measure theory, integration, and Lp spaces.

## MATH 522 Applied Functional Analysis

Spring.
Basic theory of Hilbert and Banach spaces and operations on them. Applications.

## MATH 531-532-[534] Algebra

531, fall: 532, spring; [534, not offered
1994-95.]
531: finite groups, field extensions, Galois theory, rings and algebras, tensor and exterior algebra. 532: Wedderburn structure theorem, Brauer group, group cohomology, 534: Dedekind domains, primary decomposition, Hilbert basis theorem, local rings.

## [MATH 537 Analytic Number Theory

Fall. Prerequisites: Math 511, 521, 431. Not offered 1994-95.
Topics: The Prime Number Theorem. Primes in Arithmetic Progressions. The Large Sieve and Some of its Applications.]

## MATH 549-[550] Lie Groups and Lie

 Algebras549, fall; [550, spring, Not offered 1994-95.] Prerequisites: 413-414 and 431-432 or equivalent. This is a year-long introduction to the theory of Lie groups and their representation theory for beginning graduate students Topics: Topological groups. Lie groups. Relation between Lie algebras and Lie groups; exponential map. Homogeneous manifolds. Compact groups and their representation theory. Enveloping algebras and invariant differential operators. Structure of root
systems, Coxeter groups. Classification of simple Lie algebras and Lie groups. More advanced topics: quantum groups, KacMoody algebras

## MATH 551 Introductory Algebraic Topology <br> Spring.

Fundamental group and covering spaces. Homology theories for complexes and spaces

MATH 552-[553] Differentiable Manifolds 552 fall, [553 not offered 1994-95.] Prerequisites: advanced calculus, linear algebra (Mathematics 431), point set topology (Mathematics 453). This is a year-long introduction to differential topology and differential geometry at the level of the beginning graduate student.
Topological manifolds. Smooth manifolds, immersions and embeddings, tangent bundles, fiber bundles, vector fields and dynamical systems, Froebenius' theorem. Lie groups. Integration on manifolds, differential forms, Stokes theorem. Tubular neighborhoods, transversality and cobordism. Connections, Riemannian manifolds, geodesics, curvature, Gauss-Bonnet theorem.

## MATH 561 Geometric Topology

Fall.
Topics from general topology. Introduction to geometric properties of manifolds.

## MATH 571-572 Probability Theory

571, fall; 572, spring. Prerequisite: a knowledge of Lebesgue integration theory, at least on the real line. Students can learn this material by taking parts of Mathematics 413-414 or 521
Properties and examples of probability spaces Sample space, random variables, and distribution functions. Expectation and moments. Independence, Borel-Cantelli lemma, zero-one law. Convergence of random variables, probability measures, and characteristic functions. Law of large numbers. Selected limit theorems for sums of independent random variables. Markov chains, recurrent events. Ergodic and renewal theorems. Martingale theory. Brownian motion and processes with independent increments.

MATH 571-574 Probability and Statistics 571, fall; 574 , spring. This course is a prerequisite to all advanced courses in statistics.
571: same as Mathematics 571 above. 574: topics include an introduction to the theory of point estimation, consistency, efficiency, sufficiency, and the method of maximum likelihood; the classical tests of hypotheses and their power; the theory of confidence intervals; the basic concepts of statistical decision theory; the fundamentals of sequential analysis. Intended to furnish a rigorous introduction to mathematical statistics
[MATH 573 Experimental Design, Multivariate Analysis
Not offered 1994-95.
Rationale for selection of experimental designs and algorithms for constructing optimum designs. Optimum properties and distribution theory for classical analysis of variance procedures and their simplest multivariate analogues.]
[MATH 575 Sequential Analysis, Multiple Decision Problems
Fall. Not offered 1994-95. Prerequisite: a course in mathematical statistics such as Mathematics 574. .

## MATH 577 Nonparametric Statistics

Fall. Not offered 1994-95.
A study of nonparametric techniques, especially order statistics, rank order statistics, scores, local optimality properties, and perhaps some asymptotic theory.]

## MATH 581 Logic

Spring.
Basic topics in mathematical logic, including propositional and predicate calculus; formal number theory and recursive functions completeness and incompleteness theorems.

MATH [611]-612 Seminar in Analysis [611, fall, not offered 1994-95]; 612, spring.

## MATH 613 Functional Analysis

 FallTopological vector spaces. Banach and Hilbert spaces, Banach algebras. Additional topics to be selected by instructor.

## [MATH 615 Fourier Analysis

Fall. Not offered 1994-95.]

## MATH 617 Applied Dynamical Systems

 (also T8AM 776)Fall. 3 credits. Suggested prerequisite: T\&AM 675, Mathematics 517, or equivalent. Review of planar (single-degree-of-freedom) systems. Local and global analysis. Structural stability and bifurcations in planar systems Center manifolds and normal forms. The averaging theorem and perturbation methods. Melnikov's method. Discrete dynamical systems, maps and difference equations, homoclinic and heteroclinic motions, the Smale Horseshoe and other complex invariant sets. Global bifurcations, strange attractors, and chaos in free and forced oscillator equations. Applications to problems in solid and fluid mechanics.
[MATH 622 Riemann Surfaces
Fall. Not offered 1994-95.]
[MATH 623 Several Complex Variables Not offered 1994-95.]

## [MATH 627-628 Seminar in Partial

 Differential Equations627, fall; 628, spring. Not offered 1994-95]

## MATH 631-632 Seminar in Algebra

631, fall; 632, spring
MATH 635 Topics in Algebra

## Spring

Selection of advanced topics from algebra, algebraic number theory, and algebraic geometry. Course content varies.
[MATH 637 Algebraic Number Theory Spring. Not offered 1994-95.]

## [MATH 639 Topics in Algebra II

Fall. Not offered 1994-95.
Selection of advanced topics from algebra, algebraic number theory, and algebraic geometry. Course content varies.]

## MATH 640 Homological Algebra Spring.

MATH 651-652 Seminar in Topology 651, fall; 652, spring.

MATH 653-[654] Algebraic Topology
653, spring; [654, spring, not offered 1994-95.] Duality theory in manifolds, applications, cohomology operations, spectral sequences, homotopy theory, general cohomology theories, categories and functors.

## [MATH 655 Mathematical Foundations

 for Computer Modeling and Simulation (also Computer Science 655)Spring. 4 credits. Prerequisites: Mathematics 431 and 432 or the equivalent, both in content and in the level of mathematical sophistication, or permission of instructors. Not offered 1994-95.
This course will have two parts, one purely mathematical, the other applied. The former is intended to introduce students to theoretical tools that are relevant to the study of robotics, solid modeling, and simulation. These tools will be drawn from the areas of (real and complex) algebraic geometry, topology, differential geometry, and differential equations. The latter part of the course will provide applications that illustrate uses of the mathematics and point the way to needed further developments.]

## MATH 657-658 Advanced Topology

657, fall; 658, spring.
Selection of advanced topics from modern algebraic, differential, and geometric ropology. Course content varies.

## MATH 661-662 Seminar in Geometry

661, fall; 662, spring.

## 667 <br> Algebraic Geometry

 Fall
## MATH 670 Topics in Statistics

Fall and spring.
A course taught occasionally to cover special topics in theoretical statistics not treated in other listed courses. Typical of the subjects that will be treated are time series analysis, and classification and cluster analysis.

## MATH 671-[672] Seminar in Probabllity and Statistics <br> 671, fall; [672, spring, not offered 1994-95.]

[MATH 674 Multivariate Analysis
Spring. Not offered 1994-95.]
[MATH 675 Statistical Decision Theory Spring. Not offered 1994-95.]

## MATH 677-678 Stochastic Processes

 677, fall; 678, spring.
## MATH 681-682 Seminar in Logic

681, fall; 682, spring.

## MATH 683 Model Theory Spring.

## MATH 684 Recursion Theory

Fal!
Theory of effectively computable functions. Classification of recursively enumerable sets. Degrees of recursive unsolvability. Applications to logic. Hierarchies. Recursive functions of ordinals and higher type objects. Generalized recursion theory

## [MATH 685 Topics in Logic

Fall. Not offered 1994-95.
Topics in metamathematics. Course content varies.]

## [MATH 687 Set Theory

Spring. Not offered 1994-95
Models of set theory. Theorems of Gödel and Cohen, recent independence results.]

MATH 688 Automated Theorem Proving Fall.

MATH 690 Supervised Reading and Research
Variable credit (maximum 6 each term).
MATH 701-702 Oliver Club Seminar
MATH 703-704 Olivetti Club Seminar
MATH 707-708 Seminar in Mathematics Education

MATH 711-712 Seminar in Analysis
MATH 713 Seminar in Analytic Dynamics
MATH 727-728 Seminar in Numerical Analysis
MATH 731-732 Seminar in Algebra
MATH 733-734 Seminar in Computational Algebra
MATH 749-750 Seminar in Lie Groups
MATH 751-752 Topics in Geometry and Topology
MATH 767-768 Seminar in Combinatorial and Algebraic Geometry
MATH 778 Reading Seminar in Dynamical Systems

## MODERN LANGUAGES AND LINGUISTICS

J. Bowers, chair; J. Lantolf, associate chair (314 Morrill Hall); J. Whitman, graduate faculty representative ( 320 Morrill Hall); C. Rosen, director of undergraduate studies ( 311 Morrill Hall); W. Browne, V. Carstens, G. Chierchia, A. Cohn, C. Collins, M. Diesing, G. Diffloth, J. Gair, W. Harbert, J. Jasanoff, A. Jongman, F. Landman, B. Lust, S. McConnell-Ginet, J. McWhorter, A. Nussbaum, M. Suñer, L. Waugh, J. Wolff, D. Zec

The Department of Modem Languages and Linguistics offers courses in linguistics (the study of the general nature, structure, and history of language) and elementary, intermediate, and advanced courses in many of the languages of Europe, Africa, and south, southeast, and east Asia.
Most courses in modern languages and linguistics are offered by the Deparment of Modem Languages and Linguistics; see listings below under individual language names (e.g., Spanish) and under Linguistics. Courses in foreign language literatures and certain language courses as well are taught in the following departments; consult entries under the department name for course listings.
Africana Studies and Research Center: Ewe, Swahili
Asian Studies: Chinese, Japanese, Korean, Vietnamese
Classics: Greek, Latin, Sanskrit
German Studies: German
Near Eastern Studies: Akkadian, Arabic, Aramaic, Hebrew, Turkish
Romance Studies: French, Italian, Spanish
Russian Literature: Russian
The Full-year Asian Language Concentration (FALCON Program) offers intensive instruction in Chinese, Japanese, or Indonesian to
students wishing to gain fluency in the language in a single year.

## Arabic

See listings under Near Eastern Studies.

## Bengali

Fees. A small fee may be charged for photocopied texts for course work.

## BENGL 121-122 Elementary Bengali

121, fall; 122, spring. 4 credits each term Prerequisite: for Bengali 122, Bengali 121 or examination.
D. Sudan.

The emphasis is on basic grammar, speaking, and comprehension skills; Bengali script will also be introduced.

## BENGL 201-202 Intermediate Bengali

 Reading e201, fall; 202, spring. 3 credits each term. Prerequisites: for Bengali 201, Bengali 122 or examination; for Bengali 202, Bengali 201 or examination.
D. Sudan.

Continuing instruction in grammar with attention to speaking and reading skills.
BENGL 203-204 Intermediate Bengali Composition and Conversation a 203, fall; 204, spring. 3 credits each term. Prerequisites: for Bengali 203. Bengali 122 or examination; for Bengali 204́, Bengali 203 or examination.
D. Sudan.

Continuing instruction in grammar with attention to writing skills.
BENGL 303-304 Bengali Literature I, II 303, fall; 304, spring. 4 credits each term. Prerequisites: Bengali 203-204 or equivalent.
D. Sudan.

An introduction to noted Bengali writers. Selections of works by Rabindranath Tagore and Abanindranath Tagore and short stories by Bonophul will be covered. The course will be devoted to reading these works and developing literary criticism and creative writing in Bengali.

## Burmese

NOTE: Check at Morrill 416 and Morrill 404 before classes begin for placement or other testing and organizational information, or contact J. Wheatley in Morrill 416 (255-9301).
Fees. A small fee may be charged for photocopied texts for course work.

## BURM 103-104 Burmese Conversation

 Practice103, fall; 104, spring. 2 credits each term. Prerequisite: for Burmese 104, Burmese 103 and Burmese 121. May not be taken alone. Must be taken simultaneously with Burmese 121-122. Satisfactory completion of Burmese $104 / 122$ fulfills the qualification portion of the language requirement.
S. Tun.

Additional drills, practice and extension of materials covered in Burmese 121 and 122 These courses are designed to be attended simultaneously with Burmese 121-122 respectively, allowing students to obtain qualification within a year.

## BURM 121-122 Elementary Burmese

121, fall; 122, spring. 4 credits each term. Prerequisite: for Burmese 122, Burmese 121 May be taken alone or simultaneously with Burmese 103-104. Satisfactory completion of

Burmese $104 / 122$ fulfills the qualification portion of the language requirement. S. Tun.

A thorough grounding is given in all language skills: listening, speaking, reading, and writing.

## BURM 123 Continuing Burmese

Fall. 4 credits. Prerequisite: Burmese 122. Satisfactory completion of Burmese 123 fulfills the qualification portion of the language requirement.
S. Tun.

Continuing instruction in conversational and reading skills, to prepare students for 200 level courses.

## BURM 201-202 Intermediate Burmese

 Reading ()201, fall or spring; 202, fall or spring. 3 credits each term. Prerequisites: for Burmese 201, Burmese 123; for Burmese 202, Burmese 201. S. Tun.

Continuing instruction in spoken and written Burmese

## BURM 301-302 Advanced Burmese

 Reading (i)301, fall or spring; 302, fall or spring. 3 credits each term. Prerequisites: for Burmese 301, Burmese 202 or permission of instructor; for Burmese 302, Burmese 301.

## S. Tun.

Continuing instruction in spoken and written Burmese; emphasis on enlarging vocabulary, increasing reading speed, and reading various genres and styles of prose.

## BURM 401-402 Burmese Directed

 Independent Study401, fall; 402, spring. $2-4$ credits variable each term. Prerequisite: permission of instructor. S. Tun.

Various topics according to need

## Cambodian

See Khmer.

## Cebuano (Bisayan)

Fees. A small fee may be charged for photocopied texts for course work.

## [CEBU 101-102 Elementary Cebuano

101, fall; 102, spring. Offered according to demand. 6 credits each term. Prerequisite for Cebuano 102: Cebuano 101 or equivalent. Not offered 1994-95.
J.U. Wolff and staff.

A semi-intensive course for beginners.]

## Chinese

For literature courses [conducted in English or Chinesel and Classical Chinese, see Asian Studies.
NOTE: Check the Chinese bulletin boards near Morrill 416 for information on testing, classes, etc., before classes begin. Placement tests [for those who do not know which course they qualify for] are given the week before classes begin, both fall and spring. Qualification and proficiency testing is done the first week of classes in the fall only.
Fees. Depending on the course, a small fee may be charged for photocopied texts for course work

## CHIN 101-102 Elementary Mandarin

101, fall; 102, spring. 6 credits each term. Prerequisite for Chinese 102: Chinese 101 or equivalent. Satisfactory completion of Chinese

102 fulfills the qualification portion of the language requirement.
J. Wheatley and staff.

A course for beginners or those who have been placed in the course by examination. The course gives a thorough grounding in conversational and reading skills. Students with some facility in the spoken language [because Chinese is spoken at home] but who do not read [characters] should take 109/110. Students who read Chinese, but who speak 'dialects,' such as Cantonese or Amoy, should see the program director in Morrill 416 before enrolling.

## CHIN 109-110 Elementary Reading (with Mandarin pronunciation)

109, fall; 110, spring. 3 credits each term. Prerequisite: for Chinese 110, 109 or equivalent. Satisfactory completion of Chinese 110 fulfills the qualification portion of the language requirement.

## Staff.

This course is intended primarily for students who speak some Chinese [i.e., at home], but who have had little or no formal training. The focus is on characters, reading comprehension, and reading aloud with standard pronunciation.

## CHIN 111-112 Cantonese Elomentary

 Speaking111, fall; 112, spring. 3 credits each term. Prerequisites: for Chinese 112: Chinese 111 or equivalent. Both Chinese 112 and 114 or equivalents are necessary to fulfill any
language requirements.
Staff.
A course for beginners. Conversation in standard Cantonese as spoken in Hong Kong and Canton.

## CHIN 113-114 Cantonese Elementary

 Reading113 , fall; 114 , spring. 3 credits each term. Prerequisites: for Chinese 114: Chinese 113. Both Chinese 112 and 114 or equivalents are necessary to fulfill any language requirements.
J. C. Yang.

This course is intended primarily for students who speak some Cantonese [i.e., at home], but who have had little or no formal training. The focus is on characters, reading comprehension, and reading aloud with standard pronunciation.

CHIN 201-202 Intermediate Mandarin © 201, fall or summer; 202, spring or summer. 4 credits each term. Prerequisites: for Chinese 201, Chinese 102 or equivalent; for Chinese 202, Chinese 201. Satisfactory completion of Chinese 201 fulfills the proficiency portion of the language requirement.
Q. Teng and staff.

Continuing instruction in written and spoken Chinese.

## CHIN 211-212 Intermediate Cantonese (a)

211, fall; 212, spring. 4 credits each term. Prerequisites: for Chinese 211, Chinese 112 and 114 or equivalent; for Chinese 212, Chinese 211.

> J. C. Yang.

Continuing instruction in spoken Cantonese and in characters [Cantonese and Mandarin], reading comprehension, and reading aloud with Cantonese pronunciation.
CHIN 301-302 Advanced Mandarin I © 301, fall; 302, spring. 4 credits each term. Prerequisites: for Chinese 301, Chinese 202 or equivalent; for Chinese 302, Chinese 301.
P. Wang.

Continuing instruction in spoken Chinese and in various genres and styles of written Chinese.

CHIN 303-304 Advanced Mandarin Conversation ©
303, fall; 304 , spring. 1 credit each term. Prerequisites: Chinese 201-202 or equivalent or permission from instructor. S-U grades only.

Staff.
Conversation and reading practice for students who wish to maintain language skills. Guided conversation and oral composition and translation. Corrective pronunciation drills.
CHIN 311-312 Advanced Cantonese 311, fall; 312, spring. 4 credits each term. Prerequisites: for Chinese 311, Chinese 212 or equivalent; for Chinese 312, Chinese 311. J. C. Yang.

Continuing instruction in spoken Cantonese and written Chinese with Cantonese pronunciation. Content will be determined in part by needs of students.

## [CHIN 401 History of the Chinese Language

Fall or spring, according to demand. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.

Staff.
Survey of phonological and syntactic
developments in Chinese.]

## [CHIN 403 Linguistic Structure of Chinese I]

[CHIN 404 Linguistic Structure of Chinese II
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95. Staff.
Syntax of modern Mandarin Chinese.]

## [CHIN 405 Chinese Dialects

Fall or spring, according to demand. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.

Staff.
Introductory survey of modern dialects and their distinguishing characteristics.]
CHIN 411-412 Advanced Mandarin II 411, fall; 412, spring. 4 credits each term. Prerequisites: for Chinese 411, Chinese 302 or equivalent; for Chinese 412, Chinese 411.
Q. Y. Teng.

Reading and discussion of various styles and genres of Chinese. Special attention to building vocabulary and increasing reading speed. Selections from current events, newscasts, and literature.

## CHIN 413-414 Current Events:

Advanced Reading and Discussion
413, fall; 414, spring. 2 credits each term. Prerequisites: Chinese 412 or equivalent or permission of instructor. S-U grades only. Staff.
Reading practice for students in Chinese studies. Content varies.

## CHIN 415-416 Correspondence and

## Composition

415, fall; 416, spring. 3 credits. Prerequisite: permission of instructor.
P. Wang.

Letter writing and other forms of composition for students with advanced reading and speaking ability in standard Chinese.

## [CHIN 607 Chinese Dialect Seminar

Fall or spring, according to demand. 4 credits.
Prerequisites: Chinese 405 and permission of instructor. Not offered 1994-95. Staff.
Analysis and field techniques in a selected dialect area.]

## FALCON (Full-year Asian Language Concentra-

 tion)J. Wheatley, 416 Morrill Hall (255-9301).

CHIN 160 Introductory Intensive Mandarin
Summer only. 10 credits.
J. Wheatley and staff.

Introduction to spoken and written Mandarin. Lectures on linguistic and cultural matters, intensive drills with native speakers, and laboratory work. Students who complete this course with a grade of B or above normally are eligible to enroll in an intermediate course.

CHIN 161-162 Intensive Mandarin ©
161, fall; 162 , spring. 16 credits each term. Prerequisites: for Chinese 161, Chinese 160 (Cornell summer intensive course) or equivalent or permission of instructor; for Chinese 162, Chinese 161. Satisfactory completion of Chinese 161 fulfills the proficiency portion of the language requirement.
J. Wheatley and staff.

## Czech

Fees. A small fee may be charged for photocopied texts for course work.

CZECH 131-132 Elementary Czech
131, fall; 132, spring. 3 credits each term. Prerequisite for Czech 132, Czech 131 or equivalent. This language series (131-132) cannot be used to satisfy the language requirement.
J. Josek.

Covers all language skills: speaking, listening comprehension, reading, and writing.
CZECH 133-134 Continuing Czech
133, fall; 134, spring. 3 credits each term. Prerequisites: for Czech 133, Czech 132 or equivalent. Satisfactory completion of Czech 134 fulfills the qualification portion of the language requirement.
J. Josek.

An intermediate conversation and reading course.

## Danish

Fees. A small fee may be charged for photocopied texts for course work.
DANSH 131-132 Elementary Danish 131, fall; 132, spring. 3 credits each term. Prerequisite for Danish 132, Danish 131 or equivalent. This language series cannot be used to satisfy the language requirement.
P. M. Mitchetl.

## Dutch

Fees. A small fee may be charged for photocopied texts for course work.

## DUTCH 121-122 Elementary Dutch

121, fall or summer; 122, spring or summer. 4 credits each term. Prerequisite: permission of instructor.
M. Briggs.

Intensive practice in listening, speaking, reading, and writing basic Dutch in meaning-
ful contexts. The course also offers insight into Dutch language, culture, and society.

## DUTCH 123 Continuing Dutch

Fall. 4 credits each term. Prerequisite: Dutch 122 or equivalent.
M. Briggs.

Improves speaking skills, such as fluency and pronunciation, focusing on verbal communication skills; offering a wide range of readings and sharpening listening skills based on Dutch and Dutch-speaking cultures.

## DUTCH 203 Intermediate Composition and Conversation

Spring. 3 credits. Prerequisite: Qualification in Dutch or permission of instructor.

## M. Briggs.

Improved control of Dutch grammatical structures and vocabulary through guided conversation, compositions and reading, drawing on Dutch and other Dutch-speaking cultures.

## DUTCH 204 Intermediate Composition and Conversation

Fall. 3 credits. Prerequisite: Dutch 203 or permission of instructor.
M. Briggs.

This course aims to emphasize written and oral application of accurate, idiomatic Dutch. Reading of authentic material of newspapers, literature, and history, with emphasis on
Dutch seventeenth-century culture and its influence on the Americas. Taught in Dutch.

## English

Intensive English Program, see p. 525.
Fees. A small fee may be charged for
photocopied texts for course work.
ENQLF 205 English as a Second Language
Fall. 4 credits. Prerequisite: placement by examination.
D. Campbell.

An all-skills course emphasizing listening and speaking, with some writing practice.
Students also meet individually with the instructor.

## ENGLF 206 English as a Second

 LanguageSpring. 3 credits. Prerequisite: English 205 or placement by examination.
D. Campbell.

Designed for those who have completed English 205 and who require or desire further practice, particularly in writing. Individual conferences are also included.

## ENGLF 209 English as a Second

 LanguageFall or spring. 1 credit. Prerequisite: placement by examination.
S. Schaffzin.

Practice in informal conversational English techniques for gaining information, and classroom speaking. Students also practice giving informal presentations. Personal conferences with the instructor supplement class work.

## ENGLF 210 English as a Second

## Language

Spring. 1 credit. Prerequisite: placement by examination.
S. Schaffzin.

Practice in academic speaking. Formal classroom discussion techniques and presentation of information in various forms. Personal conferences supplement class work.

ENGLF 211 English as a Second Language
Fall, spring, or summer. 3 credits. Prerequi-
site: placement by examination.
D. Campbell.

Academic writing with emphasis on improving organization, grammar, vocabulary, and style through the writing and revision of short papers relevant to students' fields. Frequent individual conferences supplement class work.

## ENGLF 212 English as a Second

## Language

Spring. 3 credits. Prerequisite: English 211 or placement by examination.

> D. Campbell.

Research paper writing. Students work on one project, for example, a research paper on a topic of their choice (if for another course, permission of the other instructor is mandatory), a thesis proposal, pre-thesis, or part of a thesis such as the literature review. Course work involves practice in paraphrase, summary, the production of cohesive, coherent prose, vocabulary use, and grammatical structure. Frequent individual conferences supplement class work. Separate sections for Social Sciences/Humanities and for Science/Technology.

## ENGLF 213 Written English for Non-

 Native SpeakersSpring. 3 credits, Prerequisite: placement by examination.
D. Campbell.

Designed for those whose writing fluency is sufficient for them to carry on regular academic work but who feel the desire for refining and developing their ability to express themselves clearly and effectively. Individual conferences supplement class work.

## Freshman Writing Seminar

## ENGLB 215-216 English for Later Bilinguals

For description, see freshman writing seminar brochure.

## Ewe

See listings under Africana Studies and Research Center.

## French

A. Cohn (director of undergraduate studies, 216 Morrill Hall, 255-3073), L. R. Waugh.
For information on language placement and transfer credit, contact C. Waldron ( 403 Morrill Hail, 255-0702). For literature and advanced language courses see Romance Studies.

## The Major

The French major has two separate tracks, the literature track and the linguistics track. The linguistics track is described here; for the literature track, see the description under Romance Studies. The major in French linguistics, is designed to give students proficiency in the oral and written language and to develop skills in the linguistic analysis of French.
While prospective majors should try to plan their programs as far ahead as possible, no student will be refused admission merely because of a late start. It is even possible for a student to begin French and/or linguistics at Cornell and become a major. Students wishing to major in French linguistics should consult Professor Linda Waugh, who will advise them.

## The French Linguistics Major

To be admitted to the major, students should have completed Linguistics 101 and French $200,203,205$ or 213 (or their equivalents) by the end of the sophomore year. It is expected that all students in the major will also take either French 220, 221 or 222, preferably by the end of the sophomore year.

## To complete the major, a student must:

1) acquire a sound degree of competence in French. This competence is demonstrated by the successful completion of French 312 (or its equivalent) or by the passing of a special examination. Typically, students in the major will have taken 312 by the end of their junior year.
2) take six courses in French, Romance, and general linguistics (in addition to Linguistics 101). These courses will include at least one course concerning the history of French (e.g., French 401, Romance Linguistics 321, French 629 [listed under Romance Studies]), one course concerning the structure of French (e.g., French 408, 410, 604, Linguistics 323), and one other course in French linguistics.
3) take two courses (preferably a sequence) in some allied area, for example, (a) French literature and civilization, (b) psycholinguistics, (c) philosophy of language, (d) French history, culture, music, or history of art or architecture. (This requirement may be waived for students who are double majors in other fields).

## Study Abroad in France

French majors or other interested students may study in France for one or two semesters during their junior year. Opting for one of several study-abroad plans recognized by the departments of Romance Studies and Modern Languages and Linguistics facilitates the transfer of credit. Information about these plans is available from Jacques Bereaud, director of undergraduate studies, Department of Romance Studies. (See the description of the program in Paris sponsored by Cornell under the Department of Romance Studies.)

## Study Abroad in Geneva

French majors or other students with a commitment to international experience may study abroad in Geneva, Switzerland. Geneva is an especially appropriate location for students who have an interest in international affairs, as many international organizations maintain offices there, among them the United Nations, the Red Cross, the headquarters of the World Health Organization, the International Labor Organization, the International Telecommunications Union, the World Intellectual Property Organization, the European Nuclear Research Center, and the Ecumenical Center at Grand-Saconnex. Cornell students enroll full-time in the University of Geneva, where they take yearlong courses in conjunction with Swiss students. They can choose classes in many subjects, including literature, economics and other social sciences, law, theology, psychology, education, architecture, physical education, and French language, civilization, and history.
Interested students can participate in internships at international organizations, and
qualified participants may be able to work under the direction of officials on research studies that are of mutual interest. The University of Geneva offers four consecutive three-week language and civilization summer courses beginning in mid-July, which prepare students for the mandatory French exam given in early October. Cornell students must attend the last of these sessions, from mid-September to early October, but earlier sessions are recommended for students who need additional language preparation
Students must be Cornell undergraduates with a strong academic record. The minimum French preparation is the completion of French 204 or 213 , or its equivalent in advanced credit or placement by the Cornell C.A.S.E. examination. Students should plan to study abroad for the entire academic year. Students interested in the study abroad program in Geneva should contact the Comell Abroad office for further information.

Honors. The honors program encourages well-qualified students majoring in French linguistics to do independent work in French outside the structure of courses. The preparation of the senior honors essay, generally spread over two terms, provides a unique learning opportunity, since it allows for wide reading, and extensive rewriting to a degree not practically possible in the case of course papers

No special seminars or courses are required of honors students, but they will have regular meetings with the faculty advisers who have agreed to supervise their work. They may receive course credit by enrolling in French 429-430, but these independent study courses must be taken in addition to the courses that meet the minimum requirements for the major. At the end of the senior year each honors student is examined orally on the honors essay by a jury consisting of his or her faculty adviser and two other faculty members. The awarding of honors is determined by the student's grades in the major and the quality of the honors essay
Fees. Depending on the course, a small fee may be charged for copies of texts for course work

## FRDML 101 Basic Course I

Summer only. 6 credits
M. J. Davis

An introductory course offering opportunities for student interaction and intensive practice in listening to, speaking, reading, and writing basic French in meaningful contexts. Students who have previously studied French must take the placement examination or receive permission from the instructor before registering for this course

FRDML 103-104 Language and Culture 103, fall; 104 , spring. 2 credits each term Students wishing to take 103 in the fall must be registered concurrently in 121; those wishing to take 104 in the spring must be registered concurrently in 122. Satisfactory completion of $103 / 121$ and $104 / 122$ fulfills the qualification portion of the language requirement.
M. J. Davis and N. Gabriel. Audio-visual materials, texts, and additional practice to supplement the curriculum of French 121-122; and lectures which offer insights into French language, culture, and society.

## FRDML 121 Elementary French

Fall or spring. 4 credits. Spring enrollment limited. No prerequisites. Intended for beginning students or those placed by examination.
M. J. Davis, N. Gabriel, and staff

The five recitation sections per week offer the opportunity for student interaction and intensive practice in listening to, speaking, reading, and writing basic French in meaningful contexts.

## FRDML 122 Elementary French

Fall or spring. 4 credits. Prerequisite: French 121 or CPT or FPT score between 370 and 440. Students who receive an FPT score of 560 after French 122 attain qualification and may enter the 200-level sequence; otherwise, satisfactory completion of French 123 is required for qualification.
M. J. Davis, N. Gabriel and staff.

The goal of French 122 is to build on the students' elementary knowledge of French so that they can function in basic situations in a French-speaking culture. Daily classes provide intensive, context-specific practice in speaking, listening, reading, and writing

## FRDML 123 Continuing French

Fall, spring, or summer. 4 credits. Limited to students who have previously studied French and have a CPT or FPT score between 450 and 550. Satisfactory completion of French 123 fulfills the qualification portion of the language requirement
A. Grandjean-Levy

French 123 is an all-skills course designed to improve pronunciation, oral communication, and reading ability; to establish a groundwork for correct writing; and to provide a substantial grammar review. The approach in the course encourages the student to see a foreign language as something more than a bunch of skills to be memorized. The course features authentic texts, a functional grammar, and exchange students from France who visit the sections.

## FRDML 200 Intermediate Reading and

 WritingFall or spring. 3 credits. Prerequisite: qualification in French (French 123 or CPT or FPT score 560-640). Satisfactory completion of French 200 fulfills the proficiency portion of the language requirement.
C. Sparfel.

A language course based on contemporary reading material. Strengthening of reading and writing skills; review and expansion of vocabulary and grammar. Taught in French

## FRDML 203 Intermediate Composition and Conversation I

Fall, spring, or summer. 3 credits. Prerequisite: qualification in French (French 123 or CPT or FPT score 560-640). Satisfactory completion of French 203 fulfills the proficiency portion of the language requirement I. Daly.

Improved control of French grammatical structure and vocabulary through guided conversation, composition, and reading. Lectures include grammar review, videos on current topics, and cultural presentations. Taught in French.

## FRDML 205 Intermediate French: le

 francais multicoloreSpring. 3 credits. Prerequisite: qualification in French (French 123 or CPT or FPT score of 560-640). Satisfactory completion of French 205 fulfills the proficiency portion of the
language requirement and can be used to satisfy the breadth requirement
N. Gabriel.

Opportunities to strengthen and expand active language skills within the context of the wider French-speaking world. Contemporary readings; video and audio materials; and people from francophone countries of Europe, Africa, and the Americas will provide bases for individual and group projects. Taught in French.

FRDML 213 Intermediate Composition and Conversation II
Fall, spring, or summer. 3 credits. Enrollment limited. Prerequisite: proficiency in French (French 200, 203, or 205), permission of instructor, or placement by Cornell Advanced Standing Examination (CASE) offered by the Department of Modern Languages and Linguistics. This course, or its equivalent, is required for admission to the Cornell Abroad program.
C. Waldron.

Emphasis on improving oral and written expression of accurate, idiomatic French along with enrichment of vocabulary and treatment of specific problems of grammar. Contemporary readings, newspaper articles on current events, television news, movies, and guest speakers will provide a basis for the courses content. (Varying emphasis on the elements according to section.) Taught in French.

## FRDML 290 French through Current

 EventsFall. 3 credits. Enrollment limited. Prerequisite: French 204 or equivalent.
A. Grandjean-Levy.

French daily television satellite news broadcasts and a subscription to a Le Figarorelated weekly will be the basis for the study of current events and contemporary French culture. Assignments will require some research on related topics for reports and papers and production of a television news broadcast.

## FRDML 291 Contemporary French Culture through Film

Fall or spring. 3 credits. Prerequisite: French 204 or equivalent.
C. Waldron

Analysis of French contemporary films and related readings. Used as a means of studying the language. Particular emphasis on the cultural and historical context as it relates to French contemporary society.

## [FRDML 401 History of the French

 Language "Fall. 4 credits. Prerequisites: qualification in French and Linguistics 101, or permission of instructor. Offered alternate years. Not offered 1994-95.

Staff.
Diachronic development of French from Latin, with emphasis on phonological and morphological change. Course work includes
problems in reconstruction, textual analyses, discussions of theoretical topics, and external history.]
[FRDML 407 Applied Linguistics: French
Fall. 4 credits. Prerequisite: qualification in French. Offered alternate years. Not offered 1994-95.

Staff.
Designed to equip the student with the ability to apply linguistic descriptions in teaching French, with special emphasis on phonetics and morphology.]

## [FRDML 408 Linguistic Structure of

## French I (also Linguistics 408)

Fall. 4 credits. Prerequisites: qualification in French and Linguistics 101 or Linguistics 400 , or permission of instructor. Offered alternate years. Not offered 1994-95.
A. Cohn.

A synchronic study and analysis of modern French, with emphasis on its phonology and morphology.]

## FRDML 410 Linguistic Structure of French II

Fall. 4 credits. Prerequisite: permission of instructor. Offered alternate years
L. Waugh

A synchronic study and analysis of modern French, with emphasis on semantics, pragmatics, and discourse analysis.

## [FRDML 604 Contemporary Theories of

 French GrammarSpring. 4 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1994-95.
L. Waugh.

Selected readings of twentieth-century French linguistics.]

## FRDML 630 French for ReadingGraduate Students

Spring and summer. 3 credits. Limited to graduate students.

Staff.
Designed for those with little or no background in French, this course's primary aim is to develop skill in reading French. Grammar basics, extensive vocabulary, and strategies for reading in a foreign language are covered. Some flexibility in selecting texts according to fields of interest is offered.

## FRDML 700 Seminar in French

 LinguisticsSpring, according to demand. Credit to be arranged.

Staff.
Seminars are offered according to) faculty interest and student demand. Topics in recent years have included current theories in French phonology, current theories in French syntax, and semantics of French.

## German

W. Harbert, (director of undergraduate studies, 210 Morrill Hall, 255-8441),
J. H. Jasanoff. For literature courses see German Studies.

The German Major
See German Studies

## Study Abroad

Comell has a formal agreement with the University of Hamburg enabling its undergraduates to take courses in any field offered by the German university. The program offers a challenging course of study and the experience of total immersion in German life and culture. Participants in this program attend a required 3 -credit orientation course in September, which is designed to help them adjust to the academic and social life of Germany. Special field trips are organized as part of the orientation session. Beginning in mid-October, students enroll as fully matriculated students at the University of Hamburg.
Cornell maintains a center in Hamburg with appropriate support staff. The resident director is a faculty member from Cornell,
who teaches a special seminar each semester, provides academic advice, and helps ensure the quality of the courses. The center, which includes a classroom, a small library, and word-processing facilities, is used by students for the orientation session, special seminars tutorials, lectures, and informal gatherings.
Applicants are expected to have attained at least proficiency in German prior to departure. Students are strongly encouraged to study abroad for the entire year rather than for one semester. For further information, students should contact W. Harbert, director of undergraduate studies, Department of Modern Languages and Linguistics ( 210 Morrill Hall, 255-8441), and the Comell Abroad Office (474 Uris Hall, 255-6224).

## German Area Studies Major

See German Studies.
Honors. The honors program in German is open to superior students who want to work independently in an area of their own choice. Students are free to select any faculty member of the Field of Germanic Studies (in the case of area studies majors, the appropriate member of their committee) to assist them in designing their honors program, to supervise their work, and to help them select a suitable topic for an honors essay. The independent study courses, German 451 and 452, may form part of the program.

## Freshman Writing Seminar Requirement

See German Studies
Fees. Depending on the course, a small fee may be charged for photocopied texts for course work.

## GERLA 121-122 Elementary German

121 , fall or summer; 122 , spring or summer. 4 credits each term. Prerequisite for German 122: German 121 or equivalent. Intended for beginners or students placed by examination. Students who obtain a CPT score of 560 after German 121-122 attain qualification and may enter the 200-level sequence; otherwise German 123 is required for qualification.
D. McGraw

A thorough grounding in all the language skills: listening, speaking, reading, and writing. Language practice is in small groups. Lectures cover grammar, reading, and cultural information.

## GERLA 123 Continuing German

Fall or spring. 4 credits. Limited to students who have previously studied German and have a CPT achievement score between 450 and 550. Satisfactory completion of German 123 fulfills the qualification portion of the language requirement.
D. Hobbs.

An all-skills course designed to prepare students for study at the 200 level.

## GERLA 203 Intermediate Composition

 and ConversationFall or spring. 3 credits. Prerequisite: qualification in German (German 123 or CPT score of 560-640).
G. Lischke.

Conversation; review of selected points of grammar; composition; reading of literary and non-literary texts; discussion of current events and videos; emphasis on development of accurate and idiomatic expression. Fulfills language proficiency requirement.

GERLA 204 Intermediate Composition and Conversation
Fall or spring. 3 credits. Prerequisite: German 203 or permission of instructor.
G. Valk.

Emphasis on improving oral and written expression of idiomatic German. Enrichment of vocabulary and appropriate use of language in conversational context. Material consists of readings in contemporary prose, articles on current events, a novel and discussion of several videos; treatment of specific grammar issues, and computer assisted instruction in writing

## GERLA 303-304 Advanced Composition

 and Conversation303, fall; 304, spring. 4 credits each term. Prerequisite for German 303: German 204 or equivalent. Prerequisite for German 304: German 303 or equivalent.
G. Valk.

303: Emphasis on increasing the students oral and written command of German. Study of the language in different text types, such as newspaper, magazines, and two novels. Discussion of current events and literary texts provides background on the history, politics, and social conflicts of German-speaking countries.

304: Course materials include DIE ZEIT, other German newspaper/magazine articles, and two contemporary novels. Emphasis on vocabulary development pertinent to issues of today's German-speaking countries. Students have the opportunity to research material for class presentation, lead discussions, and share their interests/special fields with the group.

## GERLA 306 Zeitungsdeutsch

Fall. 4 credits. Prerequisite: German 304 or equivalent.
G. Lischke

Analysis of various German daily and weekly newspapers with special emphasis on stylistic differences in journalism; discussion of current events. Students have the opportunity to research material for class presentation, lead discussions, and share their interests/special fields with the group.

## GERLA 401 Introduction to Germanic Linguistics

Fall. 4 credits. Prerequisite: Linguistics 101 or permission of instructor.
W.E. Harbert.

Survey of major issues in historical Germanic linguistics.

## [GERLA 402 History of the German

 Language *Spring. 4 credits. Prerequisites: German 204 and Linguistics 101 or permission of instructor Offered alternate years. Not offered 1994-95. Staff.
Phonological, morphological, syntactic, and semantic developments from pre-Old High German times to the present.)

## [GERLA 404 Modern German Syntax

Spring. 4 credits. Prerequisite: German 304 or equivalent, and Linguistics 101 or 303. Not offered 1994-95.

Staff.
An application of selected theoretical syntactic models to problems in the syntax of modern German.]
[GERLA 406 Runology \#
Spring. 4 credits. Prerequisite: German 401 Not offered 1994-95.
W. E. Harbert.

A study of the inscriptions in the older futhark and their relevance to historical Germanic linguistics.]

GERLA 407 Teaching German as a Foreign Language
Fall. 2 credits. Staff.
This course has been designed to familiarize students with current ways of thinking in the field of applied linguistics and language pedagogy. It introduces different concepts of foreign language methodology as well as presents and discusses various techniques as they can be implemented in the foreign language classroom. Special consideration is given topics such as planning syllabi, writing classroom tests, and evaluating student's performance.

## [GERLA 602 Gothic

Fall. 4 credits. Prerequisite: Linguistics 101.
Offered alternate years. Not offered 1994-95. W. E. Harbert.

Linguistic structure of Gothic, with extensive readings of Gothic texts.]
[GERLA 603 Old High German, Old Saxon
Fall. 4 credits. Prerequisite: Linguistics 101.
Offered alternate years. Not offered 1994-95. W. E. Harbert.]
[GERLA 605 Structure of Old English
Fall. 4 credits. Prerequisite: German 401.
Offered alternate years. Not offered 1994-95. W. E. Harbert.

Linguistic overview of Old English, with emphasis on phonology and syntax.]

## [GERLA 606 Topics in Historical

 Germanic PhonologyFall. 4 credits. Prerequisite: German 401. Not offered 1994-95. Staff.
The development of the sound system from Proto-Germanic to its daughter languages.]

## [GERLA 607 Topics in Historical

 Germanic MorphologyFall. 4 credits. Prerequisite: Gemman 401. Not offered 1994-95.
J. Jasanoff.

The Germanic verbal system and its IndoEuropean origins.]

## [GERLA 608 Topics in Historical

## Germanic Syntax

Fall. 4 credits. Prerequisite: German 401. Not offered 1994-95.

## W. E. Harbert.

A diachronic and comparative investigation of syntactic processes in the older Germanic languages.]

## GERLA 609-610 Old Norse

609 , fall; 610 , spring. 4 credits each term. H. Bernhardsson.

Study of the linguistic structure of Old Norse, with extensive reading of Old Norse texts.
[GERLA 611 Readings in Old High German and Old Saxon
Spring. 4 credits. Not offered 1994-95. J. Jasanoff.

Texts are chosen to suit the interests of the students taking the course but normally include selections from the more extensive Old High German and Old Saxon sources (Otfrid, Tatian, Heliand) as well as representative shorter works such as Hildebrandslied, Muspilli, and Genesis.]

GERLA 631-632 Elementary Reading I, II 631 , fall or summer; 632, spring or summer. 3 credits each term. Limited to graduate students. Prerequisite for German 632: German 631 or equivalent.
G. Appel.

Two-course sequence specifically designed to help students acquire German for reading academic texts from various disciplines. Orientation is toward developing reading strategies, building vocabulary, and utilizing knowledge of text structure to facilitate text understanding. The majority of reading materials will be selected on the basis of individual needs and interests of the participants in the course.

## [GERLA 710 Seminar in Germanic

## Linguistics

Fall or spring, subject to the needs of students and to the limitations of staff time. 4 credits. Not offered 1994-95.

Staff.]

## [GERLA 720 Seminar in Comparative <br> \section*{Germanic Linguistics}

Fall or spring, subject to the needs of students and to the limitations of staff time. 4 credits. Not offered $1994-95$.

Staff.
Topics include phonology, morphology, syntax, and dialectology of the older Germanic languages.]

## [GERLA 730 Seminar in German

 LinguisticsFall or spring, subject to the needs of students and the limitations of staff time. 4 credits.
Not offered 1994-95.
Staff.
Selected topics including the history, structure, and dialects of German.]

## Modern Greek

See listings under Classics.

## Modern Hebrew

See listings under Near Eastern Studies.

## Hindi

Fees. A small fee may be charged for photocopied texts for course work.

HINDI 101-102 Elementary Hindi-Urdu 101, fall; 102, spring. 6 credits each term. Prerequisite for Hindi-Urdu 102: Hindi-Urdu 101 or equivalent.
C. Fairbanks.

A semi-intensive course for students without prior experience in Hindi-Urdu or a closely related language. A thorough grounding is given in all language skills: listening, speaking, reading, and writing. Students who have had exposure to Hindi-Urdu or a closely related language in the home or otherwise should generally take 109-110. Check with instructor regarding placement.

## HINDI 109-110 Accelerated Elementary

 Mindi-Urdu109 , fall; 110 , spring. 3 credits each term. Prerequisite for Hindi-Urdu 110: Hindi-Urdu 109 or equivalent.
C. Fairbanks.

An entry-level sequence for students with some prior exposure to Hindi-Urdu or a closely related language. This course sequence will provide a thorough grounding in all the language skills: listening, speaking, reading, and writing. Completion of this sequence, including satisfactory performance
on an examination given at the end of 110 , will constitute a level of performance equal to that of the 101-102 sequence, and will thus be considered to fulfill qualification for the language requirement plus eligibility for 200-level Hindi-Urdu courses. Check with instructor regarding placement.

## [HINDI 201-202 Intermediate Hindi

 Reading ©201, fall; 202, spring. 3 credits each term. Prerequisites: for Hindi 201, Hindi 102; for Hindi 202, Hindi 201 or permission of instructor. Not offered 1994-95.
C. Fairbanks.]

## HINDI 203-204 Intermediate

Composition and Conversation © 203, fall; 204, spring. 3 credits each term. Prerequisites: for Hindi 203, Hindi 102; for Hindi 204, Hindi 203 or permission of instructor.
C. Fairbanks.

Throughout this course sequence all aspects of language learning are practiced: listening, speaking, reading, and writing. In 203 video materials are used and the emphasis is on the conversational aspect of the language. In 204 the focus shifts to reading skills, and the main text used is a popular novel.

## HINDI 301-302 Advanced Readings in

 Hindi Literature 웅301, fall; 302, spring. 4 credits each term. Prerequisites: for Hindi 301, Hindi 202; for Hindi 302 , Hindi 301 or equivalent.
C. Fairbanks.

Selected readings in modern Hindi literature.
[HINDI 303-304 Advanced Composition and Conversation ©
303, fall; 304, spring. 4 credits each term. Prerequisites: for Hindi 303, Hindi 204 or equivalent; for Hindi 304, Hindi 303 or equivalent. Not offered 1994-95.
C. Fairbanks.]

## [HINDI 305-306 Advanced Hindi

 Readings (a)305, fall; 306, spring. 4 credits each term. Prerequisites: for Hindi 305, Hindi 202 or equivalent; for Hindi 306, Hindi 305 or equivalent. Not offered 1994-95.
C. Faimanks.

Intended for those who wish to do readings in history, government, economics, etc., instead of literature.]
Note: For complete descriptions of courses numbered 600 and above, consult the appropriate instructor.
[HINDI 700 Seminar in Hindi Linguistics
Fall or spring. 3 credits. Prerequisite:
permission of instructor. Not offered 1994-95. Staff.]

## Hungarian

Fees. A small fee may be charged for photocopied texts for course work.

## [HUNGR 131-132 Elementary Hungarian

131, fall; 132, spring. 3 credits each term. This language series cannot be used to satisfy the language requirement. Not offered 1994-95.

## Staff.

Intended for beginners or students with limited knowledge of the language.]

## Indonesian

For students who have completed Indonesian 121-122-123 or its equivalent there is the option of a one-semester program in Malang, East Java, during the junior year. The program combines a variety of cultural and artistic options with area course work and advanced language study. Complete information is available through Comell Abroad.
Students who have completed a minimum of 18 credits or the equivalent are eligible to apply for a summer program in the Advanced Indonesian Abroad Program. Further information is available from Professor John Wolff (307 Morrill Hall, 255-0733).
Fees. A small fee may be charged for photocopied texts for course work.
INDO 121-122 Elementary Indonesian
121, fall; 122, spring. 4 credits each term. Prerequisite for Indonesian 122: Indonesian 121.

## J. U. Wolff.

A thorough grounding is given in basic speaking and listening skills with an introduction to reading.

## INDO $\mathbf{1 2 3}$ Continuing Indonesian

Fall. 4 credits. Prerequisites: Indonesian 122 or equivalent. Satisfactory completion of Indo 123 fulfills the qualification portion of the language requirement.
J. U. Wolff.

Improves speaking skills, such as fluency and pronunciation, focusing on verbal communication skills; offers a wide range of readings and sharpens listening skills.

## INDO 205-206 Intermediate

 Indonesian ©205, fall: 206, spring. 3 credits each term. Prerequisite for 205: Indonesian 123 or equivalent; Indonesian 206: Indonesian 205 or equivalent. Satisfactory completion of Indo 205 fulfills the proficiency portion of the language requirement
J. U. Wolff.

This course develops all four skills: reading, writing, speaking, and comprehension.

## [INDO 300 Linguistic Structure of

 IndonesianFall or spring. 4 credits. Prerequisites Indonesian 123 or equivalent and Linguistics 101. Not offered 1994-95.

Hours to be arranged. J. U. Wolff.]
[INDO 301-302 Advanced Readings in Indonesian and Malay
301 , fall; 302 , spring. 4 credits each term. Prerequisites: for Indonesian 301, Indonesian 205-206 or equivalent; for Indonesian 302, Indonesian 301. Not offered 1994-95. J. U. Wolff.]

## [INDO 303-304 Advanced Indonesian

 Conversation and Composition303, fall; 304, spring. 4 credits each term. Prerequisites: for Indonesian 303, Indonesian 206; for Indonesian 304, Indonesian 303 or equivalent. Not offered 1994-95. J. U. Wolff.]
[INDO 305-306 Directed Individual Study 305 , fall; 306 , spring. $2-4$ credits. Prerequisite: Indonesian 301-302 and 303-304 or equivalent knowledge of Indonesian or Malay. Not offered 1994-95.
J. U. Wolff

A practical language course on an advanced level in which the students will read materials
in their own field of interest, write reports, and meet with the instructor for two hours a week for two credits and twice a week for four credits
[INDO 401-402 Advanced Readings in Indonesian and Malay Literature
401, fall; 402. spring. 4 credits each term. Prerequisites: for Indonesian 401, Indonesian 302 or equivalent; for Indonesian 402, Indonesian 401 or equivalent. Not offered 1994-95.

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    J. U. Wolff.]
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## FALCON (Full-year Asian Language Concentratlon)

INDO 161-162 Intensive Indonesian 161 , fall; 162 , spring. 16 credits each term. Prerequisite: permission of instructor.
J. U. Wolff and staff.

## Related Course

Seminar in Austronesian Linguistics (Linguistics 655-656).

## Italian

G. Chierchia, C. Rosen.

For literature courses see Romance Studies.

## The Italian Major

See Romance Studies.

## Study Abroad in Italy

Italian majors may study in Italy, generally during their junior year, under any of those study-abroad plans organized by American universities that allow the transfer of grades and credit, such as the Cornell program in Rome.
The College of Architecture, Art, and Planning maintains a program open to all qualified students attending Cornell. The program is housed in the sixteenth-century Palazzo Massimo, designed by the architect Baldassare Peruzzi, on the Corso Vittorio Emanuele, in the heart of Rome. Students may enroll for a semester in the fall or spring. Courses regularly taught at the Palazzo Massimo include: Architecture 300, 401, 402, 500, 502, Design Studio; Architecture 338 and 399, Special Topics in Architectural History; Architecture 458, Special Projects in Design Communications; Architecture 367, Contemporary Italian Culture; Architecture 510, Thesis Introduction; Art 251, 311, 322, and 371; and History of Art 371, Renaissance and Baroque Art in Rome; Italian 111. 112, elementary Italian 111 and 112 correspond to Cornell courses 121 and 122 respectively (see below). Students having passed 111 in Rome will be admitted to 122 when they get back to Comell. Students having passed 112 in Rome will be granted credit but must take the Italian Skills Assessment for satisfaction of the language requirement and for placement into more advanced courses upon their return to Cornell. More advanced Italian classes in Rome are also being organized.
To be eligible, students must have completed the first two years of their curriculum requirements and be in good academic standing.
Comell collaborates with six other major U.S. universities in sponsoring the Bologna Cooperative Studies Program (BCSP) for study abroad in Bologna, Italy. Through BCSP, advanced students can experience total
immersion in Italian education and culture in a city that combines a long and rich history with modern prosperity and an active commercial and cultural life. Students attend classes at the University of Bologna, the oldest university in Europe and one of Italy's most respected. The academic year begins in
September and October with an intensive sixweek orientation in Bologna, which includes instruction in Italian grammar, conversation, and history. When the University of Bologna's academic year commences in November, students enroll in three regular, year-long courses with Italian students. In addition, students take one of the special one-semester BCSP courses in contemporary literature, art history, the European Community, and Italian language. University of Bologna faculty members teach the BCSP courses.
Housing is arranged through the BCSP program office in Bologna. Students live in rented apartments near the university with other program participants and Italian roommates.
Eligibility requirements: advanced preparation in Italian, at least a "B" average, and at least junior standing when program participation begins. The minimum Italian language preparation is the completion of Italian 204 or its equivalent. Students interested in the study abroad program in Bologna should consult the Comell Abroad office for further information.
Fees. Depending on the course, a small fee may be charged for copies of texts for course work.

## ITALA 101 Basic Course I

Summer only. 6 credits.

## Staff.

A thorough grounding in all basic language skills. Students who have previously studied Italian must take the qualifying examination before registering for this course.

## ITALA 121-122 Elementary Italian

121, fall; 122, spring. 4 credits each term. Prerequisite for Italian 122: Italian 121 or equivalent. Intended for beginners or students placed by examination. At the end of Italian 122, students who score 560 or higher on the Italian Skills Assessment attain qualification and may enter the 200 -level sequence; otherwise Italian 123 is required for qualification.
K. Battig.

A thorough grounding in all the language skills: listening, speaking, reading, and writing. Language practice is in small groups. Lectures cover grammar and cultural information.

## ITALA 123 Continuing Italian

Fall. 4 credits. Limited to students who have previously studied Italian and score between 450 and 550 on the Italian Skills Assessment. Satisfactory completion of Italian 123 fulfills the qualification portion of the language requirement.
J. Scarpella.

Italian 123 is an all-skills course designed to improve speaking and reading ability, to establish a groundwork for correct writing, and to provide a substantial grammar review

## ITALA 203-204 Intermediate

Composition and Conversation 203, fall or spring; 204, fall or spring. 3 credits each term. Prerequisites: for Italian 203, qualification in Italian; for Italian 204, 203 or equivalent.

203, fall: M. Swenson. 203, spring: J. Scarpella. 204, fall: K. Battig; spring: M. Swenson.

Guided conversation, composition, reading, pronunciation, and grammar review emphasizing the development of accurate and idiomatic expression in the language.
Note: Students placed in 200-level courses also bave the option of taking courses in introductory literature; see separate listing under Italian 201 for description of this course, which may be taken concurrently with the Italian 203-204 language courses described above. The introductory literature courses are offered by the respective literature departments, and the 203-204 language courses by the Department of Modern Languages and Linguistics.

## ITALA 313 Advanced Italian: Language

 in Italian CultureFall. 3 credits. Prerequisite: Italian 204 or equivalent or permission of instructor. ITALA 313 is not prerequisite to ITALA 314 and may be taken after ITALA 314.
M. Swenson.

Further development of all skills. Readings and discussions center on two themes: (1) contemporary Italian life and (2) the Italian language, its origins, evolution, and present state, including the role of the dialects. Emphasis on vocabulary building and awareness of stylistic levels.

## ITALA 314 Advanced Italian: Language

 and Soclal IssuesSpring. 3 credits. Prerequisite: Italian 204 or equivalent. ITALA 313 is not prerequisite to ITALA 314 and may be taken after ITALA 314. M. Swenson.

Further development of all skills, with emphasis on self-expression. Content: evolution and crisis in Italian politics, values, and national identity against the background of European unification. Social movements, issues, and attitudes, especially as reflected in the mass media.

## [ITALA 403 Linguistic Structure of Italian

Fall. 4 credits. Prerequisites: Linguistics 101 or equivalent, and qualification in any Romance language. Offered alternate years. Not offered 1994-95.
C. Rosen.

Survey of Italian syntax, using simple theoretical tools to bring hidden regularities to light. Topics include auxiliaries, modals, clitics, reflexive constructions, agreement, impersonal constructions, causatives.]

## [ITALA 404 History of the Italian

 LanguageSpring. 4 credits. Prerequisites: Linguistics 321 and either Italian 201 or 203 or equivalent. Offered alternate years. Not offered 1994-95.
C. Rosen.

Overview of Italian and its dialects from the earliest texts to the present day. Emergence of the standard language. External history and sociolinguistic circumstances.]

## ITALA 631 Readings in Italian Opera LibrettI

Spring. 2 credits. For graduate students only. Prerequisite: permission of instructor. Offered concurrently with appropriate seminars in the Department of Music.

## Japanese

For literature courses see Asian Studies.
Fees. A small fee may be charged for photocopied texts for course work.

JAPAN 101-102 Elementary Japanese
101, fall; 102, spring. 6 credits each term. Prerequisite for Japanese 102: Japanese 101 or placement by the instructor during registration. Intended for beginners or for those who have been placed in the course by examination.

## J. Zeserson.

A thorough grounding is given in all the language skills: listening, speaking, reading, and writing.

## JAPAN 123 Accelerated Introductory

 JapaneseFall. 6 credits. Prerequisite: placement by the instructor at beginning of semester. J. Zeserson.

Accelerated training in listening, speaking, reading, and writing for students who have already acquired a limited facility in Japanese through residence in Japan or brief formal study, but who require additional training to qualify for admission to Japanese 102. Attend Japan 101 lectures.

## JAPAN 201-202 Intermediate Japanese

Reading I
201, fall; 202, spring. 2 or 3 credits each term. Students currently taking Japanese 203 and 204 register for 2 credits and attend the W drill and the F lecture; other students register for 3 credits (with permission of instructor) and attend the $W$ drill and the $M, W, F$ lectures. Prerequisites: for Japanese 201, Japanese 102 or placement by the instructor during registration; for Japanese 202, Japanese 201 and 204 or placement by the instructor during registration.

Staff.
Reading of elementary texts emphasizing practical materials, with development of writing skills.
JAPAN 203-204 Intermediate Japanese Conversation ${ }^{\text {C }}$
203, fall and summer; 204, spring and summer. 4 credits each term. Prerequisites: for Japanese 203, Japanese 102 or placement by the instructor during registration; for Japanese 204 , Japanese 203,205 , or 223 , or placement by the instructor during registration.

## Staff.

Training in listening and speaking for students who have acquired basic oral proficiency. Students are strongly encouraged to enroll in Japanese 201-202 concurrently.

## JAPAN 301-302 Intermediate Japanese Reading II 영

301, fall; 302, spring. 4 credits each term. Prerequisites: for Japanese 301, Japanese 202 or placement by the instructor during registration; for Japanese 302, Japanese 301 or placement by the instructor during registration.
K. Selden and staff.

Reading of selected modern texts with emphasis on expository style.

## JAPAN 303-304 Communicative

 Competence 룽303, fall; 304, spring. 3 credits each term. Prerequisites: for Japanese 303, Japanese 204 or placement by the instructor during registration; for Japanese 304, Japanese 303 or placement by the instructor during registration.
Y. Katagiri.

Drill in the use of spoken Japanese within the constraints set by Japanese social settings.
JAPAN 341-342 Advanced Japanese for Business Purposes ©
341, fall; 342, spring. 4 credits each term. Prerequisite: permission of instructor. Meets concurrently with Japan 545-546.
R. Sukle.

This course sequence will offer advanced training in Japanese with concentration on topics relating to the conduct of business. The emphasis will be on spoken skills, with provision for an optional reading component.

## JAPAN 401-402 Advanced Japanese

 Reading ©401, fall; 402, spring. 4 credits each term. Prerequisites: for Japanese 401, Japanese 302 or placement by the instructor during registration; for Japanese 402, Japanese 401 or placement by the instructor during registration.
K. Selden, Y. Kawasaki.

Reading of selected modern texts with emphasis on expository style. One section of Japanese 401-402 specializes in business/ social science materials. Consult with Y. Kawasaki.
[JAPAN 404 Linguistic Structure of Japanese
Spring. 4 credits. Prerequisites: Japanese 102 or permission of instructor, and Linguistics 101, or equivalent introductory course in linguistics. Offered alternate years. Next offered 1995-96.
J. Whitman.

Introduction to the linguistic study of Japanese, with an emphasis on morphology and syntax.]

## JAPAN 407-408 Oral Narration and Public Speaking

407, fall; 408, spring. 2 credits each term. Prerequisites: for Japanese 407, Japanese 304 or placement by the instructor during registration; for Japanese 408, Japanese 407 or placement by the instructor during registration.
Y. Ueno.

Instruction in storytelling, lecturing, and speechmaking, with emphasis on both the construction of discourse and Japanese patterns of oral delivery.

## [JAPAN 410 History of the Japanese Language e\#

Fall. 4 credits. Prerequisite: permission of instructor. Offered alternate years. Next offered 1995-96.
J. Whitman. An overview of the history of the Japanese language followed by intensive examination of issues of interest to the participants. Students should have a reading knowledge of Japanese.]

## JAPAN 421-422 Directed Readings

421, fall; 422, spring. Credit to be arranged. Limited to advanced students and offered according to staff-time availability. Prerequisite: placement by the instructor during registration.

## K. Selden,

Topics are selected on the basis of student needs.

## JAPAN 543-544 Intermediate Japanese

 for Business Purposes543 , fall; 544, spring. 4 credits. For graduate students only.
R. Sukle.

Training in listening and speaking for students who have acquired basic oral proficiency. For students in international business and economics.

## JAPAN 545-546 Advanced Japanese for

 Business PurposesFor graduate students only; undergraduates register for Japanese 341-342. Meets concurrently with Japanese 341-342. R. Sukle.

This course sequence will offer advanced training in Japanese with concentration on topics relating to the conduct of business. The emphasis will be on spoken skills, with provision for an optional reading component.

## FALCON (Full-year Asian Language Concentration)

R. Sukle, 412 Morrill Hall (255-0734)

JAPAN 160 Introductory Intensive Japanese
Summer only. 10 credits.
R. Sukle and staff.

Introduction to spoken and written Japanese, including extensive drill with native speakers of the language, laboratory work, and lectures by the linguistics faculty on linguistic analysis and language and culture.

## JAPAN 161-162 Intensive Japanese

 (FALCON) 종161 , fall; 162 , spring. 16 credits each term. Prerequisites: for Japanese 161, Japanese 102 or 160 (Comell summer intensive course) at Cornell, or placement by the instructor during registration; for Japanese 162, Japanese 161 at Comell or placement by the instructor during registration.
R. Sukle and staff

Formal application to the program and acceptance is required for admission.

## Javanese

Fees. A small fee may be charged for photocopied texts for course work.

## JaVA 131-132 Elementary Javanese

131, fall; 132, spring. 3 credits each term. Prerequisite: for Javanese 132, Javanese 131 or equivalent.
J. U. Wolff and staff.

An elementary language course for those who have had no previous experience in the language.

## JAVA 133-134 Continuing Javanese

133, fall; 134, spring. 3 credits each term.
Prerequisites: for Javanese 133, Javanese 132 or equivalent; for Javanese 134, Javanese 133 or equivalent.
J. U. Wolff and staff.

An intermediate conversation and reading course.

## JAVA 203-204 Directed Individual Study

203, fall; 204, spring, 3 credits. Prerequisite: Javanese 134 or equivalent.
J. U. Wolff and staff.

This is a practical language course on an intermediate level in which the students will work through readings and conversations under the guidance of a native speaker for three contact hours a week.

## Old Javanese

See Linguistics 651-652.

## Khmer (Cambodian)

Fees. A small fee may be charged for photocopied texts for course work
KHMER 101-102 Elementary Khmer
101, fall; 102, spring. 6 credits each term. Prerequisite for Khmer 102: Khmer 101 or equivalent.
G. Diffloth and staff.

A course for beginners or for those who have been placed in the course by examination.
The course gives a thorough grounding in speaking and reading.

## KHMER 201-202 Intermediate Khmer

 Reading (i)201, fall; 202, spring. 3 credits each term. Prerequisites: for Khmer 201, Khmer 102; for Khmer 202, Khmer 201.
G. Diffloth and staff.

Continuing instruction in spoken and written Khmer.

## KHMER 203-204 Intermediate

Composition and Conversation 웅
203, fall; 204, spring. 3 credits each term. Prerequisites: for Khmer 203, Khmer 102; for Khmer 204, Khmer 203.
G. Diffloth and staff.

Letter writing and other forms of composition.
KHMER 301-302 Advanced Khmer ©
301 , fall; 302 , spring. 4 credits each term. Prerequisites: for Khmer 301, Khmer 202 or equivalent; for Khmer 302, Khmer 301.
G. Diffloth and staff.

Continuing instruction in spoken and written Khmer; emphasis on enlarging vocabulary, increasing reading speed, and reading various genres and styles of prose.

## KHNER 401-402 Directed Individual

 Study401, fall; 402 , spring. For advanced students. 4 credits each term. Prerequisite: permission of instructor.
G. Diffloth.

Various topics according to need.
[KHMER 403-404 Structure of Khmer
403 , fall; 404 spring. 4 credits each term. Prerequisite: Linguistics 101 or equivalent. Not offered 1994-95.
G. Diffloth.

Introduction to the linguistic study of Khmer.]

## Korean

Fees. A small fee may be charged for photocopied texts for course work.
KOREA 101-102 Elementary Korean 101, fall; 102, spring. 4 credits each term. H. Diffloth.

Covers basics of speaking, reading, and writing. Introduces Hangul writing system and rudiments of grammar.
KOREA 109-1 10 Elementary Reading 109, fall; 110 , spring. 3 credits each term. Prerequisite: permission of instructor. Satisfactory completion of Korean 110 will fulfill the qualification portion of the language requirement.
H. Diffloth.

This course is for students who have spoken some Korean in the home, but whose reading and writing skills are limited or nonexistent. If in doubt about eligibility, see instructor.

KOREA 201-202 Intermediate Korean 201, fall; 202, spring. 4 credits each term. Prerequisite: for Korean 201, Korean 102 or permission of instructor; for Korean 202, Korean 201.
H. Diffloth and staff.

Covers the basics of speaking, reading, and writing at the intermediate level. Introduces some reading and writing with Chinese characters.

## KOREA 301-302 Advanced Korean

301, fall; 302, spring. 4 credits each term. Prerequisites: for Korean 301, Korean 202 or placement by instructor; for Korean 302, Korean 301 or placement by instructor.
H. Diffloth and staff.

Reading of advanced texts, including newspapers and Chinese character material, together with advanced drill on the spoken language

## Languages

Fees. A small fee may be charged for photocopied texts for course work.
LANG 300 Independent Language Study Fall or spring. 1-4 credits. Prerequisite: permission of instructor.

Staff.
Languages are sometimes taught on a specialized basis when faculty are available to address particular student needs. Sections will be arranged with the instructor.

## Latin

See listings under Classics.

## Linguistics

Linguistics, the systematic study of human speech, lies at the crossroads of the humanities and the social sciences, and much of its appeal derives from the special combination of intuition and rigor that the analysis of language demands. The interests of the members of the Department of Modern Languages and Linguistics span most of the major subfields of linguistics, phonetics and phonology, the study of speech sounds; syntax, the study of sentence structure; semantics, the study of meaning; historical linguistics, the study of language change in time; sociolinguistics, the study of language as a social and cultural artifact; and applied linguistics, which relates the results of linguistic research to problems of bilingual education, second-language learning, and similar practical concerns.
Studying linguistics is not a matter of studying many languages. Linguistics is a theoretical discipline with ties to such areas as cognitive psychology, philosophy, logic, computer science, and anthropology. Nonetheless, knowing particular languages (e.g., Spanish or Japanese) in some depth can enhance understanding of the general properties of human language. Not surprisingly, then, many students of linguistics owe their initial interest to a period of exposure to a foreign language, and those who come to linguistics by some other route find their knowledge about languages enriched and are often stimulated to embark on further foreign language study.
Students interested in learning more about linguistics and its relationship to other disciplines in the humanities and social sciences are encouraged to take Linguistics 101, which is a prerequisite for most other
courses in the field. The Cornell Linguistic Circle, a student organization, sponsors frequent colloquia on linguistic topics; these meetings are open to the university public, and anyone wishing to learn more about linguistics is most welcome to attend.

## The Major

For questions regarding the linguistics major, contact C. Rosen ( 311 Morrill Hall, 255-0722.)

The prerequisite for a major in linguistics is the completion of Linguistics 101 and either Linguistics 201 or 203. The major has its own language requirement, which should be completed as early as possible: qualification in two languages other than English, one of which must be either non-European or non-Indo-Furopean. With approval of the department's director of undergraduate studies, this requirement may be waived (i.e., reduced to the normal arts college language requirement) for students taking the cognitive studies concentration or a double major.

The other requirements for the linguistics major are as follows:

1) Linguistics 201 (Introduction to phonetics and phonology) or Linguistics 203 (Introduction to syntax and semantics), whichever one was not taken as a prerequisite to the major
2) Linguistics 410 (Historical)
3) Three of the following five courses, one of which must be either Phonology I or Syntax I:
Linguistics 301 (Phonology I)
Linguistics 303 (Syntax I)
Linguistics 309 or 310 (Morphology I or II)
Linguistics 319 (Phonetics I)
Linguistics 421 (Semantics I)
4) A course at or beyond the 300 level in the structure of English or some other language, or a typological or comparative structure course such as Linguistics 401, or Field Methods.
5) One additional linguistics course for at least 4 credit hours, which may be a course with significant linguistic content in a related field.

Honors. Applications for honors should be made during the junior year. Candidates for admission must have a 3.0 (B) average overall and should have a 3.2 average in linguistics courses. In addition to the regular requirements of the major, the candidate for honors will complete an honors thesis and take a final oral examination in defense of it. The thesis is usually written cluring the senior year but may be begun in the second term of the junior year when the student's program so warrants. The oral examination will be conducted by the honors committee, consisting of the thesis adviser and at least one other faculty member in linguistics. Members of other departments may serve as additional members if the topic makes this advisable. Linguistics 493 and 494 may be taken in conjunction with thesis research and writing but are not required.

## Distribution Requirement

The distribution requirement in the social sciences may be satisfied by taking Linguistics 101 and (1) any other course in linguistics or
(2) any other course offered by the Department of Modern Languages and Linguistics for which this introductory linguistics course is a prerequisite.
Note: See also courses on the structure and bistory of particular languages or language families listed at the end of this section.

Fees: Depending on the course, a small fee may be charged for photocopied texts for course work.

## LING 101 Theory and Practice of Linguistics <br> 101, fall, spring, or summer. 4 credits each term.

Fall: A. Cohn; spring: Staff.
An introductory course designed to provide an overview of the science of language, especially its theoretical underpinnings, methodology, and major findings. Linguistics 101 plus any other course in linguistics or any DMLL course for which Linguistics 101 is a prerequisite satisfies the social science distribution requirement.

## LING 201 Introduction to Phonetics and Phonology

Spring. 4 credits. Prerequisite: Linguistics 101 or equivalent or permission of instructor.

## D. Zec.

An introduction to the study of human speech sounds and how they pattern in languages. The first part of the course will focus on phonetics: the production, acoustics, and perception of speech, with attention to both the common and the less common sounds of the world's languages. The second part of the course will focus on phonology: how human speech sounds pattern within and across languages, with an emphasis on the rules that govern these patterns and their possible representation.

## LING 203 Introduction to Syntax and

 SemanticsFall. 4 credits. Prerequisite: Linguistics 101 or equivalent or permission of instructor.

## M. Diesing.

This course focuses on language as a system of knowledge that enables native speakers to create and interpret the structures of their language. Part of the course will consider issues of syntactic structure, such as the order of constituents, the hierarchical organization of grammars, and syntactic universals. The other part of the course will focus on meaning and interpretation, addressing such issues as the role of context, how information is structured, and how is it encoded in the syntax.

## LING 230 Introduction to Southeast Asia Languages and Linguistics

Spring. 3-4 credits variable.
A. Cohn, G. Diffloth, J. Wheatley, and J. Wolff.

This is a survey of the languages of Southeast Asia. The goal of this course is to expose students to Southeast Asia as a linguistic area and introduce them to the rich language diversity of the region. It includes three main parts: 1) sociolinguistics and ethnolinguisticsissues of language and politics, language and culture, and language use; 2) language structures and typological patterns of the area's languages-characteristic properties of the structure of these languages; 3) historical linguistics, genetic relations between languages, as well as the linguistic effects of language contact and linguistic evidence for prehistory.

## 【LING 244 Language Use and Gender Relations (also Women's Studies 244)

Fall. 4 credits. For non-majors or majors. Not offered 1994-95.
S. McConnell-Ginet.

This course explores connections between language (use) and gender/sex systems, addressing such questions as the following. How do sex and gender affect the ways we speak, the ways we interpret and evaluate speech? How do sociocultural differences in women's and men's roles affect their language use, their relation to language change? What is meant by sexist language? How does conversation structure the social worlds of women and men? Readings draw from work in linguistics, anthropology, philosophy, psychology, literature, and general women's studies and feminist theory.]
[LING 264 Language, Mind, and Brain
Fall. 4 credits. For non-majors or majors. Prerequisite: a basic course in linguistics and or psychology is desirable. Not offered 1994-95.

## J. S. Bowers.

An introductory course that emphasizes the formal structure of natural language and its biological basis. The following topics are covered: the formal representation of linguistic knowledge, principles and parameters of universal grammar, the basic biology of language, mechanisms of linguistic performance, the modularity hypothesis, and language and cognition. This course is especially suited for majors in fields such as psychology, philosophy, computer science, and linguistics (and also for those enrolled in the concentration in cognitive studies) who want to take a one-semester introduction to linguistics that concentrates on the formal principles that govern linguistic knowledge, along with some discussion of their biological realization and their use in perception and production.]

LING 301-302 Phonology I, II 301, fall; 302, spring. 4 credits each term. Prerequisites: for Linguistics 301, Linguistics 201 or equivalent; for Linguistics 302,
Linguistics 301 or permission of instructor.
Fall: D. Zec; spring: A. Cohn Basic topics in contemporary phonological theory, which studies the representational structures and principles underlying the human ability to produce and understand spoken language. 301: Adopting a crosslinguistic perspective, develops a conception of phonological representations in which different types of phonological information are arrayed on distinct structural planes. Includes the study of segmental features and their organization, the supra-segmental quantity, and syllable organization. Relations of phonology with morphology, syntax, and phonetics. 302: Using American English as a case study, explores phonological rules and their systematic relations. Principles of syllabification and metrical structure. The organization of the rule system, constraints on rule interaction, lexical and morphological conditioning of rules, stratal and prosadic organization. Evidence for the mental representation of speech; principles of phonological acquisition.

## LING 303-304 Syntax I, II

303, fall; 304, spring. 4 credits each term. Prerequisites: for Linguistics 303, Linguistics 203; for Linguistics 304. Linguistics 303 or permission of instructor.

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Fall: W. Harbert; spring: Staff. 303 is an introduction to syntactic theory, with emphasis on the classical theory of transformational grammar. 304 is an advanced course, surveying current syntactic models and dealing with such issues as the nature of syntactic representation, levels of representation, principles of universal grammar, and the relation of syntax and semantics.

## [LING 306 Functional Syntax

Fall. 4 credits. Prerequisite: Linguistics 101 or permission of instructor. Not offered 1994-95 Staff.
A general survey of syntactic theories that highlight grammatical function and reveal its role in discourse structure.]

## LING 309-310 Morphalogy I, II

309, fall; 310, spring. 4 credits each term. Prerequisite: for Linguistics 309; Linguistics 101 or equivalent or permission of instructor; for Linguistics 310: Linguistics 203 or permission of instructor.

Fall: L. Waugh; spring: staff. 309 is a general survey focusing on the relationship of meaning and form in morphology and introducing techniques of morphological analysis. Current research on formmeaning questions is discussed. 310 considers recent discussions in morphological theory, in particular the relationship of morphology and syntax.
[LING 311-312 The Structure of English 311, fall; 312, spring. 4 credits each term. Prerequisites: for Linguistics 311, Linguistics 101 or permission of instructor; for Linguistics 312, Linguistics 311 or permission of instructor. Not offered 1994-95.
S. McConnell-Ginet.

311 provides an overview of the syntactic structure of English, drawing upon relevant theoretical approaches. 312 deals with phonology, morphology, and special problems of English structure and semantics.]

## LING 319 Phonetics I

Spring. 4 credits. Prerequisite: Linguistics 201 or permission of instructor.
A. Jongman.

Provides a basic introduction to the study of phonetics. Topics to be covered include anatomy and physiology of the speech production apparatus, transcription and production of some of the world's sounds, basic acoustics, computerized methods of speech analysis, acoustic characteristics of sounds, speech perception, speech synthesis, stress and intonation.

## [LING 320 Phonetics II

Spring. 4 credits. Prerequisite: Linguistics 319. Not offered 1994-95.
A. Jongman.

This course is a continuation of Phonetics I and provides a more detailed survey of some areas in acoustic and articulatory phonetics. Topics include feature theory, vocal tract acoustics, quantal theory, speaker normalization, theories of speech perception,
coarticulation, theories of speech production, and prosody. In addition, a number of "hands-on" projects will be part of the course.]

## [LING 321-322 History of the Romance Languages \#

321: fall; 322: spring. 4 credits each term. Prerequisites: Linguistics 101 or equivalent and qualification in any Romance language. Offered alternate years. Not offered 1994-95. C. Rosen.

321: Popular Latin. Pan-Romance trends in phonology, morphology, syntax, and the lexicon. Regional divergence. Non-Latin influences. Medieval diglossia and emergence of Romance standards. 322: French, Italian, and Spanish from 850 to 1250 A.D. Analysis of texts. Overview of other languages to the present day. Elements of dialectology.\}
LING 323-324 Comparative Romance Syntax
323, fall; 324, spring, 4 credits. Prerequisites: Linguistics 101 or equivalent, and qualification in any Romance language. Offered alternate years.
C. Rosen.

Concise survey of Romance syntax, covering the salient constructions in six languages with equal attention to their historical evolution and their current state. Grammatical innovation and divergence in a typological perspective.

## [LING 325 Pragmatics

Spring. 4 credits. Prerequisite: Linguistics 101 or permission of instructor. Not offered 1994-95.
S. McConnell-Ginet.

An introcluction to the study of such topics as speech acts, presupposition, deixis, implicatures, and conversational strategies.]

## [LING 334 Non-Linear Syntax

Fall. 4 credits. Prerequisite: Linguistics 303 or equivalent. Not offered 1994-95.
C. Rosen.

Analyses of some twenty diverse languages are examined with the aim of building a formal account of the syntactic constructions existing in the world's languages, and discerning universals that delimit this inventory. Non-linear theory, designed for comparative work, depicts constructions in the abstract, not imagining them as arrays of elements in space. Simultaneously it studies the morphosyntactic systems that relate constructions to their linear realizations.]

## [LING 366 Spanish in the United States

 (also Spanish 366)Fall. 4 credits. Prerequisite: some knowledge of Spanish. Offered alternate years. Applicable toward the social science distribution requirement. Not offered 1994-95.
J. Lantolf.

Examination of major Spanish dialects in the United States from a linguistic perspective. Contrast with the standard language. Borrowing, interference, and code switching. Syntactic, morphological, and phonological characteristics. Sex-related phenomena.]
[LING 370 Language and Cognition (also Psychology 370)
Spring. 4 credits. Prerequisite: Linguistics 101 or 264 or Psychology 215, or permission of one of the instructors. Not offered same years as Psychology 416. Not offered 1994-95. J. Bowers.

Examination of current research on selected topics on language from both linguistic and psychological perspectives. Topics may include: Universal Grammar and language acquisition, syntactic parsing, word recognition, sentence production, aphasia, and schizophrenic language.]

## LING 390 Independent Study in Linguistics

Fall or spring. $1-4$ credits variable. Prerequisite: Linguistics 101 or permission of instructor.

Staff.

Independent study of linguistics topics not covered in regular curriculum for undergrads.

## LING 400 Semiotics and Language (also Comparative Literature 410)

Spring. 4 credits. Prerequisite: some background in an area relevant to semiotics: e.g., linguistics, philosophy, psychology, anthropology, or literature: or permission of instructor.
L. Waugh.

An introduction to the study of semiotics in general and to particular semiotic theories (for example, those of Saussure, Peirce, Jakobson) and to language as a semiotic system. The particular topics to be discussed will depend on the interest of the students.

## LING 401 Language Typology

Fall. 4 credits. Prerequisite: Linguistics 101 or equivalent.
C. Rosen.

Study of a basic question of contemporary linguistics: in what ways do languages differ, and in what ways are they all alike? Efforts to formalize universals of syntax and to characterize the total repertory of constructions available to natural languages. Common morphological devices and their syntactic correlates. Emphasis on systems of case, agreement, and anaphora.

## LING 403 Introduction to Applied Linguistics

Spring. 4 credits. Prerequisite: A course in the structure of a language at the 400 level.

## J. Lantolf.

Examination of the theoretical bases of applied linguistics, including second-language learning and current language-teaching methodologies.

## LING 405-406 Sociolinguistics

405, fall; 406, spring. 4 credits each term. Prerequisite: Linguistics 101 or permission of instructor. Linguistics 405 is not a prerequisite to 406.
J. McWhorter.

405: Systematically within the interactions between language and social context, we will examine dialect usage (diglossia, multilingualism, code-switching); variation and language change (network theory, change in progress); ethnography of communication and speech acts; language and culture; and language and gender, race and power (incl. pidgins and creoles). 406: This course will be an introduction to the study of pidgin and creole languages and the issues surrounding them both in and beyond linguistics. Topics covered will include: genesis of pidgins and creoles; classification of pidgins and creoles; creoles and language universals; creoles and sociolinguistic variation; a module on Saramaccan Creole English; educational and language planning issues; sociohistorical issues; Black English.

## [LING 409 Psycholinguistics of SecondLanguage Reading

Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
G. Appel, J. Lantolf.

In-depth analysis of the research on the reading process in a second language. Topics include processing of narrative vs. expository texts (descriptive, problem solving, causative, etc.); comparison of the reading process in native vs. second languages, and development of methodologies for the teaching of reading in the second-language classroom.]

## LING 410 Introduction to Historical Linguistics

Spring. 4 credits. Prerequisite: Linguistics 201 or permission of instructor
J. Jasanoff.

A survey of the basic mechanisms of linguistic changes, with examples from a variety of languages.
LING 413 Topics in Historical Linguistics Fall. 4 credits. Prerequisite: Linguistics 410 or permission.
W. Harbert, J. Jasanoff, and C. Rosen

Examines a selection of recent research illustrating a variety of productive and innovative approaches to problems in historical linguistics. Readings center on phonological and morphological evolution in the Romance and Germanic families. Students carry out guided research projects.

LING 421-422 Semantics I, II 421, fall; 422, spring. 4 credits each term. Prerequisites: for Linguistics 421, Linguistics 203; for Linguistics 422, Linguistics 421 or permission of instructor.

Staff.
421: an introduction to semantics of natural language. The course starts from basic foundational questions concerning the nature of meaning and the empirical domain of semantic theory. Truth-conditional and logical theories and their application to the investigation of the structure of natural languages are extensively explored (with some comparisons with other approaches). Through the study of quantification, scope, anaphora, modalities, presuppositions, and the like, one tries to gain insight into general characteristics of the cognitive apparatus that is at the basis of our capacity for understanding sentences.
422: guides students into current work in semantic theory. The first half of the course is an introduction to Montague-style semantics, whose influence on current research is quite extensive. The second half of the course focuses on selected topics that have grown out of (and sometimes against) classical Montague semantics. Such topics are usually drawn from the following: generalized quantifiers and anaphora, type-shifting, problems of tense and aspect, the linguistic relevance of algebraic approaches to properties, propositions, events and thematic roles, and discourse representation theory

## [LING 430 Structure of Korean ©

Spring. 4 credits. Offered alternate years. Not offered 1994-95.
J. Whitman.

Intensive examination of the syntax and phonology of a non-Indo-European language with the objective of testing principles of current linguistic theory. No previous knowledge of Korean required.]

## [LING 431 Structure of an African Language

Fall. 4 credits. Prerequisite: Linguistics 101 or permission of the instructor. Offered alternate years. Not offered 1994-95 V. Carstens.

A survey of the grammar of an African lanaguage in light of current linguistic theory.

LING 436 Language Development (also Psychology 436 and Human Development and Family Studies 436)

Spring. 4 credits. Prerequisite: at least one course in developmental psychology
cognitive psychology, cognitive development, or linquistics. Offered alternate years B. Lust.

A survey of basic issues, methods, and research in study of first-language acquisition. Major theoretical positions in the field are considered in the light of experimental studies in first-language acquisition of phonology, syntax, and semantics from infancy on. The fundamental linguistic issues of universal grammar and the biological foundations for acquisition are discussed, as are the issues of relations between language and thought. The acquisition of communication systems in nonhuman species such as chimpanzees are addressed, but major emphasis is on the child.
[LING 440 Dravidian Structures ©
Spring, according to demand. 4 credits. Prerequisite: Linguistics 101. Not offered 1994-95.
J. W. Gair

A comparative and constrative analysis of the structures of several Dravidian languages.)
[LING 442 Indo-Aryan Structures ©
Fall, according to demand. 4 credits. Prerequisite: Linguistics 101. Not offered 1994-95.
J. W. Gair.

Typological discussion of the languages of the subfamily. Specific topics and emphasis may vary depending on the interest of the students.]

LING 443-[444] Linguistic Structure of Russian (also Russian 403-404) 443, fall; [444, spring.] 4 credits each term. Prerequisites for Linguistics 443, permission of instructor and Linguistics 101; for Linguistics 444, Linguistics 443 or equivalent. Offered alternate years. 444 not offered 1994-95.

## W. Browne.

A synchronic analysis of the structure of modern Russian. Linguistics 443 deals primarily with morphology and its relation to syntax and 444 with syntax and word order. Topics covered include case theory, the functions of word order, voice, agreement, impersonal constructions, negation, nonuniversal categories, and the relation between morphology and syntax.

## [LING 450 Computational Linguistics

Fall. 4 credits. Prerequisite: Linguistics 203. Not offered 1994-95.

Staff.
In this course we will study questions concerning the generative capacity, learnability, and parsing of different syntactic models. Some knowledge of recent developments in syntax is important. Some knowledge of mathematical linguistics may be helpful, but is not required. The course is meant for graduate students and advanced undergraduate students in linguistics, but may also be of interest to students in psychology/ psycholinguistics, computer science, and cognitive studies.]

## LING 493 Honors Thesis Research

Fall. 4 credits.
Staff.
May be taken before or after Linguistics 494, or may be taken independently

## LING 494 Honors Thesis Research

Spring, 4 credits.
Staff.

May be taken as a continuation of, or before, Linguistics 493.

LING 514 Syntax of African Languages
Spring. 4 credits. Prerequisites: Linguistics 101 and permission of instructor.
V. Carstens.

Selected topics in the syntax of African
languages.

## LING 600 Field Methods

Spring. 4 credits. Prerequisite: Linguistics 201 and 203 or permission of instructor.
C. Collins.

Elicitation, recording, and analysis of data from a native speaker of a non-Western language not generally known to students.

LING 601 Topics in Phonological Theory
Fall. 4 credits. Prerequisites: Linguistics 301 and one higher-level course in phonology.
A. Cohn.

Selected topics in current phonological theory.
[LING 603 History of Linguistics
Fall. 4 credits. Not offered 1994-95.
Staff.
The history of linguistics from early Greek and Sanskrit grammarians to the modern period.]

## LING 604 Research Workshop

Fall. 4 credits. S-U grade only. Prerequisite three or more semesters of graduate study in linguistics.
J. Bowers

Participants will present their own ongoing research and discuss it with their colleagues. Individual topics will be chosen on the basis of interest, experience, and probable focus of dissertation research
[LING 607 Twentieth-Century Linguistics
Spring. 4 credits. Prerequisite: at least one
course in linguistics or permission of instructor. Offered alternate years. Not
offered 1994-95
L. Waugh.

The development of 20th-century linguistics in America and Europe.]

## LING 608 Discourse Analysis

Spring. 4 credits. Prerequisite: permission of instructor.
J. Lantolf, L. Waugh.

Linguistic theory applied to relationships beyond the sentence.

## [LING 609 Greek Comparative Grammar (also Classics 421)

Fall. 4 credits. Prerequisite: thorough
familiarity with the morphology of classical Greek. Not offered 1994-95.
A. Nusshaum.

The prehistory and evolution of the sounds and forms of ancient Greek as reconstructed by comparison with the other Indo-European languages.]

## [LING 610 Latin Comparative Grammar

 (also Classics 422)Fall or spring. 4 credits. Prerequisite: thorough familiarity with the morphology of classical Latin. Not offered 1994-95.
A. Nussbaum.

The prehistory and evolution of the sounds and forms of classical Latin as reconstructed by comparison with the other Indo-European languages.]

## [LING 611 Greek Dialects (also Classics

 425)Fall. 4 credits. Not offered 1994-95.
A. Nussbaum.

A survey of the dialects of ancient Greek
through the reading and analysis of representative epigraphical and literary texts.]

## LING 612 Italic Dialects (also Classics 424)

Fall. 4 credits.
A. Nussbaum.

The phonology and morphology of Faliscan, Oscan, and Umbrian studied through the reading of epigraphical texts. Attention to the relations of these languages to Latin and the question of proto-Italic.

## [LING 613 Homeric Philology (also

 Classics 4271Fall. 4 credits. Prerequisite: ability to read Homeric Greek. Not offered 1994-95
A. Nussbaum.

The language of the Homeric epics: dialect background, archaisms, epicisms, and modernizations. The notion of a Kunst sprache: its constitution, use, and internal consistency. The phonological and morphological aspects of epic compositional technique.]

## [LING 614 Archaic Latin (also Classics 426)

Spring. 4 credits. Prerequisite: reading knowledge of Latin. Not offered 1994-95 A. Nussbaum.

Reading of epigraphic and literary preclassical texts with special attention to archaic and dialectal features. The position of Latin among the Indo-European languages of ancient Italy, the rudiments of Iatin historical grammar, and aspects of the development of the literary language.]

## [LING 615 Mycenaean Greek (also

 Classics 429)Fall or spring. 4 credits. Prerequisite: thorough familiarity with the morphology of classical Greek. Not offered 1994-95.
A. Nussbaum.

An introduction to the epigraphy, language, and content of the Linear B tablets with special attention to their implications for Greek historical grammar and dialectology.]

## LING 616 Syntax III

Fall. 4 credits. Prerequisites: Linguistics 304 or permission of instructor.
C. Collins.

## [LING 617-618 Hittite

617, fall; 618, spring. 4 credits each term. Prerequisites: for Linguistics 617, permission of instructor; for Linguistics 618, Linguistics 617 or permission of instructor. Not offered 1994-95.
J. Jasanoff.]
[LING 619 Rigveda
Fall. 4 credits. Not offered 1994-95. J. Jasanoff.

Reading and linguistic analysis of selected Vedic hymns]
[LING 620 Area Topics in Romance Linguistics
Spring. 4 credits. May be repeated for credit. Offered alternate years. Not offered 1994-95. C. Rosen.]

## [LING 621 Problems and Methods in

 Romance LinguisticsFall. 4 credits. Prerequisites: Linguistics 101 or equivalent and qualification in two Romance languages. Offered alternate years. Not offered 1994-95.
C. Rosen.]

## [LING 623-624 Old Irish

623, fall; 624, spring. 4 credits each term. Prerequisite for 624: 623 or permission of instructor. Not offered 1994-95.
J. Jasanoff.]

## [LING 625-626 Middle Welsh]

## [LING 627 Advanced Old Irish]

[LING 631 Comparative Indo-European Linguistics
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
J. Jasanoff

An introduction to the comparative grammar of the Indo-European languages.]

## LING 633 Seminar in First-Language

 Acquisition: Cross-linguistic Studies of the Acquisition of Anaphora (also Human Development and Family Studies 633)Fall. 1-4 credits. Prerequisite: Linguistics 436 or equivalent or permission of instructor. B. Lust

This seminar will review and critique current theoretical and experimental studies of the first-language acquisition of anaphora, with a concentration on insights gained by crosslinguistic study of this area. The seminar will forcus on relating current developments in linguistic theory regarding anaphora to current experimental research on first-language acquisition of anaphora. Attention will also be given to the development of research proposals.
LING 635-636 Indo-European Workshop
Fall. 4 credits each term. Prerequisite: permission of instructor.

635: J. Jasanoff; 636: A. Nussbaum. An assortment of subjects intended for students with previous training in IndoEuropean linguistics: problems in the reconstruction of Proto Indo-European, topics in the historical grammars of the various IE languages, reading and historical linguistic analysis of texts, and grammatical sketches of "minor" IE languages.

## LING 648 Speech Synthesis by Rule

Spring. 4 credits. Prerequisite: Linguistics 301, 319, or permission of instructor. Offered altemate years.

## S. R. Hertz.

Investigates the nature of the acoustic structure of speech sythesis, using speech as a tool for exploring this structure. A particular acoustic model will be proposed, developed, and motivated by considering the relationship between phonological and acoustic structure, speech timing, phonetic universals, coarticulation, and speech perception. The primary tool for investigation will be the Delta System, a powerful software system for investigating phonology and phonetics through speech synthesis. The course is meant for graduate students and advanced undergraduate students in linguistics, but may also be of interest to students in psychology/ psycholinguistics, computer science, and cognitive studies.

## [LING 653-654 Seminar in Southeast

 Asian Linguistics653, fall; 654, spring. 4 credits each term. Prerequisite: Linguistics 303 or permission of instructor. Linguistics 653 is not a prerequisite for 654. Not offered 1994-95.

## G. Diffloth.

Languages of mainland Southeast Asia. Topics, chosen according to student interests.
may include description, dialectology, typology, comparative reconstruction, and historical studies.]
[LING 655-656 Seminar in Austronesian Linguistics
655, fall; 656, spring. 4 credits each term. Prerequisites: for Linguistics 655, Linguistics 101 and permission of instructor; for Linguistics 656, Linguistics 655. Not offered 1994-95. J. U. Wolff.

Descriptive and comparative studies of Malayo-Polynesian languages.]

## [LING 657-658 Seminar in Austroasiatic

 Linguistics[657, fall;] 658, spring. 4 credits each term. Prerequisites: Linguistics 101 or permission of instructor. Not offered 1994-95. G. Diffloth.

Descriptive and comparative studies of Austroasiatic languages.]

## LING 700 Seminar

Fall or spring, according to demand. Credit to be arranged.

Hours to be arranged. Staff. Seminars are offered according to faculty interest and student demand. Topics in recent years have included subject and topic, Montague grammar, speech synthesis, lexicography, classical and autonomous phonology, Japanese sociolinguistics, relational grammar, semantics and semiotics, and others.

## LING 701-702 Directed Research

701, fall; 702, spring. 1-4 credits.
Hours to be arranged. Staff.

## LING 773-774 Proseminar in Cognitive Studies II (also Computer Science 774)

773 fall; 774 spring. 2 creclits each term. S-U grade only.

Staff.
The focus will be on the contribution of linguistics, computer science, and neuroscience to the study of cognition. Topics may include the phonology, syntax, and semantics of natural language; artifical intelligence work in natural language processing, vision, and reasoning; parallel distributed processing; and neuropsychology.

## Additional Linguistics Courses

[Chinese 401 History of the Chinese Language] [Chinese 403 Linguistic Structure of Chinese I]
[Chinese 404 Linguistic Structure of Chinese II]
[Chinese 405 Chinese Dialects]
[Chinese 607 Chinese Dialect Seminar]
[French 401 History of the French Language]
[French 407 Applied Linguistics: French]
[French 408 Linguistic Structure of French]
French 410 Semantic Structure of French
[French 604 Contemporary Theories of French Grammar]
French 700 Seminar in French Linguistics
German 401 Introduction to Germanic Linguistics
[German 402 History of the German Language]
[German 404 Modern German Syntax]
[German 406 Runology]
German 407 Teaching German as a Foreign Language
[German 602 Gothic]
[German 603 Old High German, Old Saxon]
[German 605 Structure of Old English]
[German 606 Topics in Historical Germanic Phonology]
[German 607 Topics in Historical Germanic Morphologyl
[German 608 Topics in Historical Germanic Syntax]
German 609-610 Old Norse
[German 611 Readings in Old High German and Old Saxon]
[German 710 Seminar in Germanic Linguistics]
[German 720 Seminar in Comparative Germanic Linguistics]
[German 730 Seminar in German Linguistics]
[Hindi 700 Seminar in Hindi Linguistics]
[Indonesian 300 Linguistic Structure of Indonesian]
[Italian 403 Linguistic Structure of Italian]
[Italian 404 History of the Italian Language]
Italian 631 Readings in Italian Opera Libretti
[Japanese 404 Linguistic Structure of Japanese]
[Japanese 410 History of Japanese Language]
[Khmer 403-404 Structure of Khmer]
[Russian 207-208 Russian Phonetics for Beginners]
[Russian 301-302 Advanced Russian Grammar and Reading]
[Russian 401-402 History of the Russian Language]
Russian 403-[404] Linguistic Structure of Russian
[Russian 407-408 Russian Phonetics]
Russian 409 Teaching Russian as a Foreign Language
[Russian 601 Old Church Slavic]
[Russian 602 Old Russian]
Russian 651-652 Comparative Slavic Linguistics
[Russian 700 Seminar in Slavic Linguistics]
[Spanish 401 History of the Spanish Language]
Spanish 407 Applied Linguistics: Spanish
[Spanish 408 The Grammatical Structure of Spanish]
[Spanish 601 Hispanic Dialectology]
[Spanish 700 Seminar in Spanish Linguistics]
[Tagalog 300 Linguistic Structure of Tagalog]
[Welsh 404-405 The Structure of Welsh I \& II]
Welsh 411 Readings of Modem Welsh

## Mandinka

Fees. A small fee may be charged for photocopied texts for course work.

MANDI 121-122 Elementary Mandinka (also Africana Studies and Research Center)
121, fall; 122, spring. 4 credits each term. Prerequisite: for Mandinka 122, 121 or examination.
V. Carstens and staff.

Foundations provided in all basic language skills, with an emphasis on speech and aural comprehension. Classes provide speaking and listening practice.
MANDI 123 Continuing Mandinka |also Africana Studies and Research Center)
Fall. 4 credits. Prerequisite: Mandinka 122 or equivalent.
V. Carstens and staff.

Building on 121-122, this is an all-skills course with a functional emphasis. Class will be conversational.

## MANDI 203 Intermediate Mandinka (also Africana Studies and Research Center)

Spring. 3 credits. Prerequisite: Mandinka 123 or equivalent.
V. Carstens and staff.

## Mepali

Study Abroad in Nepal
Comell and the central campus of the Nepalese national university-Tribhuvan-at Kirtipur, Kathmandu, co-sponsor an academic year in Nepal. North American students study and live with Nepalese students who come from outside the Kathmandu Valley to Tribhuvan University. Students may participate in one or two semesters. Courses are offered both at Tribhuvan University and at the Comell-Nepal Study Program House adjacent to the university. All courses are officially taught in English. A five-week, incountry orientation program includes classes in intensive Nepali conversation, cultural orientation programs, and a ten-day field trip and trek. Semester course offerings include Nepali language (Tibetan and/or Newari languages also possible), contemporary issues in Nepalese studies, field research design and methods in sociology/anthropology and ecology/environment, and guided field research.
Juniors and seniors in good academic standing from any major field may participate. Students must have a desire to study on the other side of the world, to participate in a multicultural program, and to undertake rigorous field research. No experience in Nepal is necessary and instruction is in English, but some prior Nepali language study is strongly recommended. Students interested in the study abroad in Nepal program should consult with the Cornell Abroad office ( 474 Uris) for further information.
Fees. A small fee may be charged for photocopied texts for course work.
NEPAL 101-102 Elementary Nepali 101, fall; 102, spring. 6 credits each term. Prerequisite: for Nepali 102, 101 or examination.
S. Oja.

Intended for beginners. The emphasis is on basic grammar, speaking and comprehension skills, utilizing culturally appropriate materials and texts. Devanagari script for reading and writing is also introduced.

## NEPAL 160 Intensive Nepali

Summer only. 10 credits. Intended for * beginners. Offered altemate years. Offered 1995.
S. Oja.

Emphasis will be on the spoken language, in dialogues, exercises, and conversation practice. In addition, however, special attention is given to assisting students to develop vocabularies and abilities appropriate to their unique professional needs. Reading and writing practice use both colloquial and scholarly materials in the Nepali (Devanagari) script.

## NEPAL 201-202 Intermediate Nepali

 Conversation (e)201, fall; 202, spring. 3 credits each term. Prerequisites: for Nepali 201, Nepali 102 or examination; for Nepali 202, Nepali 201 or examination.
S. Oja.

Intermediate instruction in spoken grammar and verbal comprehension skills, with special attention to developing technical vocabularies and other verbal skills appropriate to students' professional fields.

## NEPAL 203-204 Intermediate Nepali Composition

203, fall; 204, spring. 3 credits each term. Prerequisites: for Nepali 203, Nepali 102 or examination; for Nepali 204, Nepali 203 or examination.
S. Oja.

A systematic review of written grammar and reading comprehension, with special attention to the technical vocabularies, necessary writing skills, and published materials typical of advanced students' professional fields.

## Pali

Fees. A small fee may be charged for photocopied texts for course work.

## [PALI 131-132 Elementary Pali

131, fall; 132, spring. 3 credits each term. Not offered 1994-95.
J. Gair.

131 is an introduction to the language of the canonical texts of Theravada Buddhism.
Reading of authentic texts of Theravada Buddhism. Emphasis on both content and grammatical structure. Familiarity with Sanskrit is not required. 132 is a continuation of 131 with further readings.]

## Polish

Fees. A small fee may be charged for photocopied texts for course work.

## POLSH 131-132 Elementary Polish

131, fall; 132, spring. 3 credits each term. Prerequisite for Polish 132: Polish 131 or equivalent. Offered alternate years.
E. W. Browne.

Covers all language skills: speaking, listening comprehension, reading, and writing.

## [POLSH 133-134 Continuing Polish

133, fall; 134, spring. 3 credits each term. Prerequisites: for Polish 133, Polish 132 or equivalent; for Polish 134, Polish 133 or equivalent. Offered alternate years. Not offered 1994-95.
E. W. Browne.

An intermediate conversation and reading course.]

## Portuguese

Fees. A small fee may be charged for photocopied texts for course work.

PORT 121-122 Elementary Portuguese
121, fall; 122 , spring. 4 credits each term. Intended for beginners. Students may attain qualification upon completion of 122 by achieving a satisfactory score on a special examination.
J. Oliveira.

A thorough grounding is given in all the language skills: listening, speaking, reading, and writing.

## PORT 203-204 Intermediate Composition

 and Conversation ©203, fall; 204, spring. 3 credits each term. Prerequisites: for Portuguese 203, Portuguese 122 or permission of instructor; for Portuguese 204, Portuguese 203 or permission of instructor.
J. Oliveira.

Conversational grammar review with special attention to pronunciation and the develop-
ment of accurate and idiomatic oral expression. Includes readings in contemporary Portuguese and Brazilian prose and writing practice.

## PORT 303-304 Advanced Composition

 and Conversation ©303, fall; 304, spring. 4 credits each term. Prerequisites: for Portuguese 303, Portuguese 204 or equivalent; for Portuguese 304, Portuguese 303 or equivalent.
J. Oliveira.

## Quechua

Fees. A small fee may be charged for photocopied texts for course work.

QUECH 131-132 Elementary Quechua
131, fall; 132, spring. 3 credits each term. Prerequisite: qualification in Spanish. L. Moratō Peña

A beginning conversation course in the Cuzco dialect of Quechua

QUECH 133-134 Continuing Quechua
133, fall; 134, spring. 3 credits each term. Prerequisites: for Quechua 133, Quechua 131-132 or equivalent; for Quechua 134; Quechua 133 or equivalent.
L. Morato Peña.

An intermediate conversation and reading course. Study of the Huarochiri manuscript.

## [QUECH 135-136 Quechua Writing Lab

135 , fall; 136, spring. 1 credit each term. Prerequisites: concurrent enrollment in Quechua 131-132 or instructor's approval Letter grade only.

Staff.
Computer-assisted drill and writing instruction in elementary Quechua.]

## Romance Linguistics

[LING 321-322 History of the Romance Languages *
321, fall; 322, spring. 4 credits. Prerequisite for 321: Linguistics 101 or equivalent, and qualification in any Romance language.
Offered altemate years. Not offered 1994-95.
C. Rosen.

For description see Linguistics 321-322.]
LING 323-324 Comparative Romance Syntax
323, Fall; 324, Spring. 4 credits. Prerequisites Linguistics 101 or equivalent and qualification in any Romance language. Offered alternate years.
C. Rosen.

For description see Linguistics 323-324
[LING 620 Area Topics in Romance Linguistics
Spring. 4 credits. May be repeated for credit. Offered alternate years. Not offered 1994-95. C. Rosen.]

## [LING 621 Problems and Methods in

 Romance LinguisticsFall. 4 credits. Prerequisites: Linguistics 101 or equivalent and qualification in two
Romance languages. Offered altemate years. Not offered 1994-95.
C. Rosen.]

## Romanian

Fees. A small fee may be charged for photocopied texts for course work.
[ROMAN 131-132 Elementary Romanian 131, fall; 132, spring. Offered according to demand. 3 credits. Prerequisite for Romanian 132: Romanian 131 or equivalent. Not offered 1994-95.

Staff.
Covers all language skills: speaking, listening comprehension, reading, and writing.]
[ROMAN 133-134 Continuing Romanian
133, fall; 134, spring. Offered according to demand. 3 credits. Prerequisite for Romanian 134: Romanian 133 or equivalent. Not offered 1994-95.

Staff.
An intermediate conversation and reading course.]

## Russian

E. W. Browne, S. Paperno (director of the Russian Language Program, 302 Morrill Hall, 255-2322).

For literature courses see Russian Literature.

## The Russian Major

See Russian Literature.

## Study Abroad

Cornell is an affiliated institution in the Council on International Education Exchange program for Russian language study at Leningrad State University. Cornell students also frequently go on the American Council of Teachers of Russian program in Moscow and other Russian language programs. Opportunities are available for study during the summer a single semester, or the full year. Further information is available from Professor Patricia Carden or Diane Williams, 236 Goldwin Smith Hall.
Honors. Students taking honors in Russian undertake individual reading and research and write an honors essay.

## Freshman Writing Seminar Requirement

See Russian Literature.

## Russian and Soviet Studies Major

See "Special Programs and Interdisciplinary Studies," which follows the department listings.
Fees. A small fee may be charged for photocopied texts for course work.

RUSSA 103-104 Conversation Practice 103, fall; 104, spring. 2 credits each term. Must enroll in one section of 103 and one section of 121 , in the fall; and one section of 104 and one section of 122 in the spring
L. Paperno and staff.

## RUSSA 121-122 Elementary Russian

121 , fall or summer; 122 , spring or summer. 4 credits each term. May be taken alone and qualification will be achieved with satisfactory completion of 121-122-123; or may be taken concurrently with 103-104 and qualification will be achieved at completion of 122-104.
S. Paperno and staff.

A thorough grounding is given in all the language skills: listening, speaking, reading, and writing.

## RUSSA 123 Continuing Russian

Fall. 4 credits. Limited to students who have previously studied Russian or been placed by department. Satisfactory completion of Russian 123 fulfills the qualification portion of the language requirements
V. Tsimberov and staff

A prequalification course designed to prepare students for study at the 200 level. Passing this course is equivalent to qualification.

## RUSSA 203-204 Intermediate

Composition and Conversation
203, fall, spring or summer; 204, spring. 3 credits each term. Prerequisite: qualification in Russian (Russian 123 or placement by department). Prerequisite for Russian 204 : Russian 203 or equivalent.
L. Paperno and V. Tsimberov.

Guided conversation, composition, reading, pronunciation, and grammar review, emphasizing the development of accurate and idiomatic expression in the language.
RUSSA 205-206 Reading Russian Press 205, fall; 206, spring. 2 credits each term. Prerequisite: qualification in Russian (Russian 123 or placement by department). Both semesters must be taken in order to satisfy the proficiency level for the language requirement. This course cannot be used to satisfy the humanities requirement

## Staff.

Reading unabridged articles on a variety of topics from current Russian periodicals.
Note: Students placed in the 200-level courses also bave the option of taking courses in introductory literature; see separate listings under Russian 201 and 202 for descriptions of these courses, any of which may be taken concurrently with the 203-204 and 205-206 language courses described above. The introductory literature courses are offered by the Department of Russian Literature, and the 203-204 and 205-206 language courses by the Department of Modern Languages and Linguistics.

## [RUSSA 207-208 Russian Phonetics for Beginners

207, fall; 208, spring. 2 credits each term Open to students enrolled in Russian 121. Not offered 1994-95.

Staff.
This is both a practical and theoretical course. Practice sessions for the first part of the course will follow the 121 textbook rather closely.
There will also be discussions about phonetics in general and the sound system of Russian.]

## [RUSSA 301-302 Advanced Russian

 Grammar and Reading301, fall; 302, spring. 4 credits each term. Prerequisites: for Russian 301, second-year Russian or permission of instructor; for Russian 302, Russian 301. Offered alternate years. Not offered 1994-95.

Staff.
This course is intended primarily to increase the student's active command of difficult Russian syntactic constructions. Special attention is paid to word order, impersonal sentences, voice, negation, participles, gerunds, and also to building active vocabulary through reading modern Russian prose. Problems of phonology are also discussed.]

RUSSA 303-304 Advanced Composition and Conversation
303, fall; 304 , spring. 4 credits each term. Prerequisites: for Russian 303, Russian 204 or equivalent; for Russian 304, Russian 303 or equivalent.
L. Paperno, S. Paperno, and V. Tsimberov. Writing, reading, and conversation: viewing authentic language materials; current Russian films (feature and documentary), newspapers, TV programs, and other materials are used.

## RUSSA 305-306 Directed Individual

 Study305, fall; 306, spring. 2 credits each term. Prerequisites: for Russian 305, Russian
303-304 or equivalent; for Russian 306, Russian 305.

Staff.
This course is intended for students with special needs that cannot be met by any other Russian course.

## RUSSA 309-310 Advanced Reading

309, fall; 310, spring. 4 credits each term. Prerequisites: for Russian 309, Russian 204; for Russian 310, Russian 309 or equivalent. L. Paperno.

The purpose of the course is to teach advanced reading skills. The weekly reading assignment is $20-40$ pages of unabridged Russian prose (non-fiction) of the 20th century. The discussion of the reading is conducted entirely in Russian and is centered around the content of the assigned selection.
[RUSSA 401-402 History of the Russian Language \#
401, fall; 402, spring. 4 credits each term. Prerequisites: for Russian 401, permission of instructor; for Russian 402, Russian 401 or equivalent. Offered alternate years. Not offered 1994-95.

Staff.
Phonological, morphological, and syntactic developments from Old Russian to modern Russian.]

## RUSSA 403-[404] Linguistic Structure of

 Russian (also Linguistics 443-444)403, fall; [404, spring.] 4 credits each term. Prerequisites: for Russian 403, permission of instructor, Linguistics 101 recommended; for Russian 404, Russian 403 or equivalent. Offered alternate years. 404 offered 1994-95. W. Browne.

A synchronic analysis of the structure of modern Russian. Russian 403 deals primarily with morphology and its relation to syntax and 404 with syntax and word order. Topics covered include case theory, the functions of word order, voice, agreement, impersonal constructions, negation, nonuniversal and the relation between morphology and syntax.

## [RUSSA 407-408 Russian Phonetics

407, fall; 408, spring. 4 credits each term. Prerequisite: Russian 204. Not offered

## 1994-95.

Staff.
Treats both the practical and theoretical aspects of Russian phonetics. Lab work includes the use of the computer for acoustic phonetics, primarily for undergraduate majors in Russian and for gracluate students in Slavic linguistics and Russian literature.]

## RUSSA 409 Teaching Russian as a

Foreign Language
Fall or spring. 1 credit. Prerequisite: very good command of Russian.
S. Paperno.

Designed to equip the teacher of Russian with the basic skills of conducting a class. Geared to the courses and methodology used in the Russian language program at Comell. Not a theoretical course.

## RUSSA 413-414 Advanced Conversation

 and Stylistics413, fall; 414, spring. 2 credits each term. Prerequisites: for Russian 413, Russian 303-304 or the equivalent, for Russian 414, Russian 413 or equivalent.
L. Paperno, S. Paperno, or V. Tsimberov.

Discussion of authentic unabridged Russian
texts and TV films (feature or documentary) in a variety of nonliterary styles and genres.

## [RUSSA 601 Old Church Slavic

Fall. 4 credits. This course is prerequisite to Russian 602. Offered alternate years. Not offered 1994-95.
E. W. Browne.

Grammar and reading of basic texts.]
[RUSSA 602 Old Russian Texts
Spring. 4 credits. Prerequisite: Russian 601. Offered alternate years. Not offered 1994-95. E. W. Browne.

Grammatical analysis and close reading of Old Russian texts.]

## RUSSA 633-634 Russian for Russian Specialists

633, fall; 634, spring. 2 credits each term. Prerequisite: four years of college Russian. For graduate and advanced undergraduate students.
L. Paperno and S. Paperno.

The course is designed for students who specialize in an area of Russian studies requiring fine active control of the language. Fine points of syntax, usage, and style are discussed.

## RUSSA 651-652 Comparative Slavic

 Linguistics651, fall; 652, spring. 4 credits each term. Prerequisites: for Russian 651, Russian 601 taken previously or simultaneously or permission of instructor; for Russian 652, Russian 651 or permission of instructor. Offered alternate years.
E. W. Browne.

Sounds and forms of the Slavic languages and of prehistoric common Slavic; main historical developments leading to the modern languages.

## [RUSSA 700 Seminar in Slavic

 LinguisticsOffered according to demand. Variable credit. Not offered 1994-95.

Staff.
Topics chosen according to the interests of staff and students.]

## Sanskrit

[SANSK 131-132 Elementary Sanskrit (also Classics 131-132)
131, fall; 132, spring. 4 credits each term. Not offered 1994-95.

Staff.
An introduction to the essentials of Sanskrit grammar. Designed to enable the student to read classical and epic Sanskrit as quickly as possible.]
SANSK 251-252 Intermediate Sanskrit (also Classics 251-252) 유 \#
251, fall; 252, spring. 3 credits each term. Prerequisite: Sanskrit 132 or equivalent. C. Minkowski.

Readings from the literature of Classical Sanskrit. Fall: Selections from the two Sanskrit epics, the Mababbarata and the Ramayana. Spring: More selections from the epics and selections from either Sanskrit story literature or from Sanskrit dramas.

## Serbo-Croatian

Fees. A small fee may be charged for photocopied texts for course work.

## [SEBCR 131-132 Elementary Serbo-

 Croatian131, fall; 132, spring. 3 credits each term. Prerequisite for Serbo-Croatian 132: SerboCroatian 131 or equivalent. Not offered 1994-95.
E. W. Browne.

Covers all language skills: speaking, listening comprehension, reading, and writing.]

## SEBCR 133-134 Continuing Serbo-

 Croatian133, fall; 134, spring. 3 credits each term. Prerequisites: for Serbo-Croatian 133, SerboCroatian 132 or equivalent; for Serbo-Croatian 134, Serbo-Croatian 133 or equivalent.
Offered alternate years.
E. W. Browne.

An intermediate conversation and reading course.

## Sinhala (Sinhalese)

Fees. A small fee may be charged for photocopied texts for course work.

## SINHA 101-102 Elementary Sinhala

101, fall; 102, spring. 6 credits each term. Prerequisite for Sinhala 102: Sinhala 101 or equivalent.
J. W. Gair and staff.

A semi-intensive course for beginners. A thorough grounding is given in all the language skills; listening, speaking, reading, and writing.

## [SINHA 160 Intensive Sinhala

Summer only. 10 credits. Intended for beginners. Offered alternate years. Not offered 1995.
J. W. Gair and staff.

Emphasis is on the spoken (colloquial) language, the writing system is introduced and used to present all Sinhala materials, with additional reading practice with colloquial materials. A foundation is laid for later study of the written language (literary Sinhala).]

## SINHA 201-202 Intermediate Sinhala

 Reading201, fall; 202, spring. 3 credits each term. Prerequisites: for Sinhala 201, Sinhala 102; for Sinhala 202, Sinhala 201 or equivalent.
J. W. Gair and staff.

## SINHA 203-204 Intermediate

Composition and Conversation (e)
203, fall; 204, spring. 3 credits each term. Prerequisites: for Sinhala 203, Sinhala 102 or permission of instructor; for Sinhala 204,
Sinhala 203 or equivalent.
J. W. Gair and staff.

## Related Courses

See also Linguistics 442, 631.

## Spanish

J. Lantolf, (director of undergraduate studies, 314 Morrill Hall, 255-0720), M. Suner.
For advanced Spanish language and literature courses see Romance Studies.

## The Major

The major is designed to give students proficiency in the oral and written language, to acquaint them with Hispanic culture, and to develop their skill in the linguistic analysis of Spanish. (For the major in Spanish literature see the description under Romance Studies.) Satisfactory completion of the major should enable students to meet language require-
ments for teaching, to continue with graduate work in Spanish or other appropriate disciplines, or to satisfy standards for acceptance into the training programs of the government, social agencies, and business concems. A Spanish major combined with another discipline may also allow a student to undertake pre-professional training for graduate study in law, medicine, business, etc Students interested in a Spanish major are encouraged to seek faculty advice as early as possible. For acceptance into the major, students should consult the director of undergraduate studies of the Department of Modern Languages and Linguistics, Professor Lantolf ( 314 Morrill Hall), who will admit them to the major

## The Core

All majors will work out a plan of study in consultation with their advisers. Previous training and interests as well as vocational goals are taken into account when the student's program of courses is determined. Spanish 201 and 204 or 212 (or equivalent) are prerequisite to entering the major in Spanish. All majors normally include the following core courses in their programs:

1) Spanish 315-316-317 or 318
2) Spanish 311 and 312 (or equivalent)

Spanish majors have great flexibility in devising their programs of study and areas of concentration.

## The Linguistic Option

Spanish linguistics, for which the program normally includes at least 20 credits, and at least 8 additional credits in general or Spanish linguistics (such as 366, 401, 405, 407, 408 and others). (Linguistics 101 is recommended before entering this program.) The
J. G. White Prize and Scholarships are available annually to students who achieve excellence in Spanish

## Study Abroad in Spain

Cornell and the University of Michigan cosponsor an academic year in Spain program. Students enrolled in this program spend the first four weeks before the fall semester begins in a residential college located on the campus of the University of Madrid, where they take a course in Spanish language and contemporary society and take advantage of special lectures and field trips to Madrid and Castile. This course carries three credits. In early October the program moves to Seville, where students enroll in as many regular classes at the University of Seville as their language competency and general education permit. Their academic work is supplemented by courses designed explicitly for the program by Seville faculty, as well as a seminar regularly offered by the resident director, who is chosen from the faculty of either Cornell or Michigan. The special courses normally include history of art and architecture, Spanish composition and syntax, and modern Spanish history. In Seville students live with selected families. ComellMichigan also maintains a center in Seville, which is used by students for special seminars, tutorials, lectures, and informal gatherings.
Applicants are expected to have at least completed Spanish 204 prior to departure Students are strongly encouraged to study abroad for the entire year rather than for one
semester. Students interested in the study abroad program should consult with the Cornell Abroad office for further information (474 Uris Hall, 255-6224).

Honors. Honors in Spanish may be achieved by superior students who want to undertake guided independent reading and research in an area of their choice. Students in the senior year select a member of the Spanish faculty from either the Department of Romance Studies or the Department of Modern Languages and Linguistics to supervise their work and direct the writing of their honors essays (see Spanish 429-430).
Fees. Depending on the course, a small fee may be charged for photocopied texts for course work.

## Important information about registration

 for Spanish classesThe Spanish Program offers a number of elementary and intermediate courses to satisfy the needs of students with a variety of backgrounds; students are urged to register for the appropriate level so as to start the semester in the right class. Students with 2 or more years in the language are required to take the placement test before taking any Spanish course unless they already have a score from their achievement test.

| Background | Course |
| :--- | :--- |
| 0 Spanish | Spanish 121 |
| less than 2 years | Spanish 121 |
| 2 years or more | Placement test score <br> required for any |
|  | Spanish course |

Placement Score*
less than 370 Spanish 121
370-440 Spanish 112
450-550 Spanish 123
more than $560 \quad$ Spanish 200, 203, 213
*the placement score can be from an achievement test, the CPT, or the SPT.

## SPAND 101 Basic Course I

Summer only. 6 credits. Prerequisite: no Spanish.

Staff.
This course is intended for students with absolutely no experience in Spanish. (Spanish 123 and 203 are usually offered in the summer concurrently with 101 for students with prior experience.) Spanish 101 provides a thorough grounding in all language skills. Language practice in small groups. Lectures cover grammar, reading, and cultural information

## SPAND 112 Elementary Spanish: Review and Continuation

Fall. 4 credits. Prerequisite: placement score of $370-440$.
M. Rice.

This course is designed for students who have taken some Spanish, and who have a placement score of $370-440$. It provides a basic review and then moves on to cover new material for the remainder of the term. Students who have taken Spanish 121 may enroll for this course. As part of the final exam, students take the SPT and, according to their score, may place into Spanish 123 (score below 560) or receive qualification ( 560 or above), and placement into the 200-level courses. Evening prelim.

SPAND 121-122 Elementary Spanish 121, fall: 122, spring. 4 credits each term. Prerequisite for Spanish 122: Spanish 121 Z. Iguina.

This course is intended for students with no experience in Spanish. (Students who have previously studied 2 or more years of Spanish are not eligible for 121 unless they have a placement score lower than 370). The course provides a thorough grounding in all language skills. Language practice in small groups. Lectures cover grammar, reading, and cultural information. Evening prelims.

## SPAND 123 Continuing Spanish

Fall, spring, or summer. 4 credits. Prerequisite: Spanish 112, Spanish 122, or a placement score of $450-550$.
J. Routier-Pucci.

An all-skills course designed to prepare students for study at the 200 -level. Satisfactory completion of Spanish 123 fulfills the qualification portion of the language requirement. Evening prelim.

## SPAND 200 Spanish for English/Spanish

 BilingualsSpring. 3 credits. Prerequisites: Placement score of $560-640$ or permission of the instructor.
D. Cruz de Jesús.

A course designed to expand bilingual students' knowledge of Spanish by providing them with ample opportunities to develop and improve each of the basic language skills.
SPAND 203 Intermediate Composition and Conversation
Fall, spring, or summer. 3 credits. Prerequisite: qualification in Spanish (Spanish 123 or CPT or SPT score $560-640$ ). Not available to students who have taken Spanish 213.
D. Cruz de Jesús.

Conversational grammar review with special attention to the development of accurate and idiomatic oral expression. Includes readings in contemporary Spanish prose and practice in writing.

## SPAND 204 Intermediate Composition

 and ConversationFall or spring. 3 credits. Prerequisite: Spanish 203 or permission of instructor.
E. Dozier.

Practice in conversation with emphasis on improving oral and written command of Spanish. Includes treatment of specific problems in grammar, expository writing, and readings in contemporary prose.

## SPAND 213 Intermediate Spanish for the

 Medical and Health Professions Fall or spring. 3 credits. Prerequisite: qualification in Spanish (Spanish 123 or CPT or SPT score $560-640$ ), or permission of instructor. Not available to students who have taken Spanish 203.A. Tió.

Conversational grammar review, with dialogues, debates, compositions and readings on health-related themes. Special attention is given to relevant cultural differences. Fulfills proficiency requirement.

SPAND 310 Advanced Conversation and Pronunciation
Spring. 2 credits. Prerequisite: Spanish 204 or equivalent.
Z. Iguina.

A conversation course with intensive oral practice obtained through the production of video programs. Study of the fundamental aspects of communication in the standard
spoken and written Spanish, with some focus on dialectal variations. Weekly phonetics labs to improve pronunciation.

## [SPAND 366 Spanish in the United States (also Linguistics 366)

Fall. 4 credits. Prerequisite: some knowledge of Spanish. Counts toward the social science distribution requirement. Offered alternate years. Not offered 1994-95.

## J. Lantolf.

Examination of major Spanish dialects in the United States from a linguistic perspective. Contrast with the standard language. Borrowing, interference, and code switching. Syntactic, morphological, and phonological characteristics. Sex-related phenomena.]

## [SPAND 401 History of the Spanish

 Language \#Fall. 4 credits. Prerequisites: Linguistics 101 and qualification in Spanish, or permission of the instructor. Not offered 1994-95.

Staff.
A historical analysis of the phonology, morphology, syntax, and lexicon of the Spanish language up to the seventeenth century. Selected medieval documents are read and discussed.]

SPAND 407 Applied Linguistics: Spanish
Fall. 4 credits. Prerequisite: qualification in Spanish or permission of instructor. M. Sunter.

Designed to equip the student or future teacher of Spanish with insights into problem areas for second-language learners by using linguistic descriptions.

## SPAND 408 The Grammatical Structure of Spanish

Spring. 4 credits. Prerequisites: proficiency in Spanish and Linguistics 101 or permission of instructor. Offered alternate years.
M. Suner.

Survey of the salient morphological and syntactic characteristics of contemporary Spanish.
[SPAND 601 Hispanic Dialectology
Spring. 4 credits. Not offered 1994-95. Staff.
Survey of dialects of Latin America and the Caribbean.]

## [SPAND 700 Seminar in Spanish

 LinguisticsFall or spring, according to demand. Variable credit. Not offered 1994-95.

Staff.
Topics in synchronic and diachronic Spanish linguistics.]

## Swahili

See listings under Africana Studies and Research Center.

## Swedish

Fees. A small fee may be charged for photocopied texts for course work.
SWED 121-122 Elementary Swedish
121, fall; 122, spring. 4 credits each term. Prerequisite for 122: Swedish 121 or equivalent.
L. Trancik.

The aim of this course is to develop skills in listening, speaking, reading and writing within Sweden's cultural context.

## SWED 123 Continuing Swedish

Fall. 4 credits. Prerequisite: Swedish 122 or equivalent.
L. Trancik.

Continues developing skills in spoken and written Swedish within Sweden's cultural context.

## SWED 203 Intermediate Swedish

Spring. 3 credits. Prerequisite: Swedish 123 or permission of instructor.
L. Trancik.

Emphasis on development of all skills, through writing, reading, and discussion of culturally significant texts. Audiovisual material will further enhance language comprehension.

## SWED 204 Advanced Swedish

Fall. 3 credits. Prerequisite: Swedish 203 or permission of instructor. Taught in Swedish. L. Trancik.

Emphasis on improving oral and written expression of Swedish. Includes enrichment of vocabulary, readings in contemporary prose, treatment of specific problems in grammar, and presentation of videos and films.

## Tagalog

Fees. A small fee may be charged for photocopied texts for course work.
TAO 121-122 Elementary Tagalog 121, fall; 122, spring. 4 credits each term. Prerequisite for Tagalog 122: Tagalog 121.
J. U. Wolff and staff.

A thorcugh grounding is given in basic speaking and listening skills with an introduction to reading.

## TAG 123 Continuing Tagalog

Fall. 4 credits. Prerequisite: Tagalog 122 or equivalent. Satisfactory completion of Tagalog 123 fulfills the qualification portion of the language requirement.
J. U. Wolff and staff.

Improves speaking skills, such as fluency and pronunciation, focusing on verbal communication skills; offering a wide range of readings and sharpening listening skills.
TAG 205-206 Intermediate Tagalog © 205, fall; 206, spring. 3 credits each term. Prerequisites: for 205, Tagalog 123 or equivalent; for Tagalog 206, Tagalog 205 or equivalent. Satisfactory completion of Tagalog 205 fulfills the proficiency portion of the language requirement.
J. U. Wolff and staff.

This course develops all four skills; reading, writing, speaking, and comprehension.
[TAG $\mathbf{3 0 0}$ Linguistic Structure of Tagalog Fall or spring. 4 credits. Prerequisite: Linguistics 101. Not offered 1994-95.
J. U. Wolff.J

## Tamil

Fees. A small fee may be charged for photocopied texts for course work.

TAMIL 101-102 Elementary Tamil
101, fall; 102, spring. 6 credits each term.
Offered according to demand. Prerequisite for Tamil 102, Tamil 101 or equivalent.
J. W. Gair and staff.

A thorough grounding is given in all the language skills: listening, speaking, reading, and writing.

## Thai

Fees. A small fee may be charged for photocopied texts for course work.

THAI 101-102 Elementary Thai
101, fall; 102, spring. 6 credits each term. Prerequisite for Thai 102, Thai 101 or equivalent. Intended for beginners or students placed by examination.
N. Jagacinski.

A thorough grounding is given in all the language skills: listening, speaking, reading, and writing.
THAI 201-202 Intermediate Thai Reading
201, fall; 202, spring. 3 credits each term.
Prerequisites: for Thai 201, Thai 102; for Thai 202, Thai 201 or equivalent.
N. Jagacinski.

THAI 203-204 Intermediate Composition and Conversation (ie)
203, fall; 204, spring. 3 credits each term Prerequisites: for Thai 203, Thai 102; for Thai 204, Thai 203.
N. Jagacinski.

THAI 301-302 Advanced Thai 앙 301, fall; 302, spring. 4 credits each term. Prerequisite: Thai 202 or equivalent. N. Jagacinski.

Selected readings in Thai writings in various fields.

## THAI 303-304 Thai Literature

303, fall; 304, spring. 4 credits each term. Prerequisite: Thai 302 or equivalent. N. Jagacinski.

Reading of significant novels, short stories, and poetry written since 1850 .

THAI 401-402 Directed Individual Study 401, fall; 402, spring. 4 credits each term. For advanced students or students with special problems or interests. Prerequisite: permission of instructor.
N. Jagacinski.

## Ukrainian

Fees. A small fee may be charged for photocopied texts for course work.
[UKRAN 131-132 Elementary Ukrainian
131, fall; 132, spring. 3 credits each term. Prerequisite for Ukrainian 132, Ukrainian 131 or equivalent. Not offered 1994-95.
E. W. Browne.

Covers all language skills: speaking, listening comprehension, reading, and writing.]

## Urdu

See listing under Hindi.

## Vietnamese

Fees. A small fee may be charged for photocopied texts for course work.

## VIET 103-104 Vietnamese Conversation Practice

103, fall; 104, spring. 2 credits each term. Prerequisite for Vietnamese 104, Vietnamese 103 and Vietnamese 121. May not be taken alone. Must be taken simultaneously with Vietnamese 121-122. Satisfactory completion of Vietnamese 104/122 fulfills the qualification portion of the language requirement.
D. V. Nghieu.

Additional drills, practice and extension of materials covered in Vietnamese 121 and 122. These courses are designed to be attended simultaneously with Vietnamese 121-122 respectively, allowing students to obtain qualification within a year.

VIET 121-122 Elementary Vietnamese 121, fall; 122, spring. 4 credits each term. Prerequisite for Vietnamese 122, Vietnamese 121. May be taken alone or simultaneously with Vietnamese 103-104. Satisfactory completion of Vietnamese 104/122 fulfills the qualification portion of the language requirement.
D. V. Nghieu.

A thorough grounding is given in all language skills; listening, speaking, reading, and writing.
VIET 123 Continuing Vietnamese
Fall. 4 credits. Prerequisite: Vietnamese 122. Satisfactory completion of Vietnamese 123 fulfills the qualification portion of the languag requirement.
D. V. Nghieu.

Continuing instruction in conversational and reading skills, to prepare students for 200 level courses.

## VIET 201-202 Intermediate Vietnamese

 Reading201, fall or spring; 202, fall or spring. 3 credits each term. Prerequisites: for Vietnamese 201, Vietnamese 123: for Vietnamese 202, Vietnamese 201.

Staff.
Continuing instruction in spoken and written Vietnamese.

## VIET 301-302 Advanced Vietnamese

301, fall or spring; 302, fall or spring. 3 credits each term. Prerequisite for Vietnamese 301, Vietnamese 202 or permission of instructor; for Vietnamese 302, Vietnamese 301. Staff.
Continuing instruction in spoken and written Vietnamese; emphasis on enlarging vocabulary, increasing reading speed, and reading various genres and styles of prose.
VIET 401-402 Directed Individual Study
401, fall; 402, spring. 2-4 credits variable each term. Prerequisite: permission of instructor.
Intended for advanced students.
Staff.
Various topics according to need.

## Welsh

Fees. A small fee may be charged for photocopied texts for course work.

## WELSH 404-405 The Structure of the Welsh I \& II

404, Fall; 405, Spring. 4 credits each term. Prerequisite: Linguistics 101
W. Harbert.

404: Structure of Welsh I: Phonology and Morphology. This course will treat the phonological and morphological structure of Modern Spoken Welsh, with greater or lesser reference to current theoretical literature on these topics, depending on the background and interests of the participants. Some background in linguistics is desirable. 405: Structure of Welsh II: Syntax. This course will treat the syntax of Modern Spoken Welsh, with greater or lesser reference to current literature on these topics, depending on the background and interests of the participants. Some background in linguistics is desirable. The two courses may be taken independently.

## WELSH 411 Reading in Modern Welsh

Fall or spring. 2 credits. Prerequisite: permission of instructor.
W. Harbert.

Topics are selected on the basis of student needs.

## Yoruba

Fees. A small fee may be charged for photocopied texts for course work.

## YORUB 121-122 Elementary Yoruba (also Africana Studies and Research Center 131-132)

121, fall; 122, spring. 4 credits each term. Prerequisite for Yoruba 122, Yoruba 121 or equivalent.
V. Carstens and staff.

Foundations provided in all basic language skills, with an emphasis on speech and aural comprehension. Classes provide speaking and listening practice.
YORUB 123-203 Continuing Yoruba (also Africana Studies and Research Center 133-134)
123, fall; 203, spring. 4 credits each term. Prerequisites: for Yoruba 123, Yoruba 122 or equivalent; for Yoruba 203, Yoruba 123 or equivalent.
V. Carstens and staff. Building on 121-122, this is an all-skills course with a functional emphasis. Class will be conversational.

## Zulu

Fees. A small fee may be charged for photocopied texts for course work.

## [ZULU 121-122 Elementary Zulu (also Africana Studies and Research

 Center)121, fall; 122, spring. 4 credits each term. Prerequisites for Zulu 122, Zulu 121 or equivalent. Not offered 1994-95.
V. Carstens.

Foundations provided in all basic language skills, with an emphasis on speech and aural comprehension. Classes provide speaking and listening practice.]

## [ZULU 123-203 Continuing Zulu (also Africana Studies and Research

 Center)123, fall; 203, spring. 4 credits each term. Prerequisites: for Zulu 123, Zulu 122 or equivalent; for Zulu 203, Zulu 123 or equivalent. Not offered 1994-95.
V. Carstens.

Building on 121-122, this is an all-skills course with a functional emphasis. Class will be conversational.]

## MUSIC

S. Stucky, chair; M. Hatch, director of undergraduate studies, ( 110 Lincoln Hall, 255-5049), J. W'ebster, graduate faculty representative ( 222 Lincoln Hall, 255-3611); V. K. Agawu, M. Bilson, X. Bjerken, H. Boatwright, D. Borden. L. Coral, W. Cowdery, R. Harris-Warrick, K. Hester, J. Hsu, S. Jeneary, J. Kellock, S. Monosoff, E. Murray, D. Randel, A. Richards, D. Rosen, M. Scatterday, R. Schiller, R. Sierra, T. Sokol, N. Zaslaw

Emeritus: W. Austin, K. Husa, R. Palmer, M. Stith. Department office 255-4097.

## Musical Performance and Concerts

Musical performance is an integral part of Cornell's cultural life and an essential part of its undergraduate academic programs in music. The department encourages music making through its offerings in individual instruction and through musical organizations
and ensembles that are directed and trained by members of the faculty. Students from all colleges and departments of the university join with music majors in all of these ensembles:
Chamber Music Ensembles
Collegium Musicum
Cornell Chamber Orchestra
Cornell Chorale
Cornell Gamelan Ensemble
Cornell Jazz Ensembles
Cornell Symphony Orchestra
Cornell University Chamber Winds
Cornell University Chorus
Cornell University Glee Club
Cornell University Symphonic Band Cornell University Wind Ensemble Cornell University Wind Symphony Sage Chapel Choir
Information about requirements, rehearsal hours, and conditions for academic credit can be found in the following listings for the Department of Music. Announcements of auditions are posted during registration each fall term and, where appropriate, each spring term as well.
The university is also home to many student run musical organizations, including the Big Red Marching Band and Big Red Pep Band, the Cornell Savoyards, and several a cappella groups. Information about these groups is available through the Department of Music office, 104 Lincoln Hall (5-4097).
The Department of Music and the Faculty Committee on Music sponsor more than one hundred formal and informal concerts each year by Comell's ensembles, faculty, and students and by distinguished visiting artists. The great majority of concerts are free and open to the public. Lectures and concerts are listed in special monthly posters, CUINFO and other campus media.

## Nonmajors

In addition to its performing, instructional, and concert activities, the department offers numerous courses for nonmajors, many of which carry no prerequisites and presuppose no previous formal training in music. Consult the following course listings, and for further information apply to the department office, 104 Lincoln Hall (255-4097), or to the director of undergraduate studies.

## The Major

Two options are available to the student planning to major in music. Each carries the study of music to an advanced level through the integration of performance, music theory, and music history. Option I is a general course, not necessarily oriented toward eventual graduate or professional work in music. Option II is a more specialized and concentrated program, suitable for students who want to prepare for graduate or professional work in music.
All students contemplating a major in music under either option should arrange for placement examinations and advising in the department as early as possible, usually during the freshman orientation period. Information is available from the director of undergraduate studies, Professor Martin Hatch, 110 Lincoln Hall (255-5049), or from the chair, 106 Lincoln Hall (255-3671). All students are expected to have chosen an adviser from among the department faculty at the time of application for major status.

Option I presupposes some musical background before entering Cornell. Prerequisites for admission to the major are the satisfactory completion of Music 152, at the latest by the end of the sophomore year (the freshman year is preferable), with a final grade of B - or better, including an average grade of B - or better in all the musicianship components of Music 152 and failure in none of them; and the passing of a simple piano examination (details are available from the department office). Students must apply to the department for formal acceptance as a music major.

The requirements for the Bachelor of Arts degree with a major in music under Option I comprise the following:

1) in music theory: Music 251-252, 351, and one of the following: Music 451, 452 , 453, 454, 456, 463.
2) in music history: sixteen credits in courses numbered at the 300 level or above listed under Music in History and Culture. At least three of these courses must be drawn from the four-course sequence Music 381-384.
3) in performance: four semesters of participation in a musical organization or ensemble sponsored by the Department of Music.

Option II presupposes considerable musical study before entering Cornell. Prerequisites for admission into the Option II program are previous acceptance as an Option I major and satisfactory completion of Music 252, normally by the end of the sophomore year. Students must apply to the department for formal acceptance as an Option II major. An Option II major concentrates in one of the three areas listed below. For Option II in performance, exceptional promise must be demonstrated, in part by a successful solo recital before the end of the sophomore year
The requirements for the Bachelor of Arts degree with a major in music under Option II are:

1) completion of all the requirements for Option I, except as noted below, and
2) in addition:
a) in performance:
(1) the requirement for four semesters of participation in a musical organization or ensemble is waived (but such majors are expected to participate actively in chamber and other ensembles sponsored by the department);
(2) sixteen credits in individual instruction in the student's major instrument, or voice, earned by taking Music 391-392 throughout the junior and senior years
b) in theory and composition or in history: twelve additional credits in this area of concentration at the 300 level or above, of which either four may be earned in Music 301 or 302 when taken once for four credits, or eight may be earned in Music 401-402

Honors. The honors program in music is intended to provide special distinction for the department's ablest undergraduate majors. To become a candidate for honors in music, a student must be invited by the faculty at the beginning of the second semester of the junior
year. As soon as possible thereafter, the student will form a committee of three or more faculty members to guide and evaluate the honors work. In the senior year the candidate will enroll in Music 401-402 with the chair of the honors committee as instructor. Candidates will be encouraged to formulate programs that allow them to demonstrate their musical and scholarly abilities, culminating in an honors thesis, composition, or recital, to be presented not later than April 1 of the senior year. A comprehensive examination administered by the honors candidate's committee will be held not later than May 1. The level of honors conferred will be based primarily on the candidate's performance in the honors program, and secondarily on the candidate's overall record in departmental courses and activities.

## Distribution Requirement

The distribution requirement in the expressive arts may be satisfied with 6 credits in music, except freshman writing seminars. A maximum of 4 credits in Music 321-322 or a maximum of 3 credits in Music 331 through 346 and 421 through 450 may be used to satisfy this requirement, but not both
College of Arts and Sciences students subject to Distribution Requirement II (class of '96 or later) may satisfy the requirement in humanities and the arts either of two ways:

1) any one course of at least 3 credits excluding freshman seminars, musical performance (Music 321-322, 391-392), or organizations and ensembles (Music 331 through 340 and 421 through 448); or
2) any two courses totaling at least 6 credits, of which up to 4 credits may be in musical performance (Music 321-322, 391-392) or up to 3 credits may be in organizations and ensembles (Music 331 through 346 and 421 through 448), but not both. Under this option, one of the music courses must therefore be academic, not performanceoriented.

## Facilities

Music Library. The Music Library, in Lincoln Hall, has an excellent collection of standard research tools. Its holdings consist of approximately one hundred thousand books, periodicals, and scores and forty thousand sound and video recordings. Particularly noteworthy are the collections of opera from all periods; twentieth-century scores and recordings; a large microfilm collection of Renaissance sources, both theoretical and musical; and a collection of eighteenth-century chamber music. In addition, the Department of Rare Books, in the Kroch Library, houses a collection of early printed books on music and musical manuscripts.

Concert Halls. The Department of Music sponsors more than one hundred concerts annually. Comell's principal concert halls are Bailey Hall Auditorium (about 2,000), Alice Statler Auditorium (about 900), Sage Chapel (about 800) and Barnes Hall Auditorium (about 280).

Rehearsal Spaces. The orchestras and bands rehearse in Bailey Hall, Barnes Hall, and Barton Hall; the Jazz Ensembles, Gamelan, and Chamber Ensembles rehearse in Lincoln Hall; and the choral ensembles are quartered in Sage Chapel. Eleven practice studios in

Lincoln Hall are available for individual practice by pianists, vocalists, and instumentalists

Twenty-two grand pianos and eight upright or studio pianos are housed in Comell's offices, classrooms, and rehearsal spaces. In addition, our Center for Keyboard Studies includes two concert grand pianos (Steinway and Mason \& Hamlin), two eighteenth-century fortepiano replicas (copies of Johann Andreas Stein and Anton Walter), an original Broadwood grand piano from 1827, an original Graff grand piano from 1825, one Dowd and one Hubbard harpsichord, and a Challis clavichord. Barnes Hall houses a chamber organ by Derwood Crocker and a self-contained tracker organ by Schlicker. A large Aeolian Skinner Organ is located in Sage Chapel and there is a Helmuth Wolff tracker organ in Anabel Taylor Chapel. The music department also owns a quartet of stringed instruments in eighteenth-century proportions, with appropriate bows.
Digital/Electronic Equipment. A Macintosh Master studio is available for graduate student use (hours to be arranged) and occasional independent study use. The software used is Performer, Mosaic, Finale, and several Opcode patch editor/librarians. The instruments include a Yamaha KX88 MIDI Controller keyboard, a Yamaha TX802 FM synthesizer, an E-Mu Proteus XR, a Casio FZ 10M sampler and various other synthesizers. In addition, there are two MIDI work stations with additional instruments, including a Korg M1 synthesizer and an Akai S900 sampler

## Freshman Seminars

MUSIC 111 Sound, Sense, and Ideas
Fall. 3 credits. Each section limited to 17 students. No prerequisites; no previous training in music required. May not be counted for the distribution requirement in the expressive arts.

Section 1: Words and Music T R 11:40-12:55. J. Waldoff In speaking, writing, and even thinking about music, we rely on language to express the structure and meaning of a complex wordless art. This seminar will explore relationships between words and music. We will look at works of many periods and styles by Dowland, Handel, Mozart, Berlioz, Gershwin, Lennon and McCartney, and others. The readings will offer a wide context for thinking and writing about music.

Section 2: Music in Culture M W F
10:10-11:00. N. Nadeau.
How does music function in culture? To answer this, we will begin by investigating two disparate examples of musics with specific and important cultural roles, early medieval Christian chant and contemporary Javanese gamelan. We will discuss context form vs. function, and how the music as art copes with the religious or social baggage foisted upon it. We will then pose our questions to music a bit closer to home alternative rock, in order to better understand its place in the West in the 90s. As we gain insight into the nature of music as art and as cultural vehicle, we will also develop our ability to communicate about it. Readings will privilege informants immersed in these musical traditions over scholars or critics on the outside looking in

## MUSIC 115 Popular Musics Today

Fall. 3 credits. Each section limited to 17 students. No prerequisites; no previous training in music required. May not be counted for the distribution requirement in the expressive arts.

T R 10:10-11:25. M. Hatch.
Readings, listening, and writing assignments on the meanings and contexts of popular music in America today, and the musical and social aspects of diverse popular repertories found in selected regions elsewhere in the Americas, in Africa, and in Asia; the definition of terms for analysis and description of music, and the similarities and differences in the styles, functions, and contexts of popular musics.

## Introductory Courses

## MUSIC 101 The Art of Music \#

## Fall. 3 credits.

M W 11:15-12:05. 1-hour disc to be arranged. V. K. Agawu.
Drawing on individual works from both Western and non-Western musical traditions, this course seeks to equip students with tools for listening intelligently to music. Assigned readings will provide the necessary historical and cultural hackgrounds to the works studied, while class lectures will focus on the analytical and aesthetic issues raised by the works themselves. Whenever possible, live performances by guest artists will be included. Students will be expected to recognize excerpts from pieces studied, identify salient features of form and content, and place unknown works in the appropriate stylistic categories. Students will also be expected to attend and review one or two local concerts.

## [MUSIC 103 Introduction to the Musics

 of the WorldFall. 3 credits. No previous training in music required. Not offered 1994-95

T R 11:15-12:05; 1-hour disc to be arranged. M. Hatch. A survey of folk, popular, and art music in several regions of the world. Topics include pitch, scale, rhythm, meter, timbre, and form in instrumental and vocal music. Recordings are the main material for study; labs present opportunities to begin performance on instruments from the regions covered.]

## MUSIC 105-[106] Introduction to Music

 Theory105, fall or summer, spring. 3 credits each term. Experience in reading music is highly recommended. Prerequisite for Music 106: 105 with grade of B - or better. Music 106 is limited to 50 students. Music 106 not offered 1994-95.

105, fall: M W 9:05 plus 2 hrs to be
arranged. 105, spring: T R 10:10-11:00
plus 2 hrs to be arranged. M. Scatterday. An elementary, self-contained introduction to music theory emphasizing fundamental musical techniques, theoretical concepts, and their application. Music 105: notation, pitch, meter; intervals, scales, triads; basic concepts of tonality; extensive listening to music in various styles; analysis of representative works of Bach, Mozart, Beethoven, and Debussy. Music 106: systematic introduction to writing tonal harmony and melody; ear training.
MUSIC 108 Bach to Debussy \#
Spring. 3 credits. Prerequisite: Music 105 or permission of instructor.

M W F 12:20-1:10. R. Harris-Warrick.

A chronological survey of major works in the Westem concert repertory in all genres, from works of Bach and Handel that embody the newly consolidated language of tonality to works of Debussy and Stravinsky that signal the beginning of new strategies for many composers of the twentieth century.

## MUSIC 120 Learning Music through

 Digital TechnologyFall or spring. 3 credits. Enrollment limited. Prerequisite: permission of instructor.

Fall: T R 2:55-4:10 or M W F 2:30-3:20;
spring. M W F 2:30-3:20. D. Borden.
This course uses selected commercially available technological resources to produce live music. The student is expected to master the Macintosh computer, several music software programs, and several synthesizers using MIDI. Each student must learn at least the bare essentials in reading music as the course progresses. There are no papers to write; homework is presented in three classroom concerts. The final is a live presentation of the student's final project in a concert open to the public

## Music Theory

MUSIC 151-152 Elementary Tonal Theory
151, fall; 152, spring. 5 credits each term. Prerequisite for Music 151: knowledge of the rudiments of music and some ability to perform, demonstrated through proficiency tests given on the first two days of the term (registration is provisional, contingent on passing this test). Prerequisite for Music 152: 151 or equivalent. Intended for students expecting to major in music and other qualified students. Required for admission to the music major. All students intending to major in music, especially those intending to elect Option II should if possible enroll in Music 151-152 during the freshman year.

M W F 9:05-9:55; 2 discs to be arranged.
W. Cowdery.

Detailed study of the fundamental elements of tonal music; rhythm, scales, intervals, triads; melodic movement, two-part counterpoint, harmonic progression in the chorale style of J. S. Bach; and introduction to analysis of small forms. Drill in aural discrimination, sight singing, keyboard harmony, and elementary figured bass; rhythmic, melodic, and harmonic dictation; and score reading.

## MUSIC 220 Learning Counterpoint

 through Digital TechnologySpring. 3 credits. Enrollment limited. Prerequisite: 151/152 and/or permission of instructor.

T R 2:55-4:10. D. Borden.
This course is a study of traditional contrapuntal techniques from the fourteenth century to the present, with emphasis on the structures used by J. S. Bach. Synthesizers, samplers, MIDI, and music software will be covered.
MUSIC 251-252 Intermediate Tonal Theory
251, fall; 252 , spring. 5 credits each term. Prerequisite for Music 251: 152 or the equivalent or a suitable level of performance on a proficiency test given by the department during orientation each fall term. Prerequisite for Music 252: 251.

M W F 9:05-9:55; 2 discs to be arranged.
R. Sierra, 251 fall; J. Webster, 252 spring. Continuation of the study of harmony, including secondary dominants, chromatic harmony, and modulation. Analysis of
eighteenth- and nineteenth-century styles and forms; composition of short movements. Ear training, keyboard harmony, figured bass, sight singing, dictation, and score reading.

## MUSIC 351 Materials of TwentiethCentury Music

Fall. 5 credits. Prerequisite: Music 251 or permission of instructor.

M W F 10:10-11:00 plus 2 hrs to be arranged. E. Murray. Introduction to some techniques of composers from 1900 to about 1950, including expanded tonal resources, atonality, and new approaches to form and rhythm. Analysis of representative smaller works by Bartok, Webern, Hindemith, Schoenberg, Stravinsky, and others. Writing assignments in various styles. Ear training, dictation, sight singing, keyboard harmony, score reading.

## [MUSIC 451 Counterpoint

Fall. 4 credits. Prerequisite: Music 251 or permission of instructor. Not offered 1994-95.

T R 2:30-4:25 plus 1 hr to be arranged.
S. Stucky.

Composition in the polyphonic vocal style of the late Renaissance.]

## MUSIC 452 Topics in Music Analysis

Fall. 4 credits. Prerequisite: Music 251 or permission of instructor.

T R 2:30-4:25, V. K. Agawu. Intensive and systematic study of techniques of musical analysis, with particular emphasis on the approach of Heinrich Schenker.
Repertoire for 1994: The piano sonatas of Beethoven.

## MUSIC 453 Introduction to

 Improvisational TheoryFall. 4 credits. Prerequisite: Music 251 or permission of instructor.

M W 2:30-4:25. K. Hester.
Study and performance of tonal, modial, and blues harmonic resources; introduction to the formal structures in which these resources are embodied. Includes ear training, work at the keyboard, composing short pieces, and analyzing selected representative works of popular music and African-American art music from 1940 to 1970.

## MUSIC 454 Composition

Spring. 4 credits. Prerequisite: Music 251 or permission of instructor.

M W F 11:15-12:05. R. Sierra, D. Borden,
K. Hester, S. Stucky

Composition using models from the Classical and Romantic repertoire and employing techniques of twentieth-century concert music, including dissonant counterpoint, serialism, limited aleatorism, composition with pitchclass sets.

## [MUSIC 456 Orchestration

Spring. 4 credits. Prerequisite: Music 251 or permission of instructor. Not offered 1994-95 W 10:10-12:05.]

## [MUSIC 463 Conducting

Spring. 4 credits. Prerequisite: Music 251 or permission of instructor. Not offered 1994-95.

T R 2:30-4:25. T. Sokol.
Fundamentals of score reading, score analysis, and conducting technique; orchestral and choral contexts.

## Music In History and Culture

MUSIC 222 A Survey of Jazz
Spring. 3 credits. Enrollment limited. Prerequisite: permission of instructor.

M W 2:30-4:25 one disc to be arranged K. Hester.

This course will trace the evolution of jazz historically from its African roots to the current diverse spectrum of improvisational styles that form popular, Neoclassic, and Innovative contemporary jazz music.

## MUSIC 245 Gamelan in Indonesian History and Cultures ©

Fall or spring. 3 credits. No previous knowledge of musical notation or performance experience necessary.

M W F 1:25-2:15. M. Hatch. An introduction to Indonesia through its art. Elementary techniques of performance on the Javanese gamelan; a general introduction to Indonesian history and cultures, and the socio-cultural contexts for the arts there. Several short papers and one longer research report are required. Music 345-346 is available as a one-credit course for those who wish to study only performance techniques on the gamelan.

## [MUSIC 271 Monteverdi and the Birth of the Baroque \#

Spring. 3 credits. Prerequisite: any threecredit music course or permission of instructor. Not offered 1994-95.

M W 11:15-12:05.
Using as its focal point the career and music of Claudio Monteverdi (1567-1643), the course will examine the changes music underwent between the second half of the 16th century and the first half of the next century. Monteverdi's operas Orpheus and The Coronation of Poppea as well as representative canzonettas, madrigals, and church works will be studied alongside works of his contemporaries. Attention will also be paid to the social, political, and cultural contexts of the music discussed.]
[MUSIC 272 Music and the Dance Spring. 3 credits. Prerequisite: any threecredit music course or permission of instructor. Not offered 1994-95.

T R 9:05. R. Harris-Warrick.
This course will explore selected topics in the interrelations between music and dance in the Western tradition. Some of the areas to be examined include the influence of dance movement on musical composition, com-poser-choreographer relationships, and a comparison of music composed for dancing with dance music composed for listening. Examples will be drawn from the Renaissance, the baroque period, and the modern era. Students will be asked to pursue an independent project.]

## MUSIC 274 Opera *

Spring. 3 credits.
M W F 10:10-11:00. R. Harris-Warrick. An introduction to major works of the operatic repertory, with discussion of texts and theatrical performances as well as music Video recordings will be an integral part of the course; trips to live performances will be scheduled where possible.

## [MUSIC 275 The Choral Tradition \#

Spring. 3 credits. Prerequisite: any threecredit music course or permission of instructor. Not offered 1994-95.

M W F 10:10. R. Harris-Warrick.
A survey of representative works, both sacred and secular, in the Western choral tradition from the Middle Ages to the twentieth century. Class will include discussion of performances as well as historical and stylistic issues, and
will be integrated with local concert offerings whenever possible.]

## [MUSIC 277 Baroque Instrumental

 Music \#Spring. 3 credits. Prerequisite: any threecredit music course or permission of instructor. Not offered 1994-95

M W F 12:20. N. Zaslaw.
Topics covered will include the rise of purely instrumental music; Renaissance string bands; the English virginalists and viol consorts; the Italian violin school; the German organ school; lute and guitar music; the invention of the baroque winds, orchestra, and fortepiano; and the sonatas, concertos, and suites of Bach, Corelli, Couperin, Handel, Purcell, Rameau, Telemann, and Vivaldi.]

## [MUSIC 281 Music of the Baroque

 Period \#Fall. 3 credits. Prerequisite: ability to read music. Not offered 1994-95.

M W F 11:15-12:05. N. Zaslaw.
A study of selected works by J. S. Bach and other composers of the seventeenth and eighteenth centuries, illustrating the different traditions of the various genres and the confluence of the different national styles of the period.]

## [MUSIC 282 Music of the Classical

 Period \#3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1994-95.

M W 1:25. J. Webster.]
MUSIC 283 Music of the Romantic Era \# Fall. 3 credits. Prerequisite: any three-credit music course or permission of instructor.

T R 10:10-11:25. D. Rosen.
A chronological survey of nineteenth-century music from Beethoven through Mahler, including reference to its cultural and historical context.
[MUSIC 284 Music of the Twentieth Century
Fall. 3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1994-95.

T R 10:10-11:25. R. Sierra.
A study of selected works by leading twentieth-century composers. Readings will provide insights into historical, cultural, aesthetic, and theoretical contexts. Class lectures will consist of analytical discussions of excerpts from works. Students will be expected to know all the works on the assigned repertoire list; make intelligent guesses about others not assigned, and write effectively about broad historical and stylistic trends. There will be an extended final essay on a topic chosen by the student.]
[MUSIC 285 Music in the Middle Ages \# Fall. 3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1994-95.

M W F 2:30-3:20. N. Zaslaw.
A survey of sacred and secular music in Western Europe from the fall of the Roman Empire to the beginning of the fifteenth century. The course is designed for people who are familiar with staff notation. Paper assignments will range widely among musical, literary, cultural and historical topics.]
[MUSIC 286 Music in the Renaissance \#
Spring. 3 credits. Prerequisite: any threecredit music course or permission of
instructor. Not offered 1994-95.
M W F 10:10. D. Randel.]
MUSIC 287 Mozart \#
Fall. Prerequisite: any three-credit music course or permission of instructor. 3 credits.

M W F 11:15-12:05. N. Zaslaw. A chronological tour of the life and works of Wolfgang Amadeus Mozart by means of original documents, scores, recordings, and live performances. As a postlude, an evaluation of Peter Shaffer's play and movie Amadeus will be undertaken.

## [MUSIC 374 Music and Drama (also German Studies 374) \#

Fall. 4 credits. Prerequisite: any three-credit music course or proficiency in German or Italian. Not offered 1994-95.

T 1:25-4:25. A. Groos, R. Parker]

## Music History Seminars for Majors and Qualified Non-Majors

Prerequisite: Music 152 or permission of instructor. Intended primarily for music majors, these seminars will investigate selected topics and repertories from each period in some detail. Each seminar will include listenings, readings, oral and written papers. and analyses.
[MUSIC 381 Music in Western Europe to 1700 \#
Fall. 4 credits. R. Harris-Warrick. Not offered 1994-95

T R 10:10-11:25. 1 section to be
arranged.]
[MUSIC 382 Music of the Eighteenth Century \#
Spring. 4 credits. D. Rosen. Not offered 1994-95.

T R 10:10-11:25. 1 section to be
arranged.J
MUSIC 383 Music of the Nineteenth Century \#
Fall. 4 credits.
T R 10:10-11:25. J. Webster.
MUSIC 384 Music of the Twentieth Century
Spring. 4 credits T R 10:10-11:25. R. Sierra.
[MUSIC 388 Historical Performance Practicum
Spring. 4 credits. Not offered 1994-95. R 1:25-4:25. 1 section to be arranged. N. Zaslaw, J. Kellock.

The study of seventeenth- and eighteenthcentury singing manuals and their application to modern performance.]

## MUSIC 398-399 Independent Study in

 Music History398, fall; 399, spring. 4 credits. Prerequisite: Music 152 and permission of instructor. Staff.
Advanced study of various topics in music history. Students enrolling in Music 398-399 participate in, but do not register for, an approved 200-level music history course and, in addition, pursue independent research and writing projects.

MUSIC 406 Reading: The Pleasure of the Listener (also Society Mumanities 406, and Romance Studies 406)
Fall. 4 credits.
R $2: 30-4: 25$. N. Furman.

MUSIC 409 Listening across Cultures (also Society Humanities 409)
Fall. 3 credits.
R 12:20-2:15. M. Perlman.
MUSIC 410 Opera and Culture (also German Studies 410)
Fall. 4 credits.

W 1:25-4:25. A. Groos.

## [MUSIC 413 African American Music

 InnovatorsSpring. 4 credits. Permission of instructor. Not offered 1994-95.

R 2:30-4:25; 1 -hour disc to be arranged. K. Hester.

This course examines and experiments with methods of analyzing, appreciating, and understanding innovative art forms. Students will write three reports (with transcribed music examples or some form of accurate analytical charting, where appropriate). utilizing three different perspectives on African American Music.]

## Independent Study

MUSIC 301-302 Independent Study in Music
301, fall; 302, spring. Credit to be arranged. Prerequisite: departmental approval.
Presupposes experience in the proposed area of study.

Hours to be arranged. Staff.

## Honors Program

MUSIC 401-402 Honors in Music
401, fall; 402, spring. 4 credits each term. Limited to honors candidates in their senior year.

## Staff.

## Musical Performance

Comell faculty members offer individual instruction in voice, organ, harpsichord, piano and fortepiano, violin, viola, cello, viola da gamba, and some brass instruments to those students advanced enough to do college-level work in these instruments. Lessons are available by audition only. They may be taken either without credit or, through Music 321-322, with credit. Other instruments may sometimes be studied for credit outside Comell. but again by audition only (see Music $321 \mathrm{~h}-322 \mathrm{~h}$ ). Cornell does not offer instruction at the beginner's level.

Lessons for beginners. The Music Department can recommend outside teachers for those who wish to begin studying voice or an instrument. No credit is available for beginning instruction.
Auditions. Auditions are held at the beginning of each term for lessons for advanced students. Contact the Department of Music office ( 104 Lincoln Hall) for information.

Fees. The fee for a one-half hour lesson weekly, uithout credit, is $\$ 100$ per term. For a one-hour lesson (or two half-hour lessons) weekly, uithout credit, the fee is $\$ 200$. The fee in Music 321-322 for a one-hour lesson (or two half-hour lessons) for credit is $\$ 150$ per term. All fees are non-refundable once lessons begin, even if the course is subsequently dropped.
Scholarships. Music majors receive a scholarship equal to the lesson fee listed above. Members of the department-sponsored organizations and ensembles may, with the
permission of the director of the organization. receive a scholarship of up to one-half the Cornell fee for the type of lessons chosen during the term. (These scholarships are intended only for lessons in the student's primary performing medium.) Scholarship forms, available in the Music Department office, are to be returned to the office uithin the first three weeks of classes.
Practice rooms. Practice-room fees for twelve hours weekly are $\$ 40$ per term and for six hours weekly are $\$ 30$ per term for a room with a piano. Practice-room fees for twelve hours weekly are $\$ 20$ per term and for six hours weekly are $\$ 10$ per term for a room without a piano. The fee for the use of the pipe organ is $\$ 75$ for twelve hours weekly and $\$ 50$ for six hours weekly. All fees are nonrefundable.
Earning credit. For every 4 credits earned in Music 321-322, the student must have eamed. or currently be earning, at least 3 credits in another music course (excluding freshman seminars, Music 321-322, 331 through 340, $391-392$, or 421 through 448). These 3 credits must be earned prior to, or simultaneously with the first 2 credits in 321-322; they cannot be applied retroactively. No exceptions are made, but transfer credit for appropriate music courses already taken elsewhere may be used to satisfy this requirement with the approval of the department.
Lessons taken outside Cornell. Under certain conditions, advanced students may earn credit for lessons taken outside Comell. An audition is required, and no credit can be granted for beginning instruction. For further information, read the description of Music $321 \mathrm{~h}-322 \mathrm{~h}$ and contact the Music Department office.

MUSIC 321-322 Individual Instruction in Voice, Organ, Harpsichord, Piano, Strings, Woodwinds, and Brass
Prerequisite: Advanced students may register only after a successful audition with the instructor, usually scheduled during the first week of classes. Students may register for this course in successive years.
Students, at the sole discretion of the
instructor, earn 2 credits each term for a onehour lesson (or two half-hour lessons) weekly accompanied by an appropriate practice schedule.

## MUSIC 321a-322a Individual Instruction

 in Voice321a, fall; 322a, spring. 2 credits each term. Prerequisite: successful audition during registration. Limited enrollment.

Hours to be arranged. H. Boatwright
(fall), J. Kellock (spring).
The Vocal Coaching Program offers non-credit lessons to members of the choral ensembles.

## MUSIC 321b-322b Individual Instruction

 in Organ321b, fall; 322b, spring. 2 credits each term. Prerequisite: successful audition. Hours to be arranged. W. Cowdery.

## MUSIC 321c-322c Individual Instruction

 in Piano321c fall; 322c, spring. 2 credits each term. Prerequisite: successful audition

Hours to be arranged. M. Bilson,
X. Bjerken and staff.

MUSIC 321d-322d Individual Instruction in Harpsichord
321 d , fall; 322 d , spring. 2 credits each term.
Prerequisite: successful audition.
Hours to be arranged. W. Cowdery.
MUSIC 321e-322e Individual Instruction in Violin or Viola
321e, fall; 322e, spring. 2 credits each term. Prerequisite: successful audition.

Hours to be arranged. S. Monosoff.

## MUSIC 321f-322 Individual Instruction

 in Cello or Viola da Gamba321f, fall; 322f, spring. 2 credits each term. Prerequisite: successful audition.

Hours to be arranged. J. Hsu.

## MUSIC 321 g-322g Individual Instruction

 in Brass321 g fall, 322 g , spring. 2 credits each term.
Prerequisite: successful audition.
Hours to be arranged. M. Scatterday
MUSIC $321 \mathrm{~h}-322 \mathrm{~h}$ Individual Instruction outside Cornell
321 h , fall; 322 h , spring. 2 credits each term. Prerequisite: successful audition.

Staff sponsored.
All the standard orchestral and band instruments and guitar may, under certain conditions, be studied for credit with outside teachers. This course is available primarily for the study of instruments not taught at Cornell and for the use of those who for reasons of space cannot be admitted to Music 321a-g or $322 \mathrm{a}-\mathrm{g}$. Prior approval and audition by a member of the faculty in the department is required. For information and a list of approved teachers, consult the department office, 104 Lincoln Hall.

## MUSIC 391-392 Advanced Individual

 Instruction391, fall; 392, spring. 4 credits each term Open only to juniors and seniors majoring in music under Option II with concentration in performance and to graduate students. Option II majors whose lessons must be taken outside Cornell may apply to the department for financial assistance toward the cost of lessons; $\$ 150$ per semester will normally be awarded to such students and a larger amount may be awarded under certain circumstances. Music 391 is not a prerequisite to 392.

Hours to be arranged. Staff

## Musical Organizations and Ensembles

Students may participate in musical organizations and ensembles throughout the year. Permission of the instructor is required, and admission is by audition only, except that the Sage Chapel Choir and the Cornell Gamelan Ensemble are open to all students without prior audition. Registration is permitted in two of these courses simultaneously and students may register in successive years, but no student may earn more than 6 credits in these courses. Membership in these musical organizations and ensembles is also open to qualified students who wish to participate without earning credit.

MUSIC 331-332 Sage Chapel Choir
331, fall or summer; 332, spring. 1 credit. No audition for admission.

M 7-9:00 p.m., Sunday 9:30 a.m.
W. Cowdery.

## MUSIC 333-334 Cornell Chorus or Glee

 Club333, fall; 334, spring. 1 credit. Prerequisite: permission of instructor.

Chorus (treble voices): W 5:15-7:15 p.m., plus 2 hours to be arranged. Glee Club (mens voices): W 7:30-9:30 p.m., plus 2 hours to be arranged. T. Sokol and R. Schiller.

## MUSIC 335-336 Cornell Symphony

 Orchestra335, fall; 336, spring. 1 credit. Prerequisite: permission of instructor.
W 7:30-10 p.m. E. Murray.

## MUSIC 337-338 University Bands

337, fall; 338 , spring. 1 credit. Prerequisite: permission of instructor.

Wind symphony: fall M W 4:45-6:30 p.m. Symphonic band: spring, $M$ and $W$ 4:45-6:30 p.m. Wind ensemble: spring M 7:30-9:30 p.m. and R 4:45-6:30 p.m. M. Scatterday.

MUSIC 339-340 Cornell Jazz Ensembles
339, fall; 340 spring. 1 credit. Prerequisite: permission of instructor.

Sec 1 , W $6-8 \mathrm{pm}, \sec 2$, W $6-8 \mathrm{pm}, \sec 3$, W 8:30-10:30 p.m. K. Hester.

## MUSIC 345-346 Introduction to the Gamelan

345 fall; 346 spring. 1 credit. Enrollment limited. Prerequisite: permission of instructor; can be repeated.

M W 2:30-3:20 p.m. M. Hatch.
Concentrated instruction for beginning students in elementary techniques of performance on the Indonesian gamelan. Music 245 is a 3 -credit course that complements the instruction in gamelan by an introduction to Indonesian history and cultures.

## MUSIC 421-422 Cornell Chamber

 Orchestra421, fall; 422, spring. 1 credit. Prerequisite: permission of instructor.

> R 5:00-6:30 J. Hsu.

Study and performance of the chamber symphonies of Haydn, Mozart, and their contemporaries. For strings, woodwinds, and homs.

## MUSIC 437-438 Chamber Winds

437, fall. 438 , spring. 1 credit each term. Prerequisites: enrollment in Symphonic Band, Wind Symphony or Wind Ensemble in the same semester as this course AND permission of instructor only.

T 4:45-6:30, fall, and to be arranged, spring. M. Scatterday.
A flexible instrumentation ensemble performing original woodwind, brass, and percussion music from Gabrieli brass choirs and Mozart serenades through more contemporary works such as Stravinsky's Octet or L'Histoire Du Soldat. The ensemble will perform on wind symphony, symphonic band and wind ensemble concerts in addition to several chamber concerts throughout the year.

## MUSIC 441-442 Chamber Music

Ensemble
441 fall; 442 spring. 1 credit. Prerequisite: permission of instructor.

M 5:30-7:00 for large ensemble. Hours for smaller ensembles to be arranged. S. Monosoff.

The Monday ensemble will study and perform one or more of the following works,
depending upon personnel: Schubert Two-

Celio Quintet; Mendelssohn Octet; Schubert Octet; Spohr Nonet. Smaller ensembles will study and perform duos, trios, or quartets. String and wind players are welcome.

## MUSIC 443-444 Chorale

443 fall; 444 spring. 1 credit each term. Prerequisite: permission of instructor.

F 4:30-6:15. T. A. Sokol and R. Schiller. Study and performance of selected choral music for mixed voices.

## MUSIC 445-446 Cornell Gamelan Ensemble

445 fall; 446 spring. 1 credit each term. Enrollment limited. Prerequisite: Music 245 or 345-346, or permission of instructor; can be repeated.

R 7:30-10 p.m. M. Hatch.
Advanced performance on the Javanese gamelan. Tape recordings of gamelan and elementary number notation are provided. Some instruction by Indonesian musicians is offered in most years.
[MUSIC 447-448 Collegium Musicum
447 fall; 448 spring. 1 credit. Prerequisite: permission of instructor. Not offered 1994-95.

T 5-6:30. J. Hsu.
Study and performance of Baroque instrumental music. For string and wind instruments.]

## Graduate Courses

Open to qualified undergraduates with permission of instructor.

## MUSIC 601 Introduction to Bibliography and Research

Fall. 4 credits.
M 1:25-4:00. L. Coral.
This course explores the nature of the discipline and introduces the many types of bibliographic tools needed to pursue research in music.

## [MUSIC 602 Analytical Technique

Fall. 4 credits. Not offered 1994-95.
W 1:25-4:25. J. Webster.
A critical survey of various analyical methods in current use. Frequent analytical assignments and class presentations.]

## [MUSIC 603 Editorial Practice

Spring. 4 credits. Not offered 1994-95.
F 10:10-12:05. R. Harris-W/arrick.
Fundamental techniques of source study and filiation, the nature of a musical text, and the editorial process. Opportunity to make a critical edition based on original sources.]

## MUSIC 604 Ethnomusicology: Areas of

 Study and Methods of AnalysisSpring. 4 credits. Open to graduate students in anthropology, linguistics, psychology, sociology, and other cognate fields with permission of instructor.

T 2:30-4:25. M. Hatch.
Major aspects of research into musical cultures of the world. Problems, theories, and methods, especially those affecting analytical terminology, transcription and analysis of sound events, and fieldwork.

## MUSIC 622 Historical Performance

 PracticumSpring. 4 credits.
M. Bilson, S. Monosoff.

MUSIC 653 Topics in Tonal Theory and Analysis
Spring. 4 credits.
R 1:25-4:25. E. Murray.
Problems in the analysis of rhythm, in
particular those concerning meter. Eigh-
teenth- and nineteenth-century contexts will
be the primary focus, but some earlier and
later examples will be considered.
[MUSIC 654 Topics in Post-tonal Theory and Analysis
Spring. 4 credits. Not offered 1994-95. M 1:25-4:25. V. K. Agawu.
Various approaches to the post-tonal repertory will be explored, including set theory, voice leading, and rhythmic factors. Music studied will include works by Berg, Webern, Stravinsky, Dallapiccola, Boulez, and others.]

## MUSIC 657-658 Composition

657, fall; 658, spring. 4 credits each term. F 1:25-4 plus 1 hr , to be arranged. S. Stucky.

## MUSIC 659-660 Composition

659, fall; 660 , spring. 4 credits each term.
F 1:25-4 plus 1 hr , to be arranged.
R. Sierra.
[MUSIC 677 Mozart: His Life, Works, and Times (also German 757)
Fall. 4 credits. Not offered 1994-95.
T 2:30-5. N. Zaslaw.
After an introduction to the current state of Mozart studies, students will pursue individual research projects while the seminar undertakes a group investigation of the manuscript and printed sources for, and historical context of, Mozart's Symphony in D major, K. 297.]
MUSIC 679 Opera (also German Studies 653 and Comparative Literature 655)
Spring. 4 credits. W 1:25-4:25. A. Groos.
[MUSIC 680 Topics in Ethnomusicology
Spring. 4 credits. Not offered 1994-95. W 2:30-4:25. M. Hatch.
Advanced readings in ethnomusicology, with attention focused on a particular topic.]
[MUSIC 681 Seminar in Medieval Music
Fall. 4 credits. Not offered 1994-95. D. Ranclel.]

## [MUSIC 684 Seminar in Renaissance

 Music684, fall. 4 credits. Not offered 1994-95. R 1:25-4:25.]
[MUSIC 686 Seminar in Baroque Music
Fall. 4 credits. Not offered 1994-95. W 2:30-4:25. N. Zaslaw.
An investigation of seventeenth-century concerted music in Italy, France, and Germany, from Monteverdi's Vespro della
Beata Vergine to Bach's Weimar cantatas.]

## [MUSIC 687 Seminar in Classical Music

Spring. 4 credits. Not offered 1994-95. M 1:25-4. L. Coral.
Based on auction records, publishers catalogues, and other documents, this seminar will explore the dissemination of music in the second half of the eighteenth century.]

## MUSIC 688 Seminar in Classical Music

Fall. 4 credits.
R 1:25-4:25. N. Zaslaw.
Topic for fall 1994: A study based on original sources of the pasticcio in eighteenth-century opera, with special emphasis on Mozart's contributions.

## ARTS AND SCIENCES - 1994-1995

## MUSIC 689 Seminar in Music of the

 Romantic EraFall, spring. 4 credits each term
Fall, W 1:25-4:25, J. Webster; spring,
M 1:00-4:00, D. Rosen.
Topic for fall 1994: Instrumental music in the larger forms
Topic for spring 1995: Verdi.

## [MUSIC 690 Seminar in Music of the

 Twentieth CenturySpring. 4 credits. Not offered 1994-95. W 1:25-4:25. R. Sierra.]

MUSIC 691-692 Historical Performance
691, fall; 692, spring. 4 credits each term.
Prerequisite: permission of instructor Hours to be arranged. M. Bilson, J. Hsu, S. Monosoff.

Lessons on the major instrument with supplementary study and research on related subjects.
[MUSIC 693 Seminar in Performance Practice
Fall or spring. 4 credits. Not offered 1994-95 N. Zaslaw.]

MUSIC 697-698 Independent Study and Research
697, fall; 698, spring. Credit to be arranged. Hours to be arranged. Staff.
[MUSIC 785-786 History of Music Theory 785, fall; 786, spring. 4 credits each term. Not offered 1994-95.
J. Webster.]

## [MUSIC 787-788 History and Criticism

 787 , fall; 788 , spring. 4 credits. Not offered 1994-95.R 1:25-4:25. D. Rosen.]

## [MUSIC 789 Liturgical Chant in the West

 Spring. 4 credits. Not offered 1994-95. W 1:25-4:25. D. Randel.The formation of the major Western liturgical repertories, their interrelation, and their early history.]

## NEAR EASTERN STUDIES

J. Taragona Borras, R. Brann (director of undergraduate studies), B. Hamad, L. Kant, S. Katz, M. Litvak, P. Morewedge, D. I. Owen (director of the Program of Jewish Studies), L. Peirce, A. Sáenz-Badillos Perez, 1). Powers, chair, G. Rendsburg (graduate faculty
representative), N. Scharf, S. Shoer, M. Younes
Joint faculty: M. Bernal, S. H. Nasr
(A. D. White Professor-at-Large), S. Telhami

## The Department

The Department of Near Eastern Studies (360 Rockefeller Hall, 255-6275) offers courses in the archaeology, civilization, history, languages, and literatures of the Near East. Students are encouraged to take an interdisciplinary approach to the cultures of this region that has had an important impact on the development of our own civilization and that plays a vital role in today's world community. The department's course offerings treat the Near East from ancient times to the modern period and emphasize methods of historical and literary analysis.

## Distribution Requirements

Any two Near Eastern Studies history or archaeology courses at the 200, 300 or 400 level that form a reasonable sequence or combination satisfy the distribution requirement in the social sciences/history. Any two Near Eastern Studies civilization or literature courses at the 200,300 , or 400 level that form a reasonable sequence or combination satisfy the distribution requirement in the humanities. NES 197 or NES 198 plus any other Near Eastern studies course will constitute a sequence to fulfill the distribution requirement in either social sciences/history or humanities, depending on the second course used in combination with 197 or 198. All 200 or 300 -level language courses may fulfill the humanities requirement

## The Major

The precise sequence and combination of courses chosen to fulfill the major is selected in consultation with the adviser. All majors must satisfy the following requirements (no course may be used to satisfy two requirements; S-U options not permitted):
A. Qualification in two Near Eastern Studies languages or Proficiency in one.
B. Nine three- or four-credit NES courses, which must include the following:

1. NES 197 or 198.
2. Two 200 -level NES survey courses, one whose chronological parameters fall within the period 3000 B.C.E to 600 C.E., and one whose chronological parameters fall within the period 600 C.E. to the present. The following are examples (a complete list can be obtained in the department office):
3000 B.C.E to 600 C.E.
NES 223, Introduction to the Bible
NES 263, Introduction to Biblical History and Archaeology
NES 248, Introduction to Classical Jewish History
600 C.E. to the present
NES 233, The Lyrics of Love and Death: Medieval Hebrew and Arabic Poetry in Translation NES 257, Islamic History 600-1258 NES 258, Islamic History 1258-1914 NES 294, Modern History of the Near East
3. At least two NES courses at the 300 level or above (only one of which may be NES 301, 302, 311, or 312).
Prospective majors should discuss their plans with the director of undergraduate studies before formally enrolling in the department. To qualify as a major, a cumulative grade average of C or better is required.
Honors. Candidates for the degree of Bachelor of Arts with honors in Near Eastern Studies must fulfill the requirements of the appropriate major study and enroll in the honors course, NES 499, in the fall and spring semesters of their senior year. For admission to the honors program, candidates must have a cumulative average of $\mathrm{B}+$ or better and have demonstrated superior performance overall in Near Eastern Studies courses. After consulting their major adviser, candidates should submit
an outline of their proposed honors work to the department during the second semester of their junior year.
Study abroad. Near Eastern Studies majors may choose to study in the Near East in their junior year. There are various academic programs in the countries of the Near East that are recognized by the Department of Near Eastern Studies and that allow for the transfer of credit. Archaeological field work on Cornell-sponsored projects in the Near East or recognized field schools in Israel may also qualify for course credit.

## Freshman Seminar

[NES 122 An Introduction to the Classics of Jewish Literature (also Jewish Studies 102 and Religious Studies 122)

102, spring. 3 credits each semester. Not offered 1994-95.

Staff.]
[NES 125-126 The Bible as Literature in its Ancient Near Eastern Context (also Jewish Studies 125-126 and Religious Studies 125-126)
Fall 125; spring 126.3 credits. Not offered 1994-95.]

NES 127 "Two Shall Become One Flesh": Gender Relations in the Hebrew Blble
Fall. 3 credits. Freshman Seminar. Enrollment limited to 17 students.

T R 8:40-9:55. C. Smith.
The institution of marriage delighted, disappointed, and often baffled the authors of the Hebrew scriptures. In this course we will read selections from the Hebrew Bible (in translation) and examine the portrayal of courtship and marriage in its laws, poetry, and narratives.
NES 141 The Encounter of Judaism and Christianity in the Rabbinic Era Fall. 3 credits. Freshman Seminar. Enrollment limited to 17 students.

T R 1:25-2:40. S. Katz.
This seminar will explore the basic theological matters at issue in the dialogue and confrontation between Judaism and Christianity. I will concentrate on the early history of this encounter-the first to the sixteenth century C.E.-and on basic theological notions that are central to both traditions. Among the subjects to be analyzed in a comparative way are: covenant, torah, man, sin redemption, and messianism.
[NES 154 Harems, Houris, and Hashish: Western Perceptions of the Middle East
Spring. 3 credits. Not offered 1994-95.]

## Language Courses

NES 101-102 Elementary Modern Hebrew I and II (also Jewish Studies 105-106)
101, fall; 102, spring. 6 credits each term. Prerequisite for NES 102: 101 or permission of instructor. Satisfactory completion of NES 102 fulfills the qualification portion of the language requirement. Enrollment limited to 15 students in each section.

M-F Section 1: 10:10-11:00; Section II:
11:15-12:05; Section III: 1:25-2:15.
S. Shoer.

Intended for beginners (section I for students without any previous background). A
thorough grounding is given in all the language skills, emphasizing reading, writing, grammar, listening, and speaking. (1) Oral comprehension and production: (a) in the classroom-ability to understand the basic dialogues and passages without the aid of written texts, to use these texts in variation, and to create new ones; (b) in the outside world-ability to meet basic travel needs and daily routine needs, both at work and in a study situation. (2) Reading: (a) in the classroom-ability to read the texts in the lessons, as well as new texts based on materials presented in class, and to deal with extensive readings (i.e., materials based on texts presented in the classroom as well as additional contextually relevant vocabulary items); (b) in the outside world-ability to read simple roadsigns, train and bus schedules, menus, simple directions, etc.
(3) Writing: (a) in the classroom-ability to communicate by writing short sentences and to construct short dialogues based on simple sentences or brief passages on topics included in classroom discussions; (b) in the outside world-ability to construct simple, very short letters or notes, or brief summaries or reports. (4) Culture: meet basic courtesy needs in informal situations, know basic geographic facts, and become aware of the composition of the people of the country.

## NES 111-112 Elomentary Arabic I and II

111, fall; 112, spring. 6 credits each term. Prerequisite for Arabic 112: Arabic 111 or permission of instructor.

M-F Section I: 10:10-11:00; Section II: 11:15-12:05. M. Younes. The course provides a thorough grounding in all language skills: listening, speaking, reading, and writing. It starts with spoken Arabic and gradually integrates Modern Standard Arabic in the form of listening and reading texts. Emphasis will be on learning the language through using it in meaningful contexts. The student who successfully completes the two-semester sequence will be able to: 1) understand and actively participate in simple conversations involving basic practical and social situations (introductions, greetings, school, home and family, work, simple instructions, etc.; 2) read Arabic material of limited complexity and variety (simple narrative and descriptive texts, directions, etc.; 3) write notes and short letters describing an event or a personal experience. An important objective of the course is to familiarize students with basic facts about the geography, history, and culture of the Arab world.

## NES 201-202 Intermediate Modern

 Hebrew I and II (also Jewish Studies 201-202)201, fall; 202, spring. Enrollment limited to 15 students in Section I and 15 students in Section II each term. 4 credits each term Prerequisites for NES 201, 102 or permission of instructor; for NES 202, 201 or permission of instructor.

M T W R Section I: 10:10-11:00; Section II: 1:25-2:15. N. Scharf.
Second-year modern Hebrew. Continued development of reading, writing, composition, listening, and speaking skills. (1) Oral comprehension and production: (a) in the classroom-ability to carry on a conversation, listen to a short lecture, or deliver a short lecture on topics covered in the classroom or related topics; (b) in the outside worldability to interact with speakers of Hebrew
and exchange ideas on basic interests and current events, in work or study situations or informal gatherings, and to relay simple information and give directions. (2) Reading: (a) in the classroom-ability to read simplified short stories, short news items, and newspaper headlines; (b) in the outside worldability to read short newspaper items, work directions, maps, plans, etc. (3) Writing: (a) in the classroom-ability to write short compositions, take notes in class, compose schedules, write out directions, etc.; (b) in the outside world-ability to write letters, reports, and summaries of events, and to complete questionnaires. (4) Culture: expand knowledge of culture into some areas of literature, popular culture, and historical background.

## NES 211-212 Intermediate Arabic I

 and II 숭211, fall; 212, spring. Enrollment limited to 15 students in each section. 4 credits each term. Prerequisites: for NES 211, one year of Arabic or permission of instructor; for NES 212, 211 or permission of instructor.

M T W R Section I: 10:10-11:00; Section II:
1:25-2:15. B. Hamad and M. Younes. A sequel to NES 111-112. Continued development of the four language skills through extensive use of graded materials on a wide variety of topics. More attention will be given to developing native-like pronunciation and to grammatical accuracy than in NES 111-112, but the main focus will be on developing communication skills. The student who successfully completes 212 will be able to: 1) understand and express himself or herself in Arabic in situations beyond the basic survival needs; 2) read and comprehend written Arabic of average difficulty; 3) write a letter, a summary of a report or a reading selection. An appreciation of Arabic literature and culture will be sought through the use of authentic materials.

## NES 217-218 Intermediate Turkish I

 and II ©217, fall; 218, spring. Limited to 15 students. 4 credits each term.

T R 2:55-4:10. L. Peirce.
The course aims at the continuing development of reading, composition, and oral comprehension and production skills. Readings include selections from modern short stories, newspapers, and nonfiction prose. Both formal and informal contexts for writing and speaking are emphasized. The course will begin with a brief review of formal grammar.

## NES 301-302 Advanced Modern

 Hebrew I and II (also Jewish Studies 301-302) 상301, fall; 302, spring. Limited to 15 students. 4 credits each term. Prerequisite for NES 301: 202 or equivalent with permission of instructor. Prerequisite for NES 302: 301 or equivalent with permission of instructor. This sequence may be used to fulfill the humanities distribution requirement in literature. Limited to 15 students.

M W F 2:30-3:20. N. Scharf. Advanced study of Hebrew through the analysis of literary texts and expository prose. This course employs a double perspective: language is viewed through literature and literature through language. Students will develop composition skills by studying language structures, idioms, and various registers of style.

NES 311 Advanced Arabic I ©
Fall. 4 credits. Prerequisite: NES 212 or permission of instructor. Limited to 15 students.

M W F 2:30-3:20. B. Hamad.
Students will be introduced to authentic, unedited Arabic language materials ranging from short stories and novels to political speeches and writings. Emphasis will be on developing fluency in oral expression through lively discussions of socially and politically provocative issues that are presented in the reading selections. A primary objective will be increased accuracy in pronunciation and grammar.
NES 312 Advanced Arabic II ©
Spring. 4 credits. Limited to 15 students. Prerequisite: NES 311, or permission of instructor.

T R 10:10-11:25. D. Powers. A reading course in classical Arabic. We will read the Qur'an and explore the manner in which it has been understood by Muslims throughout their history, as reflected in the commentary literature (tafsir). Special attention to grammar, syntax, and lexicography.
[NES 330-331 Hieroglyphic Egyptian I and II ©
330, fall; 331, spring. 4 credits. Not offered 1994-95.]
[NES 333-334 Elementary Akkadian I and II (also NES 633-634) ©
333, fall; 334, spring. 4 credits each term. Prerequisite for NES 334: 333 or permission of instructor. Prerequisite for NES 634: 633 or permission of instructor. Not offered 1994-95.]

## NES 335-[336] Readings in Akkadian

 Texts (also NES 635-[636])635, fall; [636, spring]. 4 credits. Prerequisite for NES 336: 333-334. Prerequisite for 636: 633-634.

T R 1:10-2:25. D. I. Owen. May be repeated for credit.
Selected readings in Akkadian texts.
NES 337-338 Ugaritic I and II *
337, fall; 338, spring. 4 credits. Prerequisite: Knowledge of another Semitic languate (preferably Hebrew).

Fall: M W 1:25-3:10; spring: T R 10:1011:25. G. Rendsburg.
Study of the language and literature of ancient Ugarit, an important site in northern Canaan. Special attention is paid to the relationships between Ugaritic and Hebrew and between Canaanite literature and the Bible.
[NES 412 Introduction to Arabic Linguistics (also DMLL 512) © *
Spring. 4 credits. Prerequisites: one year of Arabic and an introductory course in linguistics or permission of instructor. Not offered 1994-95.]

## [NES 416 Structure of the Arabic

 Language 웅Spring. 4 credits. Prerequisite: one year of Arabic or a background in linguistics. Enrollment limited to 15 students. Not offered 1994-95.
M. Younes.]

## NES 433 Introductory Sumerian I (also

 NES 631) 륭Spring. 4 credits each semester. Prerequisite: permission of instructor

T R 2:55-4:10. D. I. Owen.

An introduction to the Sumerian cuneiform script and grammar of the third millennium 13.C.E. Readings in selected Sumerian economic, legal, and historical inscriptions, a basic introduction to Sumerian grammar, and a survey and discussion of Sumerian civilization and culture will constitute the course. Recommended to students who have taken or plan to take Akkadian and/or Hittite as well as those in linguistics or otherwise interested in the history of language
[NES 625 West Semitic Inscriptions © © $_{\text {\# }}$ Fall. 4 credits. Prerequisite: knowledge of Hebrew. Not offered 1994-95.]

## NES 631 Introductory Sumerian I (also NES 4331

Spring. 4 credits. Prerequisite: permission of instructor
For description, see NES 433 under Near Eastern Languages.
[NES 633-634 Elementary Akkadian I and II (also NES 333-334)
633, fall; 634, spring. 4 credits each term. Prerequisite for NES 634: 633 or permission of instructor. Not offered 1994-95.]

## NES 635-[636] Readings in Akkadian

 Texts (also NES 635-[336])635, fall; $[636$, springl. 4 credits.
For description see NES 335 under Near Eastern Studies Languages.

## NES 637-638 Ugaritic I and II (also NES

 337-338)337, fall; 338, spring. 4 credits. Prerequisite: Knowledge of another semitic language (preferably Hebrew).
For description, see NES 337-338 under Near Eastern Languages.

## Archaeology

NES 247 Introduction to Jewish Art and Archaeology from the Hellenistic to the Rabbinic Period (also Classics 249, Jewish Studies 247, Religious Studies 247, Archaeology 247)

## Fall. 3 credits

T R 2:55-4:10. L. Kant.
In this course, we will examine material evidence of Judaism from the fourth century B.C.E. to the fifth century C.E. Equal attention will be given to Palestine and the Diaspora. We will look at various kinds of structures, including tombs and cemeteries, prayer buildings and synagogues, houses, fortresses, palaces, and the Jerusalem Temple. All types of objects will come under consideration, such as paintings, mosaics, sarcophagi, jewelry and gemstones, coins, inscriptions, and papyri. In general, we will attempt to understand this material both in terms of its Near Eastern heritage and the powerful influence of the Graeco-Roman environment. Attention will also be paid to relations to early Christian art and archaeology

## [NES 261 Ancient Seafaring (also Archaeology 275) 흉

Spring. 3 credits. Not offered 1994-95. D. I. Owen.)
[NES 263 Introduction to Biblical History and Archaeology (also Archaeology 263, Jewish Studies 263, and Religious Studies 264) © \#
Spring. 3 credits. Not offered 1994-95.]
[NES 264 Agriculture and Society in the Ancient Near East (a)
Spring. 3 credits. Not offered 1994-95.]

NES 267 Mediterranean Archaeology (also Classics 219) 률
Fall. 3 credits.
T R 11:40-12:55. J. Coleman
An examination of the archaeological basis of ancient Mediterranean civilization with special focus on contacts and interrelationships in the Bronze Age (ca. 3500-1100 B.C.). Topics include the Neolithic period of Anatolia, Greece, and the Near East; the rise of civilization in Egypt; the Bronze Age states of Syro-palestine (Ebla, Ugarit, Byblos, etc.), Cyprus, copper, and the Alasia question; the Hittites and Bronze Age Anatolia; the early Bronze Age in Greece; Minoans; Mycenaeans, and their eastern and western Greek contacts; the Bronze Age in the western Mediterranean; and ancient ships and trade in the late Bronze Age.

## [NES 361 Interconnections in the Eastern Mediterranean World in Antiquity 중

Fall. 4 credits. Not offered 1994-95.]
NES 362 The History and Archaeology of Ancient Syria (also Archaeology 362/662, Jewish Studies 362 and NES 662) © \#
Spring. 4 credits. Prerequisite: Any archaeology or ancient history course or permission of instructor.

T R 11:40-12:55. D. I. Owen Wide-ranging discoveries in Syria over the past two decades have increased dramatically our knowledge and understanding of the history of ancient Syria. This course will survey both the new discoveries and the older data-archaeological and written-from sites such as Ebla and Ugarit and provide a synthesis of the historical and archaeological developments. Relationships to the contemporary civilization in Mesopotamia, Anatolia, Israel, and Egypt from 3000-500 B.C.E will be stressed.
[NES 366 The History and Archaeology of the Ancient Near East (also Archaeology 310) © CH
Fall. 4 credits. Not offered 1994-95.)

## [NES 367 The History and Archaeology of Ancient Egypt e\#

Fall. 4 credits. Not offered 1994-95.]
[NES 461 Seminar in Syro-Palestinian Archaeology: The Israelite Conquest of Canaan (also Jewish Studies 461) 율

Fall. 4 credits. Not offered 1994-95.]

## Civilization

NES 197[-198] Introduction to Near Eastern Civilization (also Jewish Studies 197 and Religious Studies 197-[198]) *
Fall. 3 credits each term. Required for all NES department majors. NES 197 or 198 and any other NES course will constiture a sequence to fulfill the distribution requirement in either the social sciences or humanities, depending on the second course used in combination with NES 197 or 198.

M W F 2:30-3:20. R. Brann.
This course is designed to provide an introductory overview of Near Eastern society and culture from ancient to modern times for students with little or no previous training. Lectures and discussions will focus on four major periods of Near Eastern history: ancient, biblical, Islamic, and modern. In each historical period we will consider the
development of major religious ideas, social and political institutions, economic structures, and literary forms. Readings will be chosen from primary sources in translation and secondary materials. In addition, presentation of films, slides, and other audio-visual materials will be integral to the course

## NES 246 Seminar on Jewish Mysticism

 (Religious Studies 246) "Spring. 3 credits. Limited to 20 students. M W F 1:25-2:15. S. Katz.
This course will deal with an intensive study of certain essential problems in the history of Jewish mysticism from the Rabbinic period to the early Middle Ages. Knowledge of Hebrew is not required.

NES 247 Introduction to Jewish Art and Archaeology from the Hellenistic to the Rabbinic Period (also Classics 249, Jewish Studies 247, Religious Studies 247, ARKEO 247)
Fall. 3 credits.
For description, see Near Eastern Studies 247 under Near Eastern Archaeology.
NES 251 Introduction to Islam: Religion, Politics, and Society (also Religious Studies 252) @\#
Spring. 3 credits
T R 2:55-4:10. P. Morewedge
After tracing the emergence of Islam as an historical phenomenon in the Near East, the course will focus on the intellectual traditions of Islamic civilization: theology, as reflected in the Qur'an and the writings of theologians; mysticism, as revealed in poems of Omar Khayyam and Rumi; and philosophy, as seen in the writings of Avicenna and Ibn Khaldun. Issues to be discussed will include the nature of theocracy, religious tolerance and pluralism, the status of women, and ethics of jibad. Students will be introduced to the basic sources of Islamic civilization and the reference works essential to the study of those sources.

NES 281 Gender and Society in the Muslim Middle East (also Religious Studies 281, Women's Studies 281) @\#

Spring. 3 credits. Limited to 20 students.
T R 11:40-12:55. L. Peirce.
This course examines conceptions of gender in traditional Muslim society and the ways in which they have affected the experiences of Muslim women and men. Topics to be covered include the position of women in the religious law of Istam, female seclusion and the harem, sexuality, and social hierarchies and family structure. Although attention will be given to gender issues in the contemporary Near East, the course focuses on the historical roots of present-day social configurations. Readings include primary sources in translation.

NES 296 Mystery Cults, Mythologies, and Religions of Iran (also Religious Studies 296) ©
Fall. 3 credits
T R 10:10-11:25. P. Morewedge An introduction to the religious history and mythology of Iran from the sixth century B.C. to modern times, including discussion of Mithraism, the epic of The Book of Kings, Zoroastrianism, Mazdaism, Zurvanism, Manichaeism, and Shiism, with special attention to the Iranian encounters with Hellenic, Indic, and Arab cultures.
[NES 320 Topics in Religion: Religious Symbols in Near Eastern Late Antiquity (also Jewish Studies 340 and Religious Studies 340) © \#
Spring. 4 credits. Not offered 1994-95.]
NES 324 The History of Early Christianity (also Jowish Studies 344 and Religious Studies 325) *
Fall. 4 credits.
T R 1:25-2:40. L. Kant.
History of Christianity in the Roman Empire from its beginnings in the New Testament period to the Council of Chalcedon. Empha sizing primary sources (both textual and archaeological/iconographic), the course treats the socio-cultural changes in Christian communities, as well as developments in Christian "orthodoxy" and "heretical" movements (e.g., Gnostics); the role of Greek philosophy in shaping Christian thought; martyrdom and persecution; asceticism, monasticism, and holy persons; Christian views of political and social responsibility.
[NES 327 The Missions of Paul and His Successors (also Religious Studies 327)

Fall. 4 credits. Not offered 1994-95
T R 2:55-4:10. L. Kant.
With special focus on the Pauline tradition, we will examine Christianity in the first to early second centuries C.E. as a missionary religious movement, surveying its spread to various cities throughout the Graeco-Roman/Near Eastern world, such as Antioch, Ephesus, Colossae, Thessaloniki, Phillipi, Corinth, and Rome. Through a close reading of New Testament texts, we will investigate the different forms Christianity took in various places, noting its transformation from a Jewish missionary movement to a gentile one Attention will be drawn to the following: the urban character of Christian missions; initiatory rites, such as baptism; the role of Jewish synagogues and of god-fearers; the eschatological stance of early Christian communities; and views of the Roman government toward early Christianity and vice versa. In addition, we will consider the meaning of missionizing and conversion in the ancient world to determine what is meant, and did not mean, to become a Christian. Knowledge of Greek is not at all necessary but students with the background will have the opportunity to use it.]

NES 339 Muslims, Christians, and Jews in Islamic Spain: Literature and Society (also JWST 339, COM L 334, RELST 334, SPANL 339) ©*
Fall. 4 credits.
M W F 12:20-1:10. R. Brann.
Islamic Spain was a frontier society comprising six distinct ethnic-religious communities: Arabs, muwalladun (native descendants of Iberian converts to Islam), Berbers, musta'ribun (Arabicized Christians), Jews and "Slavs" (European slave soldiers and their descendants). This course will examine the literature, culture, and society of al-Andalus (Islamic Spain) from the Umayyad emirate until the close of the Reconquista (711-1248) The development of Arabic (and Hebrew) poetry will be surveyed with focus on style, genres, and motifs. Conflicting theories of the origin and identity of Hispano-Arabic poetry and culture will also be considered.
[NES 340 Judaism and Christianity: A Historical and Theological Encounter (also Religious Studies 341) \#

Spring. 4 credits. Enrollment limited to 20 students. Not offered 1994-95.
S. Katz.]
[NES 348 Varieties of Judaism in the Graeco-Roman World (also Jewish Studies 348 and Religlous Studies 348) 률

Spring. 4 credits. Not offered 1994-95.]
NES 351 Introduction to Islamic Law (also NES 651, RELST 350, HIST 372 652) © \#

Spring. 4 credits. Enrollment limited to 20 students.

T R 1:25-2:40. D. Powers.
After surveying the historical development of Islamic Law, the seminar will focus on the structure and function of the Islamic legal system in the fourteenth and fifteenth centuries, using legal documents, judicial opinions, and court cases (in English translation) to elicit major themes and issues.
[NES 352 Islam and the West (a)
Spring. 3 credits. Not offered 1994-95.J
[NES 357 Isiamic Law and Society ©\# Fall. 4 credits. Not offered 1994-95.J
[NES 453 Islam in South Asia (also History 417 and Religious Studies 417) ©

Fall. 4 credits. Not offered 1994-95. R. Ahmed.]

## History

NES 244 Introduction to Ancient Judaism (also JWST 244 and RELST 244) e"

Spring. 3 credits
TR 1:25-2:40. G. Rendsburg.
This course focuses on the development of Judaism as a religion and as a civilization in antiquity. Particular emphasis is placed on theological development culminating in monotheism, the role of the covenant, law and society, sacrifice and prayer as modes of worship, and similar topics. Jewish civilization is placed within the context of ancient civilizations (Canaan, Egypt, Babylon, Persia, Greece, Rome). Texts to be studied include selections from the Bible, the Apocrypha, the Dead Sea Scrolls, Josephus, and the Mishnah. All readings in English translation.

## NES 248 Introduction to Classical

 Jewish History (also RELST 248) © © Fall. 3 credits. Enrollment limited to 50 students.T R 10:10-11:25. S. Katz.
A survey of the major developments in Jewish history between the destruction of the first temple in 586 B.C.E. and the rise of Islam.
Topics will include the return under Ezra and Nehemiah; the encounter with Hellenism; the Antiochene persecutions; the growth of Roman influence; the rebellion of 70 C.E.; the rise of such Jewish groups as the Sadducees, Pharisees, and Essenes; the conflict with early Christianity; and the nature of rabbinic Judaism.

## NES 249 Introduction to Modern Jewish History \# <br> Spring. 3 credits. Enrollment limited to 50 students <br> M W F 10:10-11. S. Katz.

A survey of the major developments in Jewish history between the expulsion from Spain (1492) until 1900. Topics will include the growth of mysticism and Hasidism; the development of Eastern European Jewry; the impact of emancipation; the rise of Jewish pluralism, e.g., Reform Judaism, Conservative Judaism, Neo-Orthodoxy; the character of modern anti-Semitism; the origins and growth of American Jewry; and the beginnings of political Zionism.
[NES 257 Islamic History: 600-1258 (also History 254 and Rellgious Studies 257) \#
Fall. 3 credits. Not offered 1994-95.]
[NES 258 Islamic History: 1258-1914 (also History 248 and Religious Studies 258) (0) \#
Spring. 3 credits. Not offered 1994-95.]
[NES 261 Ancient Seafaring (also Archaeology 275) © \#
Spring. 3 credits. Not offered 1994-95.]
[NES 264 Agriculture and Sociaty in the Ancient Near East ©\#
Spring. 3 credits. Not offered 1994-95.]

## NES 294 Modern History of the Near

 East: Changing Politics, Society, and Ideas (also Government 358 and JWST 294) ©Fail. 4 credits. Fulfills the college distribution requirement in history or the social sciences.

T R 2:55-4:10. M. Litvak.
This introductory course is designed to acquaint students with the main political, social, and cultural trends that have shaped the modern and contemporary history of the Near East. While discussing developments in the region during the nineteenth and twentieth centuries, the lectures will focus on such themes as modernization, nationalism, Islamic response, and Arab politics in the global and regional contexts. The course does not presuppose any knowlege of Near Eastern languages.
[NES 340 Judaism and Christianity: A Historical and Theological Encounter (also Religious Studies 341) \#

Spring. 4 credits. Not offered 1994-95]

## [NES 350 Queen of Cities: Byzantine Constantinople, Ottoman Istanbul (also CLASS 352, HIST 315, and RELST 352) ©

Spring. 4 credits. Not offered 1994-95.]
NES 351 Introduction to Islamic Law (also NES 651, RELST 350, HIST 372) 652) ©\#

Spring. 4 credits. Enrollment limited to 20 students.
For description, see NES 351 under Near Eastern Studies Civilization.
[NES 352 Islam and the West 상
Spring. 3 credits. Not offered 1994-95.]

## NES 353 Politics and Culture in Late Medieval Central Asia and the Near East (also HIST 317) © 0

Fall. 4 credits.
T R 11:40-12:55. L. Peirce
This course explores the phenomenon of the "military patronage state." This term has been used to describe the combination of a ruling class organized for conquest and conspicuous cultural patronage, characteristic of the states established by the Mongols, Timurids, Mamluks, and early Ottomans. Two other
notable features of these states that we will examine are the close ties that existed between rulers and sufi saints and the prominence of women in politics and cultural production. Wherever possible, readings will emphasize primary sources in translation
[NES 354 Iran: Between Islam and the West (also History 378)
Spring. 4 credits. Enrollment limited to 25 students, Not offered 1994-95.
D. Menashri.]
[NES 358 The Islamic Resurgence (a Spring. 4 credits. Prerequisite: NES 258 or NES 294. Not offered 1994-95.]
[NES 359 Ottoman History: 1300-1923 (also HIST 389, HIST 646, and NES 658) 울

Fall. 4 credits. Not offered 1994-95
L. Peirce.]
[NES 361 Interconnections in the Eastern Mediterranean World in Antiquity (:)
Fall. 4 credits. Not offered 1994-95.]
NES 362 The History and Archaeology of Ancient Syria (also NES 662, ARKEO 362/662, and JWST 362) © \#
Spring. 4 credits. Prerequisite: Any
archaeology or ancient history course or permission of instructor.
For description, see NES 362 under Near
Eastern Studies Archaeology
[NES 366 Archaeology of the Ancient Near East (also Archaeology 310) ©

Fall. 4 credits. Not offered 1994-95.]
[NES 367 The History and Archaeology of Ancient Egypt @ \#
Fall. 4 credits. Not offered 1994-95.]
[NES 395 International Relations of the Middle East (also Government 392) 훙

Spring. 4 credits. Not offered 1994-95. S. Telhami.]

NES 418 Seminar in Islamic History: Muhammad and the Rise of Islam (also HIST 460/660, NES 618, and RELST 418) ©
Fall. 4 credits. Enrollment limited to 20 students. Prerequisite: NES 257 or 258 , or permission of instructor.

T R 1:25-2:40. D. Powers.
This course will focus on the life of the Prophet Muhammad and first century of Islamic history, with special attention to methodological issues relating to the study of this period. Three literary forms-all available in English translation-will serve as the basis for discussion: The Qur'an, the biography of the Prophet (Sira), and the sayings of the
Prophet (Hadith). Knowledge of Arabic is desirable but not required.
[NES 453 Islam in South Asia (also History 417 and Religious Studies 417) 륭

Fall. 4 credits. Not offered 1994-95.
M 2:30-4:25. R. Ahmed.]
[NES 456 Sexuality, Society and the State in the Near East (also History 457 and Women's Studies 455) ©
Spring. 4 credits. Prerequisite: Permission of the instructor. Limited to 15 students. Not offered 1994-95.
L. Peirce.]

NES 493 Ethnicity in the Modern Middle East - Historical and Social Science Approaches (also S HUM 413)
Fall. 1 credit. Seminar will meet four times only (September 13, 15, 20, and 22). Enrollment limited to 17 students.

T R 2:30-4:25. L. Valensi.
The goal of the seminar is the study of ethnic and religious groups in the Middle East in the 19 th and 20 th centuries. Methodologically, the seminar will probe the merits and the limits of the different approaches utilized so far to understand pluralistic societies such as those of the Middle East: 1) Descriptive, objective approaches (naming, counting, mapping, and storytelling); 2) Focusing on interaction and conflicts in the shaping and reproduction of collective identities; 3) The study of conversation, "Metissages," cosmopolitanism, and crossing the borders of religious and ethnic groups.

NES 618 Seminar in Islamic History: Muhammad and the Rise of Islam (also HIST 460/660, NES 418, and RELST 418)
Fall. 4 credits. Prerequisite: NES 257 or 258 , or permission of instructor. Enrollment limited to 20 students.
For description, see NES 418 under Near Eastern Studies History.

NES 651 Introduction to Islamic Law (also NES 351, RELST 350, HIST 372) 652)

Spring. 4 credits. Enrollment limited to 20 students.
For description, see NES 351 under Near
Eastern Studies, Civilization
[NES 682 International Relations of the Middle East (also Government 682)
Spring. 4 credits. Not offered 1994-95.]

## Literature

[NES 171 The Hebrew Muse: Explorations in Classical Jewish Literature (also JWST 171)
Fall. 3 credits. Not offered 1994-95. Staff.]
[NES 220 The Greek New Testament (also CLASS 202 and RELST 202)
Spring. 3 credits. Not offered 1994-95. J. Rusten.]

NES 223 Introduction to the Bible (also JWST 223 and RELST 223) ©
Fall. 3 credits.
M W F 10:10-11:00. G. Rendsburg.
This course is intended to introduce the student to the literature of the Hebrew Bible, with particular attention paid to the material in Genesis through 1 Kings. Emphasis is placed on literary, historical, and theological matters. Special use is made of the numerous archaeological discoveries that have advanced our knowledge of ancient Israel. As such, the Bible is studied against the backdrop of ancient Near Eastern literature, history, religion, mythology, law and culture.
[NES 224 Wisdom Literature: An Introduction 륭
Spring. 3 credits. Not offered 1994-95.]
[NES 226 Exodus and Conquest * Spring. 3 credits. Not offered 1994-95.1
[NES 227 Introduction to the Prophets (also Jewish Studies 227 and Religious Studies 227) 생
Spring. 3 credits. Not offered 1994-95. G. Rendsburg.]
[NES 228 Genesis (also Near Eastern Studies 628, Jewish Studies 228 and Religious Studies 228)
Spring. 3 credits. Prerequisite: knowledge of Hebrew. Not offered 1994-95.
G. Rendsburg.]
[NES 233 The Lyrics of Love and Death: Medieval Arabic and Hebrew Poetry and Narrative [in Translation] (also Comparative Literature 333 and Jewish Studies 233) ©
Spring. 3 credits. Not offered 1994-95.]
NES 313 Arab-African Fiction (also Africana Studies 313) 앙
Spring. 4 credits. Enrollment limited to 20 students.

M W F 12:20-1:10. B. Hamad.
This course will be devoted to the novels and short stories of Middle Eastern and African authors, including Najib Mahfouz, Tawfiq alHakim, al-Tayyib Saleh, and Yusuf Idris. Through these texts, we will explore the impact of modernization and Western colonialism and culture upon the traditional Arab-African environment, both in the city and the village. All materials will be read in English translation. No prerequisites.

## [NES 332 Ancient Near Eastern

 Literature © "Spring. 4 credits. Not offered 1994-95.]
NES 339 Muslims, Christians, and Jews in Islamic Spain: Literature and Society (also JWST 339, COMP LIT 334, RELST 334, SPAN LIT 339) © \# Fall. 4 credits.
For description, see NES 339 under Near Eastern Studies Civilization.
[NES 356 Readings in Classical Arabic Texts (also NES 656) ©
Spring. 4 credits. Prerequisite: NES 211-212 or permission of instructor. Not offered 1994-95.

## D. Powers.]

[NES 400 Seminar in Advanced Hebrew (also JWST 400) 랑
Spring. 4 credits. Enrollment limited to 15 students. Prerequisite: NES 302/JWST 302 or permission of instructor. Not offered 1994-95.
N. Scharf.]
[NES 402 Seminar In Hebrew Literature and Poetics (also Jewish Studies 402) ©

Spring. 4 credits. Prerequisites: NES 301 or equivalent and permission of instructor. Not offered 1994-95.]

## [NES 411 Readings in Classical Arabic

 Texts 융Fall. 4 credits. Not offered 1994-95.]
[NES 420 Readings in Biblical Hebrew Prose (also Jewish Studies 420 and Religious Studies 420) © "
Spring. 4 credits. Prerequisite: one year of Hebrew, biblical or modern. Course may be repeated for credit. Not offered 1994-95. G. Rendsburg.]
[NES 421 Readings in Biblical Hebrew Poetry (also Jewish Studies 421 and Religious Studies 423) © "
Spring. 4 credits. Prerequisite for NES 421 one year of Biblical or Modern Hebrew. Course may be repeated for credit. Nor offered 1994-95.]

## [NES 428 Medieval Biblical Hebrew

 Exegesis (also Jewish Studies 488 and Religious Studies) @\#Spring. 4 credits. Prerequisite: Advanced knowledge of Hebrew or permission of instructor. Not offered 1994-95.]

NES 429 Readings in the New Testament (also Comparative Literature 429, English 429, and Religious Studies 429) *

Fall. 4 credits. Enrollment limited to 8 NES students; 9 Comparative Literature students; and 8 Religious Studies students.

M W F 12:20-1:10. J. P. Bishop
Close readings of representative texts from the New Testament in modern scholarly editions, with the help of appropriate commentary, introductory and specialized. The focus for 1994 will be on acts and letters from Paul. All readings will be in English, but repeated reference to the Greek original will be made. Graduate students and undergraduates from other colleges who are interested in the materials should not feel inhibited from enrolling. The approach will be primarily exegetical; that is, we will try to find out what the texts say and what they mean by what they say. Thus we can hope to stay open to scholarly and religious issues alike.
[NES 432 Readings in Judeo-Arabic: Medieval Judeo Arabic and Hebrew Poetics (also Jewish Studies 482) \#

Spring. 4 credits. Prerequisite: Arabic 212, Hebrew 202, or equivalents. Designed for graduate students but open to undergraduates with permission of instructor. Entire sequence may be repeated for credit; readings will vary from year to year. Not offered 1994-95.]
[NES 627 The Song of Songs (also Religious Studies 627 and Jewish Studies 627) © *
Fall. 4 credits. Prerequisite: knowledge of Hebrew. Not offered 1994-95.]
[NES 628 Genesis (also NES 228 and Jewish Studies 628)
Fall. 4 credits. Not offered 1994-95.]
[NES 633-634 Elementary Akkadian I and II (also Near Eastern Studies 333-334)
Fall, 633; spring, 634. 4 credits. Not offered 1994-95.]

NES 499 Independent Study, Honors
Fall and spring. Variable credit. Prerequisite: permission of instructor. Staff.

## NES 635-[636] Readings in Akkadian

 Texts (also NES 335-[336])635, fall; [spring, 636]. 4 credits. Prerequisitc for 636: 633-634. Prerequisite for 336: 333-334.
For description see NES 335-336 under Near Eastern Languages.

## [NES 656 Readings in Classical Arabic

 Texts (also NES 356)Spring. 4 credits.
For description see NES 356 under Near Eastern Studies Literature. Not offered 1994-95.]

NES 491-492 Independent Study, Undergraduate Level
Fall and/or spring. Variable credit. Prerequisite: permission of instructor. Staff.

NES 691-692 Independent Study: Graduate Level
Fall or spring. Variable credit. Prerequisite: permission of instructor. Staff.

## The Program of Jewish Studies

The Program of Jewish Studies encompasses a broad spectrum of disciplines that includes civilization, history, language, literature, philology, and religion. The program offers students the opportunity to take a wide variety of courses in Jewish Studies whose subjects are not represented in the department of Near Eastern Studies. Students interested in planning a program in Jewish Studies should consult with the director, Professor David A. Owen, 360 Rockefeller Hall. For complete listings and descriptions, see Program of Jewish Studies under "Special Programs and Interdisciplinary Studies."
[JWST 102 An Introduction to the Classics of Jewish Literature (also Near Eastern Studies 122 and Religious Studies 122)
102, spring. 3 credits each semester. Not offered 1994-95.

Staff.]
JWST 247 Introduction to Jewish Art and Archaeology from the Hellenistic to the Rabbinic Period (also CLASS 249, NES 247, RELST 247, ARKEO 247)
Fall. 3 credits.
T R 2:55-4:10. L. Kant.
JWST 274 Jewish Civilization in Eastern Europe: 1814-1939 (also Russian Literature 274)
Fall. 2 credits.
R 1:25-4:25. A. Nadler.
[JWST 450 Undergraduate Seminar in Recent American History: Benjamin N. Cardozo and the American Judicial Tradition (also History 440)
Fall. 4 credits. Permission of instructor required. Not offered 1994-95.]
[JWST 478 Jewish-American Writing (also English 488)
Spring. 4 credits, Limited enrollment. Permission of the instructor required. Not offered 1994-95.

TBA. J. Porte.]
JWST 491-492 Independent Study: Undergraduate
Fall or spring. Variable credit. Prerequisite: permission of instructor. Staff.
JWST 499 Independent Study: Honors
Fall and spring. Variable credit. Prerequisite: permission of instructor.

Staff.

## Related Courses in Other Departments

Africana Studies
Archaeology
Classics
Comparative Literature
Economics
English

German Studies
Government
English
History
History of Art
Medieval Studies
Modern Lanaguages and Linguistics
Philosophy
Religious Studies
Romance Studies
Russian Literature
Society for the Humanities
Sociology
Women's Studies

## NEPALI

See Department of Modern Languages and Linguistics.

## PHILOSOPHY

T. H. Irwin, chair (on leave spring 1995),
R. N. Boyd, G. Fine (on leave spring 1995),
C. A. Ginet (on leave 1994-95), H. Hodes,
J. Jarrett, K. Jones, N. Kretzmann, D. Lyons, R. W. Miller, S. Shoemaker, N. L. Sturgeon (on leave fall 1994), A. W. Wood

The study of philosophy provides students with an opportunity to become familiar with some of the ideas and texts in the history of thought while developing analytical skills that are valuable in practical as well as academic affairs. It affords the excitement and satisfaction that come from understanding and working toward solutions of intellectual problems. The curriculum includes offerings in the history of philosophy, logic, philosophy of science, ethics, social and political philosophy, metaphysics, and theory of knowledge. Any philosophy course numbered in the 100 s or 200 s is suitable for beginning study in the field. Sections of Philosophy 100 are part of the freshman writing seminar program; they are taught by various members of the staff on a variety of philosophical topics, and because of their small size (seventeen students at most) they provide ample opportunity for discussion. Students who want a broad introduction to philosophy may take Philosophy 101, but many students with special interests may find that the best introduction to philosophy is a 200-level course in some particular area of philosophy; such courses have no prerequisites and are usually open to freshmen.

## The Major

Students expecting to major in philosophy should begin their study of it in their freshman or sophomore year. Admission to the major is granted by the director of undergraduate studies of the department on the basis of a student's work during the first two years. Normally the student must have completed two philosophy courses with grades of B or better. Eight philosophy courses are required for the major. They must include at least one course in ancient philosophy (Philosophy 210 or 211, or a course with a large component on Plato or Aristotle), at least one course in classical modern metaphysics and epistemology (Philosophy 212 or a course on the empiricists, the rationalists, or Kant), and a minimum of three courses numbered above 300. A course in formal logic (e.g., Philoso-
phy 231), while not required, is especially recommended for majors or prospective majors.
Philosophy majors must also complete at least 8 credits of course work in related subjects approved by their major advisers. Occasionally majors may serve as teaching or research aides, working with faculty members familiar with their work
Honors. A candidate for honors in philosophy must be a philosophy major with an average of B - or better for all work in the College of Arts and Sciences and an average of $\mathrm{B}+$ or better for all work in philosophy. In either or both terms of the senior year a candidate for honors enrolls in Philosophy 490 and undertakes research leading to the writing of an honors essay by the end of the final term. Honors students normally need to take Pbilosophy 490 both terms of their senior year in order to urite a satisfactory bonors essay Philosophy 490 does not count toward the eight philosophy courses required for the major. Prospective candidates should apply at the philosophy department office, 218
Goldwin Smith Hall

## Fees

In some courses there may be a small fee for photocopying materials to be handed out to students.

## Introductory Courses

These courses have no prerequisites; all are open to freshmen.

## PHIL 100 Freshman Writing Seminars in Philosophy

Fall and spring. 3 credits. Consult the brochure listing freshman writing seminars prepared by the John S. Knight Writing Program

## PHIL 101 Introduction to Philosophy

 (by petition for breadth requirement)Fall and spring. 3 credits.
Fall: Lecs M W 2:30; disc. F 2:30-3:20. R. Miller.

An introduction to central topics of philosophy. We will discuss questions of epistemology (what can we know for sure? what is the difference between rational belief and dogmatism?), philosophy of mind (is your mind just the same as your brain? do you really have free will?), and ethics (what makes acts morally wrong? what social inequalities are unjust?) Readings will be chosen from classic and contemporary writers

Spring: T R 10:10. A. Wood A survey of some main topics and problems in philosophy: proofs for the existence of God, belief and doubt, the mind-body problem, free will, the basis of morality. Readings will include selections from writings of St . Anselm, St. Thomas Aquinas, Descartes, Plato, Kant, Mill, Nietzsche, Peirce, and James
[PHIL 145 Contemporary Moral Issues 3 credits. Offered only in 6 -week summer session.]
[PHIL 201 Philosophical Problems Not offered 1994-95.]
[PHIL 210 Ancient Thought
4 credits. Not offered 1994-95.]

PHIL 211 Ancient Philosophy *
Fall. 4 credits. No prerequisites.
M W F 2:30. G. Fine
This course explores the origins of Western philosophy, as it emerged in Ancient Greece and Rome. We will explore some of the central ideas of the presocratics, Socrates, Plato, Aristotle, and the post-Aristotelians (Epicureans, Stoics, and Sceptics). Questions to be considered include: What are the nature and limits of knowledge? How reliable is perception? What are the basic entities in the universe-atoms? Platonic Forms? Aristotelian substances? Is moral knowledge possible? Why be moral? What is the nature of happiness and what sor of life will make people happy? Do human beings have free will? This course has no prerequisites

## PHIL 212 Modern Philosophy *

Spring. 4 credits
M W F 10:10, plus disc. 1 hour each week
to be arranged. S. Shoemaker.
A survey of major philosophical problems in metaphysics and the theory of knowledge in seventeenth- and eighteenth-century European philosophy. Readings from Descartes,
Spinoza, Locke, Leibniz, Berkeley, Hume, and Kant.

## PHIL 213 Existentialism

Fall. 4 credits
T R 10:10-11:25; plus disc T 11:40 or
T 3:35. A. Wood.
We will sudy writings of four principal modern writers usually categorized as
"existentialist": Nietzsche, Dostoyevsky, Kierkegaard, and Sartre. Readings will include novels, prose-poetry and pseudonymous literature used as vehicles for conveying philosophical ideas.
PHIL 214 Philosophical Issues in Christian Thought
Spring. 4 credits
T R 2:55; disc. 1 hour each week to be arranged. N. Kretzmann.
Topic for 1994-95: Christian ethics
PHIL 231 Introduction to Formal Logic 4 credits. Normally offered in the six-week summer session.

Fall: M W F 1:25, H. Hodes. Spring: M W F 1:25, J. Jarrett.
Analysis and evaluation of deductive reasoning in terms of formalized languages The logic of sentences, predicates, and quantifiers. (This course, rather than Philosophy 331, is the recommended introductory formal logic course.) Fall prelims scheduled $10 / 13$ and 11/15

## PHIL 241 Ethics (by petition for breadth

 requirement)Spring. 4 credits.
Lecs, T R 2:55-4:10; plus disc. 1 hour each week to be arranged. R. Miller. Introduction to the philosophical study of major moral questions-for example: Are all values relative, or are there some objective moral values? Have we ever any good reason to care about the interests of other people? Do people have rights with which governments should not interfere, even to advance the general welfare? What inequalities are unjust? The course discusses general issues in moral philosophy, together with some of their implications for particular current moral controversies, such as the debates over abortion, reverse discrimination, and policies reducing economic inequality. Readings from major philosophers of the past, as well as contemporary sources.

## [PHIL 242 Social and Political Theory (by petition for breadth requirement) (also Government 260) <br> 4 credits. Not offered 1994-95.]

[PHIL 243 Aesthetics
Fall. 4 credits. Not offered 1994-95.]
[PHIL 244 Philosophy and Literature
4 credits. Not offered 1994-95.]

## PHIL 245 Ethics and Health Care

Fall. 4 credits. Normally offered also in the six-week summer session. Open to sophomores, juniors, and seniors.

Lecs, T R 1:25; disc, 1 hour each week to
be arranged. K. Jones.
This course is an introduction to the ethnical issues surrounding health care. Topics include: (1) the professional-patient relationship, (2) justice and access to health care, (3) autonomy, quality of life, personhood and their relation to issues such as abortion and euthanasia.

PHIL 246 Ethics and the Environment Spring. 4 credits. Open to all undergraduates. Permission of instructor required for graduate students.

Lecs, M W F 11:15; disc, 1 hour each week
to be arranged. N. Sturgeon.
Critical philosophical analysis of the conceptual frameworks in which policies affecting the environment are formulated and judged Topics include the nature of ethics and the possibility of knowledge in ethics; the nature and extent of individual and social obligation to distant people, future generations, nonhuman animals and nonsentient things (e.g., the ecosystem); the origin of environmental problems and the range of options for their solution
[PHIL 247 Ethics and Public Life
Spring. 4 credits. Not offered 1994-95.]

## [PHIL 261 Knowledge and Reality

4 credits. Not offered 1994-95.]
PHIL 262 Philosophy of Mind
Fall. 4 credits.
M W F 10:10. S. Shoemaker.
An introduction to issues about the nature and identities of persons and "selves", both as discussed in the writings of such philosophers as Descartes, Locke, and Hume, and as treated in contemporary discussions of them. Questions will include: What is the relation of a person to his or her body? What constitutes the continued identity of persons over time? Why does personal identity matter? What constitutes the unity of a person at a time? How do persons have knowledge of the minds and identities of other persons, and how do persons have knowledge of their own minds and identities?

## PHIL 263 Religion and Reason

Fall. 4 credits.
TR 11:40. N. Kretzmann
Recent and traditional literature will be taken into account in the examination of such topics as evidence for and against the existence of a god, philosophical problems associated with the attributes of God as described in the great monotheistic religions, and philosophical problems associated with the relationship of God to the physical universe and to human beings.

PHIL 286 Science and Human Nature (also Science and Technology Studies 286)
Spring. 4 credits
M W F 10:10. R. N. Boyd.
An examination of attempts in the biological and social sciences to offer scientific theories of human nature and human potential and to apply such theories to explain important social and psychological phenomena

## Intermediate or Advanced Courses

Some of these courses have prerequisites.
[PHIL 309 Plato \#
4 credits. Not offered 1994-95.]
[PHIL 310 Aristotle \#
4 credits. Not offered 1994-95.]
PHIL 311 Modern Rationalism *
Fall. 4 credits. Prerequisites: at least one previous philosophy course at the 200 -level or above.

M W F 11:15. G. Fine
This course focuses on the metaphysics and epistemology of Descartes, Spinoza, and Leibniz. Topics to be considered include: scepticism; the nature and limits of knowledge; innate ideas; substance; causation; freedom and determinism; necessity; proofs for the existence of God.

PHIL 312 Modern Empiricism \# Spring. 4 credits.

M W F 2:30. S. Shoemaker.
The metaphysical and epistemological views of Hume. Topics will include thought and meaning, knowledge and skepticism, causation and causal reasoning, and personal identity. Special attention will be given to Hume's views about causation.

## PHIL 314 Ancient Philosophy: The World of Theory and the World of Ordinary

 LifeSpring. 4 credits.
T R 1:25. C. Meinwald
We will be studying the questions: Are both worlds legitimate, or only one? If both, then how are they related? We will consider 1) the Eleatics, who challenge the ordinary world; b) some from a group (which included Anaxagoras, Empedocles, the atomists, Plato, Aristotle, the Stoics, and the rationalists in medicine) who maintain that the world accessible to theory underlies the ordinary world, and for whom theorizing concerning ultimate realities is relevant to our understanding of the world around us; c) the Sceptics, who challenge the theoretical world. There will be three $5-7$ page papers

## [PHIL 315 Medieval Philosophy \#

4 credits. Not offered 1994-95.1

## PHIL 316 Kant *

Fall. 4 credits.
T R 11:40. A. Wood
Introduction to Kant's main doctrines in metaphysics, theory of knowledge, and ethics. Topics include the possibility of nonempirical knowledge, the nature of space and time and our knowledge of them, proof of the existence of an objective world, why events must have causes, determinism and the possibility of free will, and the basis of morality.

## PHIL 317 Hege

## Spring. 4 credits.

T R 11:40. A. Wood.
An introduction to Hegel's system of philosophy, emphasizing Hegel's moral and social philosophy and philosophy of history. The principal text studied will be Hegel's Elements of the Pbilosophy of Right (1821).

PHIL 318 Twentieth-Century Philosophy Fall. 4 credits.

M W F 2:30. H. Hodes. A survey of philosophical writing from the late 19th to early 20th century authors including G. Frege, B. Russell, L. Wittgenstein, on language, foundations of mathematics, topics in metaphysics (and perhaps epistemology).
Recommended background: Philosophy 231.
[PHIL 319 Philosophy of Marx \#
4 credits. Not offered 1994-95.1

## [PHIL 331 Formal Logic

4 credits. Not offered 1994-95.]

## PHIL 332 Philosophy of Language

 Spring. 4 credits.M W F 11:15. H. Langsam.
An introduction to the philosophy of language, focusing on problems about meaning, truth and reference in linguistic communication, and how these issues bear on the relations among mind, language and the world.
PHIL 341 Ethical Theory (also Women's Studies 341)
Spring. 4 credits.
M W F 3:35. K. Jones.
Like much of contemporary feminist theory, feminist ethics began with the assumption that ethical theory was fully adequate to address feminist concerns. All that needed to be done was to take the resources of ethical theory and apply them to hitherto overlooked questions, such as abortion, affirmative action, justice in the family, and pornography. However, this project assumes that the theories themselves are not gender biased. This claim has been challenged. In particular, it has been argued that traditional ethical theory overlooks the situatedness of agents and devalues emotions and relations to particular others. We will critically examine these claims and their challenge to ethical theories that take the principal moral concept to be the concept of "duty." In addition, we will examine the view, argued for by Carol Gilligan, that women speak with a distinctive ethical voice-a voice of care, rather than justice. Gilligan's work raises the problem of what feminist ethics is: any move from "feminine" to "feminist" must be treated with great suspicion. It turns out that a wide variety of projects are currently being pursued under the general heading of feminist ethics and we will attempt to enlarge our understanding of what feminist ethics is and might become.

PHIL 342 Law, Society, and Morality (also Law 666)
Spring 1995. 4 credits.
M W F 3:00-3:50. D. Lyons.
This course is an introcluction to the philosophy of law, with an emphasis on the nature and interpretation of law and the relation of law to moral principle. Theories to be considered include natural law, legal positivism, and legal realism. Topics include law as coercive command, the open texture of law, and the idea of a general obligation to obey the law

PHIL 343 Resistance and Responsibility (also Law 676)
Fall. 4 credits.
T R 1:25. D. Lyons.
This course will consider two closely related ideas: the idea of political obligation (that the members of a society have a moral obligation to obey its laws) and the idea of civil disobedience (that principled resistance to law can sometimes be justified). Readings are from both political philosophy and the history of political resistance. Previously titled:
Political Obligation and Civil Disobedience
[PHIL 344 History of Ethics: Ancient and Medieval *
4 credits. Not offered 1994-95.]
[PHIL 345 History of Ethics: Modern \#
4 credits. Not offered 19945-95.]
PHIL 346 Modern Political Philosophy (also Government 462)
Fall. 4 credits.
T R 2:55. R. Miller.
A study of the leading contemporary theories of justice, including the work of Rawls.
Nozick, and Gauthier. We will consider the different treatment in each theory of equality liberty, and the general welfare, the different conceptions of morality on which each is grounded, and the consequences of each for current political controversies.

## [PHIL 361 Metaphysics and Epistemology

4 credits. Not offered 1994-95.]
[PHIL 362 Philosophy of Mind
4 credits. Not offered 1994-95.]

# [PHIL 363 Topics in the Philosophy of Religion 

4 credits. Not offered 1994-95.]
[PHIL 368 Global Climate and Global Justice (also Government 368)
Not offered 1994-95.]
PHIL 369 Limiting War: The Morality of Modern State Violence (also Government 469)
Fall. 4 credits.
T R 1:25. H. Shue. Discussion section to be arranged.
Modern states employ and threaten violence in several forms. This course critically examines the best arguments about limiting or prohibiting various contemporary methods of fighting, or otherwise coercing, one's enemies-arguments with conclusions ranging from pacifism to "realism." Have traditional principles of just war been overtaken by recent events and technologies, or is it possible to provide a reasonable justification for limiting the means or ends of future wars? In 1994 the course focuses on two extended case-studies: nuclear weapons in the post-Cold-War world and the conduct of the Gulf War against Iraq in 1991

## PHIL 381 Philosophy of Science:

 Knowledge and Objectivity (also Science and Technology Studies 381)Fall. 4 credits.
W 7:30-9:30 p.m. Sections: R 10:10-11:25, 1:25-2:40. R. Boyd.
An examination of central epistemological and metaphysical issues raised by scientific
theorizing: the nature of evidence; scientific objectivity; the nature of theories, models, and paradigms; and the character of scientific revolutions
[PHIL 382 Philosophy and Psychology 4 credits. Not offered 1994-95.]

## PHIL 384 Philosophy of Physics

Fall. 4 credits.
M W F 10:10. J. Jarrett.
An introduction to issues arising in a philosophical examination of modern physical science. Relevant aspects of classical statistical mechanics, relativity theory, and quantum mechanics will be considered in connection with such topics as microphysical indeterminateness, probabilistic laws, causality, the direction of time, action-at-a-distance, and scientific explanation.
[PHIL 389 Philosophy of Science: Evidence and Explanation
4 credits. Not offered 1994-95.]
PHIL $\mathbf{3 9 0}$ Informal Study
Fall or spring. Credit to be arranged. Staff.
To be taken only in exceptional circumstances. Must be arranged by the student with his or her adviser and the faculty member who has agreed to direct the study.

## Advanced Courses and Seminars

These courses are offered primarily for majors and graduate students.
[PHIL 395 Majors Seminar
4 credits. Not offered 1994-95.\}
PHIL 409 German Philosophical Texts
Fall and spring. 2 credits. Prerequisites: knowledge of German and permission of instructor.

Hours to be arranged. A. Wood
Reading of philosophical texts in the original German
PHIL 410 Latin Philosophical Texts \# Fall and spring. Variable credit. Prerequisites; knowledge of Latin and permission of instructor.

Hours to be arranged. N. Kretzmann. Reading of philosophical texts in the original Latin.

## PHIL 411 Greek Philosophical Texts

 (also Classics 311) \#Fall. Variable credit. Prerequisites: knowledge of Greek and permission of instructor.

Hours to be arranged. T. Irwin.
Reading of philosophical texts in the original Greek.

## PHIL 412 Medieval Philosophy \#

Fall. 4 credits.
T R 2:55. N. Kretzmann.
Topic for 1994-95: The philosophy of Thomas Aquinas, especially metaphysics, philosophy of mind, and theory of knowledge.
[PHIL 413 Topics in Ancient Philosophy *
4 credits. Not offered 1994-95.]
[PHIL 414 German Philosophy after Kant \#
4 credits. Not offered 1994-95.]
[PHIL 415 Special Topics in the History of Philosophy "
Fall. Not offered 1994-95.]
[PHIL 416 Modern Philosophy \#
4 credits. Not offered 1994-95.]
[PHIL 431 Deductive Logic (also Mathematics 481)
4 credits. Not offered 1994-95.]
[PHIL 433 Philosophy of Logic
4 credits. Not offered 1994-95.]

## PHIL 436 Intensional Logic (also Mathematics 483)

Spring. 4 credits. Prerequisite: one previous course on logic or permission of the instructor.

M W F 1:25. H. Hodes.
Review of derivations and models for logic; introduction to the abstract theory of consequence-relations, derivations and Kripke models for classical normal modal logics (including Soundness and Completeness Theories); time permitting: logics of subjunctive conditionals, relation of modal and intuitionistic logic.

## [PHIL 437 Topics in the Philosophy of Language <br> 4 credits. Not offered 1994-95.]

[PHIL 441 Contemporary Ethical Theory 4 credits. Not offered 1994-95]

## [PHIL 442 Ethics and the Philosophy of Mind <br> 4 credits. Not offered 1994-95.]

## [PHIL 444 Contemporary Legal Theory (also Law 710) <br> 4 credits. Not offered 1994-95.]

PHIL 446 Topics In Social and Political Philosophy
Spring. 4 credits.
M W F 10:10. K. Jones.
The topic is the concept of identity. Recent work in moral and political philosophy has used "identity" and related notions such as "self-conception" or "self-definition." We will examine what the various writers have in mind when using such terms and how they have been thought relevant to moral and political theory.

## PHIL 461 Metaphysics

Spring. 4 credits.
T 3:30-5:30 p.m. R. Boyd, S. Mohanty. Justification, explanation, and truth. We will investigate recent controversies over our access to truths about the external world, in everyday life and in science. Issues may include the nature of explanation and the status of inference to the best explanation; the dependence of justification on background assumptions and its implications for relativism; the role of social practice in justification and reference and their bearing on realism; the relation between everyday, technical scientific, and moral inquiry. Readings may include work by Anscombe, Fine, Harman, Miller, Putnam, Rorty, van Fraassen, and
Wittgenstein.
[PHIL 481 Problems in the Philosophy of Science
4 credits. Not offered 1994-95.]
PHIL 490 Special Studies in Philosophy
Fall and spring. 4 credits. Open only to honors students in their senior year. See Honors description at front of Philosophy section.
Staff.

PHIL 611 Ancient Philosophy \# Spring. 4 credits

M 4:30-6:30. C. Meinwald.
Topic for 1995: Plato, the Parmenides and the Philebus. Course requirements: one term paper, one presentation.
[PHIL 612 Medieval Philosophy
4 credits. Not offered 1994-95.]
[PHIL 613 Modern Philosophers
4 credits. Not offered 1994-95.]
PHIL 619 History of Philosophy * Fall. 4 credits.

M 4:30-6:30. T. Irwin.
Some central issues in Aristote's philosophy and their treatment by Hellenistic philosophers, especially the Stoics. Topics include: scepticism; meaning and reference; conditionals; modality; substance, form, and matter; causation and explanation; determinism and moral responsibility; morality, virtue, and happiness; reason and emotion.
[PHIL 633 Philosophy of Language (also Linguistics 700)
4 credits. Not offered 1994-95.]

## [PHIL 641 Ethics and Value Theory

4 credits. Not offered 1994-95.]
PHIL 661 Theory of Knowledge (also S8TS 6611
Spring. 4 credits
W 4:30-6:30. R. Miller
Topic for 1994-95: Recent work on truth, rationality, and knowledge. We will look at some leading current discussions of what makes a belief rational, what determines its content, what is involved in asserting its truth what knowledge requires in addition to true belief, and the implications of each of these questions for our access to mind-independent facts. Readings are likely to include work by Putnam, Davidson, Fodor, Goldman, and Nozick.

## PHIL 662 Philosophy of Mind

Fall. 4 credits.
R 4:30-6:30. H. Langsam.
Topic for Fall 1994: Experience.
[PHIL 663 Philosophy of Religion
4 credits. Not offered 1994-95.]

## PHIL 664 Metaphysics

Fall. 4 credits.
T 4:30-6:30. S. Shoemaker.
Topic: Causality, Properties, and Intrinsicness.
[PHIL 665 Metaphysics
4 credits. Not offered 1994-95.]
[PHIL 681 Philosophy of Science
4 credits. Not offered 1994-95.]
[PHIL 682 Philosophy of Social Science
4 credits. Not offered 1994-95.]

## PHIL 700 Informal Study

Fall or spring. Credit to be arranged. Staff.
To be taken by graduate students only in exceptional circumstances and by arrangement made by the student with his or her Special Committee and the faculty member who has agreed to direct the study.

PHIL 773 Proseminar in Cognitive Studies (also Cognitive Studies 773, Linguistics 773, and Computer Science 773)
Fall. 2 credits. Fall: R grade.
T 1:25-2:40.
See course description under PHIL 774.

PHIL 774 Proseminar in Cognitive Studies (also Cognítive Studies 774, Linguistics 774, and Computer Science 774)
Spring. 2 credits. S-U only.
T 1:25-2:40. Staff (taught from Comell's Cognitive Studies Program, representing the fields of computer science, linguistics, psychology, and philosophy). Year-long commitment is mandatory.
This is a year-long lecture-and-discussion course that is intended to provide graduate students with an interdisciplinary introduction to the study of knowledge, its representation, acquisition, and use. Topics may include the psychology of perception and cognition; the philosophy of mind, language, and knowledge; the phonology, syntax, and semantics of natural language; computational approaches to natural language processing, vision and reasoning; parrallel distributed processing, and neuropsychology.

## PHYSICS

D. B. Fitchen, chair ( 109 Clark Hall, 255-6016); R. S. Galik, director of undergraduate studies; J. P. Alexander, V. Ambegaokar, N. W. Ashcroft. K. Berkelman, E. Bodenschatz,
D. G. Cassel, G. V. Chester, B. Cooper,
R. M. Cotts, P. Drell, V. Elser, C. P. Franck,
B. Gittelman, K. Gottfried, B. Greene, L. N. Hand, D. L. Hartill, C. L. Henley, W. Ho, D. F. Holcomb, M. P. Kalos, T. Kinoshita, A. LeClair, D. M. Lee, G. P. Lepage,
R. M. Littauer, N. D. Mermin, N. Mistry,
J. Orear, J. M. Parpia, J. R. Patterson,
R. O. Pohl, J. D. Reppy, R. C. Richardson,
J. T. Rogers, D. L. Rubin, E. E. Salpeter,
J. P. Sethna, S. L. Shapiro, A. J. Sievers,
E. Siggia, R. H. Silsbee, P. C. Stein,
R. M. Talman, M. P. Teter, S. A. Teukolsky,
R. Thorne, M. Tigner, H. Tye, T-M. Yan

The Department of Physics offers a full range of university-level work in physics, from general education courses for nonscientists to doctoral-level independent research. Major research facilities are operated by two component organizations, the Laboratory of Atomic and Solid State Physics (LASSP) and the Laboratory of Nuclear Studies (LNS). LASSP carries out extensive research efforts in condensed-matter physics and in lowtemperature physics. LNS operates a major high-energy particle physics research facility at Wilson Laboratory, the Cornell electronpositron storage ring (CESR). Theoretical work is carried out in many fields of physics, including astrophysics. There is a full schedule of weekly research-oriented seminars and colloquia. Junior and senior students will find many opportunities for research participation and summer employment.
Three introductory physics sequences are open to freshmen: 101-102, 112-213-214, and 207-208. In addition, there is a group of general-education courses, Physics 201 through 206, 209, 210. Physics 101-102, a selfpaced autotutorial course, is designed for students who do not intend to take further physics courses and who do not have preparation in calculus. Physics 112 and 207 both require calculus (Mathematics 191 or 111), and additional mathematics is required for subsequent courses in the sequence. Physics 101-102 or 207-208 may be taken as terminal physics courses. The three-term sequence 112-213-214 or its honors version,
$116-217-218$, is recommended for engineers and physics majors. Physics 214 and 218 are placing an increasing emphasis on use of the computer for homework, laboratory exercises, and projects; some knowledge about computing, perhaps at the level of Computer Science 99 or 101, is desirable.

Courses beyond the introductory level that might be of interest to nonmajors include. Physics 315, Phenomena of Microphysics; Physics 330, Modern Experimental Optics; and Physics 360, Electronic Circuits.
Advanced placement and credit are offered as outlined in "Advanced Placement of Freshmen, " or students may consult Professor Cotts, 522 Clark Hall. Students requesting transfer credit for physics courses taken at another college should consult the director of undergraduate studies.

## The Major

The major program is constructed to accommodate students who wish to prepare for professional or graduate work in physics as well as those who wish to complete their major program in the field of physics but have other post-graduation goals.

Students who wish to major in physics are advised to start the physics sequence in the first term of their freshman year. (Note that students who have had contact with introductory calculus may take Physics 112 with coregistration in Mathematics 191.) The major program can still be completed with a secondterm start, but flexibility in future course scheduling is reduced.
Prospective majors are urged to make an early appointment at the physics office for advice in program planning. Acceptance into the major program is normally granted upon completion of a year of physics and mathematics courses at Cornell with all course grades at the Blevel or higher. The department office will give advice in the matter of selecting a major faculty adviser. Details of the major course program are worked out in consultation between the student and major adviser.

## Physics Core

Common to all major programs is a requirement to complete a core of physics courses. In addition to the three-term introductory sequence (Physics 112-213-214 or Physics 116-217-218), the core includes five upperlevel courses-(a) the two-course sequence in modern physics (Physics 316-317), (b) at least three semester hours of laboratory work selected from Physics 310, 330, 360, 410, Astronomy 410, (c) an intermediate course in classical mechanics, and (d) an intermediate course in electromagnetism.
Accompanying these physics courses should be work in mathematics through at least Mathematics 294 or 222. Students following the professional/graduate school channel are expected to complete at least one additional year of applicable mathematics (Applied and Engineering Physics 321-322 or Mathematics 421-422).

In addition to the core, each physics major must complete 15 semester hours of credit in an area of concentration which has been agreed upon by the student and major faculty adviser.
Note: The requirements as stated above apply to all students who will graduate in the
class of 1995 or later. Students graduating in 1994 or earlier will be governed by the requirements in effect at the time of their acceptance into the major program. Those earlier requirements included fewer credits in the core.

## Concentration within Physics

A student who wishes to pursue professional or graduate work in physics or a closely related field should follow a concentration within the field of physics. For those students with a strong high school preparation, the sequence Physics 116-217-218 is encouraged. Core courses in mechanics and electromagnetism will normally be Physics 318 and Physics 327 respectively. The minimum 15 hours beyond the core must be composed of physics courses with numbers greater than 300 and must include the senior laboratory course Physics 410 . This means a physics concentration needs a minimum of 7 hours of laboratory work to complete the requirements. The accompanying table shows several typical course sequences by means of which the major requirements may be completed. The primary distinction among students who may follow the different sequences is the amount and level of pre-college work in calculus and in physics. Changes in these standard patterns will be common, as agreed upon between student and major faculty adviser.

## Concentration outside Physics

The concentration will reflect the student's interest in some area related to physics. The array of courses that comprise the concentration must have internal coherence. The array will normally be worked out in conference with the major faculty adviser and must be approved by the adviser. Of the required 15 hours credit beyond the core, at least 8 credits must be in courses numbered above 300 . Students have chosen to concentrate in such topics as chemical physics, astrophysics, natural sciences, history and philosophy of science, computer science, meteorology, or mathematically oriented economics. A combined biology-chemistry concentration is appropriate for pre-medical students or those who wish to prepare for work in biophysics. The concentration in natural science is particularly appropriate for students who wish to prepare for secondary school teaching.

For students with concentrations outside physics, the core requirements in mechanics can be appropriately met with Physics 314. For such students, Physics 323 is the normal choice for work in electromagnetism.
Students with an astronomy concentration who might continue in that field in graduate school should use Astronomy 410, 431, 432 as part of the concentration; they should use physics 318 and 327 to satisfy the core requirements in mechanics and electromagnetism.

## Foreign Language Requirement

Students interested in eventual graduate work in physics are advised to meet this College of Arts and Sciences requirement with work in French, German, or Russian.

## Honors

A student may be granted honors in physics upon the recommendation of the Physics Advisers Committee of the physics faculty.

## Double Majors

Double majors including physics are possible and not at all uncommon. It should be noted, however, that if a student wishes to complete a major in physics as well as a major in one or more other subjects, any course used to satisfy a requirement of the second major may not be used also in satisfaction of any physics major requirement.

## Distribution Requirement

Class of 1995 and before: The requirement in physical sciences is met by any two sequential courses such as Physics 101-102 or 207-208 or 112-213 or any combination of the first term of one sequence and the second term of another. It is also met by any two general education courses from the group 200-206, 209,210 or by a combination of 101 or 112 or 207 with one from the group 200-206, 209, 210.

Class of 1996 and after: All Physics courses.

## Courses with Overlapping Content

Because the department offers several courses with overlapping content, students should select courses carefully to meet the needs of their academic programs and to ensure credit for each course they take. Listed below are groups of courses with largely similar content. In general, students may receive credit for only one of the courses in each group.
Physics 101, 207
Physics 102, 208
Physics 112, 116
Physics 213, 217
Physics 214, 218

## Course Prerequisites

Prerequisites are specified in physics course descriptions to illustrate the materials that students should have mastered. Students who wish to plan programs different from those suggested by the prerequisite ordering are urged to discuss their preparation and background with a physics adviser or with the
instructor in the course. In many cases an appropriate individual program can be worked out without exact adherence to the stated prerequisites.

## Courses

PHYS 101-102 General Physics
101, fall; 102, spring (101-102 also normally offered in summer). 4 credits each term. Prerequisites: three years of high school mathematics, including some trigonometry. Prerequisite for Physics 102: Physics 101 or 112 or 207. Includes more modern physics and less mathematical analysis than Physics 207-208 but more mathematics than Physics 201-206, 209, 210. (Students planning to major in a physical science should elect Physics 207-208 or 112-213-214.) A mostly self-paced, mastery-oriented autotutorial format; students work in a learning center at hours of their choice. Mastery testing on each unit (with a limit of three attempts).

One opening lecture 7:30 p.m., R Aug. 25 or M Aug. 29 (fall); M Jan. 23 (spring).
Fall, R. M. Cotts, B. Richardson; spring, R. M. Cotts, B. Richardson.

Basic principles treated quantitatively but without calculus. Major topics for 101: kinematics and dynamics; forces; and sound. Momentum; energy; thermal physics; kinetic theory; thermodynamics; fluid mechanics; waves and sound. For 102: electricity and magnetism; optics; relativity; atomic, quantum, and nuclear physics; particles and waves. Laboratory emphasizes instrumentation, measurement, and interpretation of data. At the level of Physics, by Cutnell and Johnson.

## PHYS 112 Physics I: Mechanics and

 HeatFall or spring (normally also offered in summer). 4 credits. Primarily for students of engineering and for prospective physics majors. Prerequisite: coregistration in Mathematics 192 (or 194 or 112), or substantial previous contact with introductory calculus combined with coregistration in Mathematics 191 or 111.

## Typical Physics Course Sequences

(The semesters in which $314,316,317,323$, and 443 are listed are those that will be available to majors in the classes of 1995 or later.)
$\begin{array}{cc}\text { semester } & \text { No AP math } \\ \text { or physics }\end{array}$
1 year AP
calculus and good HS physics

Outside
concentrators

| 116 | 112 |
| :---: | :---: |
| 217 | 213 |
| 218,330 | 214 |
| 316,318 | 310 or 360 |
| 317,327 | 316 |
| 360,443 | 314 |
| 341,410 | 317,323 |

317, 323
341, 410

Outside concentrators (alternate)

1st - Fall
112
213

213
2nd - Spring
214
316,310 or 360
4th - Spring
317, 327
6th - Spring
318, 443
341, 410

## Elective(s)

Lecs M W F 10:10 or $12: 20 ; 2$ recs each week; six 3 -hr. labs. Evening exams: fall, Sept. 27 , Oct. 25 , Nov. 29 ; spring, Feb. 21 , Mar. 16, Apr. 20. Fall, A. LeClaire; spring, J. Parpia.

Mechanics of particles: kinematics, dynamics, conservation laws, central force fields, periodic motion. Mechanics of many-particle systems: center of mass, rotational mechanics of a rigid body, static equilibrium. Introduction to thermodynamics. At the level of
Physics for Scientists and Engineers, Vol. 1, by Tipler.

## PHYS 116 Physics I: Mechanics and

 Special RelativityFall or spring. 4 credits. A more analytic version of Physics 112, intended for students who will be comfortable with a deeper, somewhat more abstract approach. Intended mainly but not exclusively for prospective physics majors. Prerequisites: a good secondary school physics course and familiarity with basic calculus. Corrective transfers between Physics 116 and Physics 112 (in either direction) are encouraged during the first few weeks of instruction.

Lecs, M W F 10:10; 2 recs each week; one 3-hr. lab alternate weeks. Evening exams may be scheduled. Fall, spring, B. Greene. A more rigorous version of Physics 112, covering similar topics at the level of $A n$ Introduction to Mechanics, by Kleppner and Kolenkow.

## PHYS 200 Art, Archaeology, and

 Analysis (also Engineering 185, MS\&E 285, Archaeology 285, English 285, Art 372, and NS\&E 285)
## Spring. 3 credits.

Lecs. M W F 11:15-12:05. D. Clark An interdepartmental course on how techniques of physical sciences and engineering are being applied to issues in cultural research. Archaeological artifacts, works of art, and rare books will be discussed with focus on historical and technical aspects of their creation and on their analysis by modern methods including microscopic, infra-red, and $x$-ray examination and by nuclear techniques such as carbon dating and compositional analysis using neutrons and charged particles. Scientific concepts underlying the methods will be discussed. Isotopic composition and/ or radiographic images are used to identify pigments, inks, clays, etc.; to deduce geographical origins; to date and authenticate objects, and to study their creator's techniques.

## PHYS 201 Why the Sky Is Blue: Aspects

 of the Physical WorldFall. 3 credits.
Lec, T R 2:55-4:10; rec, W 2:30-3:20 or W 3:35-4:25. A. Sadoff.
This is a descriptive physics course aimed specifically at the non-science student. There is an emphasis on the ideas of modern physics where the approach is both historical and thematic. The methodology of science and the nature of evidence is emphasized. An overriding theme is the character of physical laws as shown through the great principles of symmetry and conservation. While there are a few computational problems assigned, the purpose is to help students to understand the concepts rather than to master problemsolving techniques.

## PHYS 202 The World According to

 Physics-The Way Things Work Summer only. 3 credits. Prerequisite: three years of high school mathematics, including some trigonometry.M-F 10:00-12:00; laboratories two afternoons per week, to be arranged. R. Lieberman.

Intended to provide students majoring in fields outside the sciences with an appreciation for the familiar physical world surrounding them. Which falls faster, a pound of gold or a pound of feathers? What trajectory does a launched rocket follow? How efficient is an efficient automobile engine? What actually keeps a satellite circling the earth-why doesn't it just fall down or fly away? Can you build a ship that runs off the heat found in the ocean? With an emphasis on problem solving, the course helps the student to develop skills transferable to other areas. Topics include Newton's basic laws of motion, trajectories, satellites, space travel, and the concepts of energy.

## PHYS 204 Physics of Musical Sound

Spring. 3 credits. Intended for nonscientists; does not serve as a prerequisite for further science courses. Assumes no scientific background but will use high school algebra.

Lec, M W F 9:05-9:55; disc, R 3:35 or
F 3:35. E. Cassel.
Many features of the production, propagation, and perception of musical sound may be understood in terms of important concepts in physics. Topics covered will include the mechanism of tone production in musical instruments, distinctions in tone quality, musical scales and tuning, some basic principles of room acoustics and reproduction of sound, and aspects of the mechanism of hearing. There will be some lab activities using computers to sample the frequency spectrum of various sounds and wave forms. At the level of The Science of Sound, by T. D. Rossing.

PHYS 205 Reasoning about Luck Spring. 3 credits. Intended for nonscientists; does not serve as a prerequisite for further science courses. Assumes no scientific background but will use high school algebra. Lecs, M W F 2:30; 5. 1-hr. labs to be arranged. V. Ambegaokar.
An attempt to explain how and when natural scientists can cope rationally with chance.
The first part of the course deals in a constructive way with the basic ideas of probability theory and explains why it is that in large systems likely events can become overwhelmingly likely. An introduction to mechanics and to heat as probabilistic mechanics follows. In this way, interested students are given a nontrivial understanding of the second law of thermodynamics, that putative bridge between C. P. Snow's two cultures. Another physical theory, quantum mechanics, in which chance occurs-though in a somewhat mysterious way-is touched on. Approximately five self-paced laboratory experiments will be included.

## PHYS 206 War and Peace in the Nuclear

 Age (also Government 384)Spring. 4 credits. Intended for nonscientists; does not serve as a prerequisite to further science courses. Assumes no scientific background but will use high school mathematics.

Lecs, T R 10:10-11:25; 1 rec each week. P. Stein.

This course is intended for any student who wishes to understand the following: the history and evolution of militrary strategy; the developments in 20th-century physics that culminated in the development of the
"atomic" bomb; the principles, types, and effects of nuclear weapons; existing and proposed arsenals and delivery systems; the evolution of the nuclear military strategy of the nuclear powers; and the history of nuclear arms-control negotiations. The course will also examine important concepts involved in military strategy and arms control. Much attention will be given to the problem and mechanisms of control of proliferation and weapons of mass destruction. Assignments emphasize quantitative reasoning skills as well as the technical subject matter.

PHYS 207-208 Fundamentals of Physics 207, fall; 208, spring. 4 credits each term. Prerequisites for Physics 207: high school physics plus Mathematics 111 or 191, or substantial previous contact with introductory calculus, combined with coregistration in a math course approved by instructor. Prereq uisites for Physics 208: Physics 207 (or 112 or 101 ) and at least coregistration in Mathematics 112 or 192 . Physics $207-208$ is a twosemester introduction to physics with emphasis on tools generally applicable in the sciences, intended for students majoring in a physical science, mathematics, or an analytically oriented biological science.

Lecs M W F 9:05-9:55 or 11:15-12:05; two
rec and one 2 -hour lab each week, 207 ,
R. M. Littauer; 208, B. Cooper. Evening
exams: fall, Oct. 6, Nov. 8; spring, Feb. 28, Apr. 11.
207: Mechanics, conservation laws, waves, and topics from thermal physics, fluids, acoustics and properties of matter
208: Electricity and magnetism, topics from physical and geometrical optics, quantum and nuclear physics. At the level of Fundamentals of Physics, by Halliday and Resnick
PHYS 209 Relativity and Chaos
Fall. 3 credits. Intended for nonscientists; does not serve as a prerequisite for further science courses. Assumes no scientific background but will use high school algebra.

Lecs M W F 2:30-3:20; rec T $2: 30-3: 20$;
N. D. Mermin.

We will examine two revolutionary fields of classical physics, one venerable and one relatively recent: the special theory of relativity will be developed, with a view to understanding how certain simple but apparently contradictory facts about light lead to extraordinary insights into the nature of time; and the newer subject of "chaos" will be explored, with a view to seeing how extremely simple rules can lead to behavior of breathtaking complexity.

## [PHYS 210 Randomness in Classical and Quantum Physics

Spring. 3 credits. Intended for nonscientists; does not serve as a prerequisite for further science courses. Assumes no scientific background but will use high school algebra Not offered 1994-95.

Lecs M W F 2:30-3:20; rec T 2:30-3:20;
N. D. Mermin.

We will examine two areas of physics where randomness plays a central role: the classical probability theory of gamblers, and its relation to subjects from the nature of coincidence to the direction of the flow of time; and the quantum theory, which promotes randomness from a consequence of human ignorance to a
fundamental aspect of the physical world, leading to Einstein's celebrated rejection of a dice-throwing God and his more disturbing complaint about "spooky actions at a distance."]

## PHYS 213 Physics Il: Electricity and Magnetism

Fall or spring (also normally offered in summer). 4 credits. Primarily for students of engineering and for prospective physics majors. Prerequisites: Physics 112 and coregistration in the continuation of the mathematics sequence required for Physics 112.

Lecs, T R 9:05 or 11:15; 2 recs each week; one 3-hr. lab alternate weeks. Evening exams: fall, Oct. 6, Nov. 8; spring, Mar. 2, Apr. 6. Fall, J. Alexander, spring, Staff. Electrostatics, behavior of matter in electric fields, DC and AC circuits, magnetic fields, Faraday's law, Maxwell's equations, electromagnetic oscillations and waves. At the level of Physics for Scientists and Engineers, Vol. 2, by Tipler. Laboratory covers electrical measurements, DC and AC circuits, resonance phenomena.

## PHYS 214 Physics III: Optics, Waves, and Particles

Fall or spring (also normally offered in summer). 4 credits. Primarily for students of engineering and for prospective physics majors. Prerequisites; Physics 213 and coregistration in the continuation of the mathematics sequence.

Lecs, TR 9:05 or 11:15; 2 recs each week; one 3 -hr. lab alternate weeks. Evening exams: fall, Oct. 4, Nov. 3; spring, Mar. 7,
Apr. 20. Fall, J. Rogers; spring, P. Drell. Physics of wave phenomena, electromagnetic waves, interference and diffraction effects, optics, wave properties of particles, introduction to quantum physics. Course includes computer use in solving problems. At the level of Pbysics for Scientists and Engineers, Vol 1 and Vol. 2, by Tipler.

## PHYS 216 Introduction to Special Relativity

Fall or spring, based upon preregistration 1 credit. S-U only. Enrollment may be limited. Course will be completed within first four weeks of term. Co-registration in this course is a prerequisite for registration in Physics 217, unless the student has taken a relativity course at the level of Physics 116 or Astronomy 106. Prerequisites: Physics 112 or Physics 207 or permission of instructor.

Lecs T R 8:00-8:50. Fall, N. D. Mermin; spring, staff.
Introduction to Einstein's Theory of Special Relativity. Topics to be covered include: Galilean and Lorentz transformations, the concept of simultaneity, time dilation and Lorentz contraction, the relativistic transformations of velocity, momentum and energy, and relativistic invarience in the laws of physics. At the level of An Introduction to Mechanics by Kleppner and Kolenkow or Space and Time in Special Relativity by Mermin.

## PHYS 217 Physics II: Electricity and Magnetism

Fall or spring. 4 credits. Enrollment may be limited. Intended for students who have done very well in Physics 112 or 116 and in mathematics and who desire a more analytic treatment than that of Physics 213. Prospective physics majors are encouraged to select Physics 217 . Prerequisites: approval of student's adviser and permission from the
instructor. A placement quiz may be given early in the semester, permitting those students who find Physics 217 too abstract or analytical to transfer into Physics 213, which they can do without difficulty at that time. Vector calculus will be taught in this course, but previous contact, especially with the operations grad, div, and curl, is helpful. It is assumed the student has seen Special Relativity at the level of Physics 116 or is currently enrolled in Physics 216.

Lecs, M W F 10:10, one rec each week; one 3 -hr. lab alternate weeks. Evening exams may be scheduled. Fall,
B. Gittelman; spring, K. Berkelman At the level of Electricity and Magnetism, by Purcell (Vol. 2, Berkeley Physics Series).

## PHYS 218 Physics III: Waves and

 ThermodynamicsFall or spring. 4 credits. Enrollment may be limited. A special section of Physics 214. Conditions governing enrollment are similar to those of Physics 217.

Lecs, M W F 11:15, one rec each week; one 3-hr. lab altemate weeks. Fall, J. Brock; spring, E. Bodenschatz.

Topics covered in recent years have included oscillators, mechanical waves, waves at interfaces, standing waves, electromagnetic waves, guided waves, scattering, interference and diffraction, geometric optics, the doppler effect, and an introduction to matter waves. Evening exams may be scheduled. A more rigorous version of Physics 214

## PHYS 310 Intermediate Experimental Physics

Spring. 3 credits. Enrollment may be limited Prerequisite: Physics 208 or 213.

Labs, T W 1:25-4:25. E. Cassel
Students select from a variety of experiments. An individual, independent approach is encouraged. Facilities of the Physics 410 lab are available for some experiments.

PHYS 314 Intermediate Mechanics Spring. 4 credits. Prerequisites: Physics 208 or 214 (or equivalent) and Math 294 (or equivalent); Applied and Engineering Physics 322 or coregistration in Mathematics 421 recommended. Intended for physics majors with concentration outside of physics or astronomy; Physics 318 covers similar material at a more analytical level.

Lecs: M W F 10:10-11:00; F 1:25-2:15. Staff.
Includes Newtonian mechanics, Lagrange and Hamilton formulations, central forces, rigid body motion, and small oscillations. At the level of Classical Dynamics by Marion and Thornton

PHYS 316-317 Modern Physics I and II 3 credits each term. Physics 316 is offered every term, Physics 317 only in fall term. The two courses comprise a two-term sequence and it is assumed that a student registering in Physics 316 will continue with Physics 317. Prerequisites: Physics 316: Physics 214 or 218, and coregistration in at least Mathematics 294 or equivalent; Physics 317: Physics 316.

Lecs M W F 9:05-9:55, rec; T 2:30-3:20.
316: fall, staff; spring, J. Alexander.
317: fall, N. W. Ashcroft.
Introduction to the physics of microscopic phenomena, emphasizing the use of elementary quantum and statistical mechanics. At the level of Physics of Atoms, Molecules, Solids, Nuclei, and Particles by Eisberg and Resnick. Physics 316: Breakdown of classical concepts in microphysics; light quanta and matter
waves; Schrodinger equation and solutions in 1 and 3 dimensions; hydrogen atom, exclusion principle, the periodic table. Physics 317: Classical and quantum statistical mechanics; molecules; solid state physics; nuclear physics and radioactivity; elementary particle physics.

## PHYS 318 Analytical Mechanics

Spring. 4 credits. Prerequisites: Physics 116 or permission of instructor; Applied and Engineering Physics 321 or coregistration in Mathematics 421. Intended for physics majors concentrating in physics or astronomy. Physics 314 covers similar material at a less demanding level.

Lecs, M F 10:10-11:00, sec, F 2:30; sem
W or R, 1:25-3:20. L. N. Hand.
Newtonian mechanics of particles and systems of particles, including rigid bodies; oscillating systems; gravitation and planetary motion; moving coordinate systems; Euler's equations; Lagrange and Hamilton formulations; normal modes and small vibrations; introduction to chaos. At the level of Classical Dynamics (3rd edition) by Marion and Thomton. Supplementary reading will be assigned.

PHYS 323 Intermediate Electricity and Magnetism
Fall. 4 credits. Prerequisites: Physics 208 or 214 (or equivalent) and Math 294 (or equivalent); coregistration in Applied and Engineering Physics 321 or Math 421 recommended. Intended for physics majors with concentration outside of physics or astronomy; Physics 327 covers similar material at a more analytical level.

Lecs, M W F 11:15-12:05, F 1:25-2:15. T. Laredo.

Includes electro/magnetostatics, boundary value problems, dielectric and magnetic media, Maxwell's Equations, and electromagnetic waves, and an introduction to special relativity. At the level of Introduction to Electrodynamics, by Griffiths.

## PHYS 327 Advanced Electricity and

 MagnetismFall. 4 credits. Prerequisites: Physics 217/218 or permission of instructor; coregistration in Applied and Engineering Physics 321 or Mathematics 421 . Intended for physics majors concentrating in physics or astronomy Physics 323 covers similar material at a less demanding level. N.B.: Physics 327 assumes knowledge of the material at the level of Physics 217.

Lecs, M W F 11:15, F 2:30. P. Lepage. Electro/magneto-statics-vector and scalar potentials, Laplace's Equation and boundary value problems, multipoles; radiation-solutions to Maxwell's Equations, energy-momentum of radiation; electrodynamics in media; special relativity-transformations, four vectors, particle kinematics and dynamics, relativistic electrodynamics. At the level of Introduction to Electro-dynamics, by Griffiths.

PHYS 330 Modern Experimental Optics Fall. 4 credits. Enrollment limited. Prerequisite: Physics 214 or equivalent.

Lec. M 2:30; lab, T R 1:25-4:15.
E. Bodenschatz.

A practical laboratory course in basic and modern optics. Students spend two-thirds of the course experimenting with the physics of basic optical phenomena: interference, diffraction, coherence, polarization, and image formation. The last part of the course involves a choice among experiments on lasers and applications of lasers, light pulses and optical communication, and holography.

The course also serves as an introduction to the use of optical equipment and techniques that are employed in current research in the fields of biology, chemistry, physics, and astronomy

## PHYS 341 Thermodynamics and

 Statistical PhysicsFall. 4 credits. Prerequisites: Physics 214 and Mathematics 294

Lecs, M W F 10:10-11:00, R 2:30
V. Ambegaokar.

Statistical physics, developing both thermodynamics and statistical mechanics simultaneously. Concepts of temperature, laws of thermodynamics, entropy, thermodynamic relations, free energy. Applications to phase equilibrium, multicomponent systems,
chemical reactions, and thermodynamic
cycles. Application of statistical mechanics to physical systems; introduction to treatment of Maxwell-Boltzmann, Bose-Einstein, and FermiDirac statistics with applications. Elementary transport theory. At the level of Fundamentals of Statistical and Thermal Pbysics, by Reif, or Thermal Pbysics, by Morse.

PHYS $\mathbf{3 6 0}$ Electronic Circuits (also Applied and Engineering Physics 363)

Fall or spring. 4 credits. Prerequisite: Physics 208 or 213 or permission of instructor. No previous experience with electronic circuits is assumed; however, the course moves through the introductory topics (DC and AC circuits, basic circuit elements) rather quickly.
Students wishing a more complete background might consider taking Electrical Engineering 210 before Physics 360 . Fall term is usually less crowded.

Lec, M 2:30-4:25; labs. T R or W F 1:25-
4:25 (also M W 7:30-10:30 pm in spring).
Fall, E. Kirkland; spring, J. Alexander.
An experimental survey of some devices and circuits in two general areas: analog and digital electronics. The analog circuits covered include operational amplifiers, filters, diodes, biopolar and field effect transistors. The digital circuits covered include combinatorial (gates) and sequential (flip flops and counters) logic. Simple microcomputer interfacing and programming is then used to investigate digital to analog and analog to digital (DAC, ADC) conversion.

PHYS 400 Informal Advanced Laboratory
Fall or spring; (also offered during summer) Variable to 3 credits. Prerequisites: two years of physics and permission of instructor

Lab, T W 1:25-4:25, see Physics 410 Experiments of widely varying difficulty in one or more areas, as listed under Physics 410, may be done to fill the student's special requirements.

## PHYS 410 Advanced Experimental

 PhysicsFall or spring. Summer with permission of instructor. 4 credits. Limited to seniors except by special permission. Prerequisites: Physics 214 (or 310 or 360 ) plus 318 and 327 , or permission of instructor.

Lec, M 2:30-4:25; labs, T W 1:25-4:25
Fall, W. Ho, and staff; spring, D. L. Hartill and staff.
Selected topics in experimental concepts and techniques. About seventy different experiments are available in acoustics, optics, spectroscopy, electrical circuits, electronics and ionics, magnetic resonance, X-rays. low temperature, solid state, cosmic rays, nuclear physics. The student performs three to six
diverse experiments, depending on difficulty, selected to meet individual needs and interests. Independent work is stressed

## PHYS 443 Introductory Quantum

 MechanicsSpring. 4 credits. Prerequisites: Physics 318 and 327 , or 314 and 323; Physics 316 and Applied and Engineering Physics 321 or Mathematics 421; or permission of instructor. Lecs, M W F 9:05-9:55, F 2:30. Evening exams may be scheduled. T.-M. Yan. Introduction to concepts and techniques of quantum mechanics, at the level of Introduc tion to Quantum Mechanics, by Dicke and Wittke.

## PHYS 444 Nuclear and High-Energy

 Particle PhysicsSpring. 4 credits. Prerequisite: Physics 443 or permission of instructor

Lecs, M W F 9:05-9:55, F 1:25. Staff. Behavior of high-energy particles and radiation; elementary particles; basic properties of accelerators and detectors; general symmetries and conservation laws. At the level of Concepts of Particle Pbysics, by Gottfried and Weisskopf.

## PHYS 454 Introductory Solid-State

 PhysicsFall. 4 credits. Prerequisite: Physics 443 , A\&EP 361, Chemistry 793, or permission of instructor. (May also be offered in spring. Spring times and format will be announced if offered.)

Lecs, M W 10:10-11:00, computer lab T, W, or R 1:25-3:30, disc F 1:25-2:15 or 2:30-3:20. R. Silsbee.
An introduction to modern solid-state physics, including crystal structure, lattice vibrations, electron theory of metals and semiconductors, and selected topics from magnetic properties, optical properties, superconductivity, and defects. At the level of Introduction to Solid State Physics, by Kittel, and Solid State Pbysics, by Ashcroft and Mermin.

## [PHYS 455 Geometrical Concepts in Physics

Spring. 3 credits. Prerequisite: Physics 327 and at least coregistration in Physics 318 or permission of instructor. Offered alternate years. Not offered 1994-95

Lec. T R 10:10-11:25. 13. Greene.
Geometrical methods are an essential tool in modern theoretical physics and also provide deep insights into classical physicselectrodynamics, thermodynamics, mechanics, special and general relativity. This course will introduce basic concepts from topology and differential geometry, emphasize calculational methods and illustrate their utility by drawing examples from these areas of physics. In particular, we shall cover manifolds, differential forms, vector bundles, homotopy, homology and lie groups. At the level of Geometrical Methods of Matbematical Pbysics by Bernard Schutz.]

## PHYS 480 Computational Physics

Spring, 3 credits, S-U only. Prerequisites: Applied and Engineering Physics 321-322 or Math 421-423 or equivalent, and the ability to write programs in any compurer language. No previous knowledge of numerical analysis is assumed.

Lec T R 10:10-11:25. S. Teukolsky. Course content is essentially identical to Physics 680, but a different grading system will be used for undergraduates.

PHYS 481-489 Special Topics Seminar
Offerings are announced each term. 2 and 3 credits. Limited to senior physics majors and those who receive permission of instructor. S-U grades only.

Hours to be arranged. One selected topic of current interest is studied. Students participate in organization and presentation of material.

PHYS 490 Independent Study in Physics Fall or spring. Variable to 4 credits. Ordinarily limited to seniors. Prerequisite: Permission required of professor who will direct proposed work. A copy of request for independent study form must be filed with physics department course coordinator, 121 Clark Hall. Individual project work (reading or laboratory) in any branch of physics.

PHYS 500 Informal Graduate Laboratory
Fall, spring; (also offered during summer.) Variable to 2 credits. By permission of instructor.

## PHYS 510 Advanced Experimental

 PhysicsFall, spring, or summer. 3 credits Labs, T W 1:25-4:25. Fall, W. Ho and staff; spring, D. L. Hartill and staff.
About seventy different experiments are available in acoustics, optics, spectroscopy, electrical circuits, electronics and ionics, magnetic resonance, X-rays, low temperature, solid state, cosmic rays, nuclear physics. Students perform four to eight experiments selected to meet individual needs. Independent work is stressed. An optional lecture associated with Physics 410, M 2:30-4:25 is available. It includes lectures on techniques used in experiments in the advanced laboratory and on current research topics.

## PHYS 520 Projects in Experimental

 PhysicsFall, spring, or summer. Variable to 3 credits. To be supervised by faculty member.
Students must advise department course coordinator of faculty member responsible for their project. Prerequisite: Physics 510. Projects of modern topical interest that involve some independent development work by student. Opportunity for more initiative in experimental work than is possible in Physics 510.

## [PHY5 525 Physics of Black Holes, White Dwarfs, and Neutron Stars (also Astronomy 511, High-Energy Astrophysics)

Spring. 4 credits. Not offered 1994-95.
Lecs, T R 1:25-2:40. S. L. Shapiro.
The formation of compact objects: neutrino and gravitational radiation from supernova collapse and neutron stars. Equilibrium configurations, equations of state, stability criteria, and mass limits. The influence of rotation and magnetic fields. Pulsar phenomena. Mass flow in binary systems; spherical and disk accretion; high-temperature radiation processes. Compact X-ray sources and X-ray bursts. Emphasis will be on the application of fundamental physical principles to compact objects. Topics in diverse areas of physics will be discussed: solid-state physics, nuclear physics, relativity, fluid dynamics, high-energy physics, etc. No astronomy or general relativity prerequisites. Text: Pbysics of Black Holes, White Dwarfs, and Neutron Stars, by Shapiro and Teukolsky.]

PHYS 551 Classical Mechanics
Spring. 3 credits. Prerequisite: an undergraduate course in classical mechanics at the level of books by K. Symon or J. B. Marion. Lecs, T R 10:10, R 2:30. R. Talman. Lagrangian and Hamiltonian formulation of classical mechanics, with modern applications in nonlinear dynamics. Foundations will be taught at the level of Matbematical Metbods in Classical Mechanics, by Arnold.

## PHYS 553-554 General Relativity (also Astronomy 509-510)

553 , fall; 554 , spring. 4 credits. Prerequisite: knowledge of special relativity at the level of Classical Mechanics, by Goldstein

Lecs, T R 1:25-2:40. S. L. Shapiro. Physics 553 is a systematic introduction to Einstein's theory, with emphasis on modern coordinate-free methods of computation. Topics include review of special relativity, modern differential geometry, foundations of general relativity, laws of physics in the presence of a gravitational field, experimental tests of gravitation theories. At the level of Gravitation, by Misner. Physics 554 is a continuation of 553 that emphasizes applications to astrophysics and cosmology. Topics include relativistic stars, gravitational collapse and black holes, gravitational waves, cosmology.

## PHYS 561 Classical Electrodynamics

 Fall. 3 credits.Lecs, T R 8:30-9:55; sec. R 3:35-4:25. S. Teukolsky.

Maxwell's equations, electromagnetic potentials, electrodynamics of continuous media (selected topics), special relativity, radiation theory. At the level of Classical Electrodynamics, by Jackson.

## PHYS 562 Statistical Physics

Spring. 4 credits. Primarily for graduate students. Prerequisites: a good knowledge of quantum mechanics (at the level of Merzbacher), classical mechanics (at the level of Marion), and statistical mechanics (at the level of Reif).

Lecs, M W F 9:05-9:55. N. W. Ashcroft Macroscopic or thermodynamic concepts including the laws of thermodynamics, thermodynamic functions, thermodynamic stability, and the thermodynamics of phase equilibria. Microscopic concepts including $1-, 2-$, and N - particle quantum states; the micro-canonical, canonical and grandcanonical distributions; Bose-Einstein, FermiDirac and Boltzmann statistics; the densitymatrix. The microscopic-macroscopic connection. Applications include spin systems-the Ising and related models; strongly correlated fluids, and lattice-gases, including distribution and correlation functions, thermodynamic perturbation theory and introduction to critical phenomena; dense Fermi- and Bose- systems; linear response of quantal and classical systems; transport properties and the Boltzmann equation. At the level of Statistical Mechanics by Pathria or Statistical Mechanics by Huang, 2d edition.

## PHYS 572 Quantum Mechanics I

## Fall. 4 credits.

Lecs, fall, M W F 9:05-9:55. K. Gottfried. The formulation of quantum mechanics in terms of states and operators. Symmetries and the theory of angular momentum; stationary and time-dependent perturbation theory; Fermi's Golden Rule; variational methods, and the elements of scattering theory. At a level of Modern Quantum Mechanics by Sakurai,

Quantum Mechanics, by Merzbacher, and Quantum Mecbanics, by Landau and Lifshitz. Familiarity with elementary aspects of the Schroedinger equation, including its application to simple systems such as the hydrogen atom, is assumed.

## PHYS 574 Quantum Mechanics II

Spring. 4 credits. Prerequisite: Physics 572 Required of all Ph.D. majors in physics. Lecs, M W F 11:15-12:05. Staff. Discussion of various aspects of quantum mechanics, such as path integral formulation, collision theory, theory of spectra of atoms and molecules, theory of solids, second quantization, emission of radiation, relativistic quantum mechanics. At the level of Lectures on Quantum Mechanics, by Gordon Baym.

## PHYS 635 Solid-State Physics I

Fall. 3 credits. Prerequisites: A good undergraduate solid-state physics course, such as Physics 454.

Lecs, T R 11:40-12:55. A. Sievers. A survey of the basics of the physics of solids. Metals, crystal structures, electron and phonon states, semiconductors, some advanced topics. At the level of Solid State Pbysics, by
N. W. Ashcroft and N. D. Mermin.

## PHYS 636 Solid-State Physics II

Spring. 3 credits. Prerequisite: Physics 635
Lecs, T R 11:40-12:55. J. Sethna. A continuation of Physics 635; magnetism, superconductivity, broken symmetries, elementary excitations, and other topics in quantum condensed matter physics not covered in Solid State Physics by Ashcroft and Mermin, such as topological defects, superfluids, the quantum Hall effect, mesoscopic quantum transport theory, disordered systems, Anderson localization and other metalinsulator transitions.

## PHYS 645 High-Energy Particle Physics

 Fall. 3 credits.Lecs, M W F 10:10-11:00. D. G. Cassel. Introduction to the physics of baryons, mesons, and leptons. Strong, electromagnetic, and weak interactions. Relevance of symmetry laws to particle physics. Introduction to the quark model. At the level of Introduction to High Energy Pbysics, by Perkins.

## PHYS 646 High-Energy Particle Physics

Spring. 3 credits.
Lecs, T R 2:55-4:10. Staff.
Topics of current interest, such as high-energy electron and neutrino interactions, electron positron annihilation, and high-energy hadronic reactions, are surveyed. Lectures and reading material are at the level of Introduction to High Energy Pbysics, by Perkins.
Note: Only S-U grades will be given in courses numbered 650 or above.

## PHYS 651 Relativistic Quantum Field Theory I

Fall. 3 credits. S-U grades only. Lecs, M W F 11:15-12:05. T. Kinoshita. Topics to be covered include consequences of causality and Lorentz invariance, field quantization, perturbation theory, calculation of cross sections and decay rates, and an introduction to radiactive corrections and renormalization with applications to electromagnetic and weak interactions.

## PHYS 652 Relativistic Quantum Field

 Theory IISpring. 3 credits. S-U grades only. Lecs, T R 10:10-11:25. A. LeClair. This course is a continuation of Physics 651 and introduces more advanced methods and concepts in quantum field theory. Topics include functional integral methods, quantization of non-abelian gauge theories, the renormalization group, dispersion relations, and spontaneous symmetry breaking. Applications to the electroweak theory and quantum chromodynamics are emphasized.

## PHYS 653 Statistical Physics

Fall. 3 credits. Normally taken by graduate students in their second or later years. Prerequisites: Competence in the basic principles of quantum mechanics, statistical physics at the level of Physics 562, and thermodynamics. S-U grades only

Lecs, T R 2:55-4:10. J. Sethna. Survey of topics in modern statistical physics: Dynamical statistical physics (kinetic theory, Boltzmann equation, hydrodynamics); theory of simple fluids; scaling theories and the renormalization group; phase transitions in disordered systems; pattern formation in nonlinear systems, percolation theory

## PHYS 654 Theory of Many-Particle

 SystemsSpring. 3 credits. Prerequisites: Physics 562, $574,635,636$, and 653 . S-U grades only.

Lecs. W F 2:30-4. V. Ambegaokar.
Equilibrium and transport properties of microscopic systems of many particles studied at zero and finite temperatures. Formalisms such as thermodynamic Green's functions introduced and applied to such topics as normal and superconducting Fermi systems, superfluidity, magnetism, insulating crystals.
[PHYS 661 Advanced Topics in High Energy Particle Theory
Fall. 3 credits. Prerequisites: Physics 652. S-U grades only. Not offered 1994-95.

Lecs, T R 10:10-11:25. Staff
This course will present advanced topics of current research interest. Subject matter will vary from year to year. Some likely topics are two-dimensional conformal field theory with applications to string theory and condensed matter physics, applications of the electroweak theory, lattice guage theory, mathematical methods (e.g. group theory), perturbative quantum chromodynamics, anomalies and geometry, current algebra, heavy quark physics, heavy quark symmetry and phenomenological issues beyond the standard model.]

## PHYS 665 Topics in Theoretical

 Astrophysics (also Astronomy 699)Fall. 2 credits. S-U grades only.
Lecs, M 2:30-4. E. E. Salpeter.
An informal seminar meeting Mondays (and occasionally Wednesclays) for advanced graduate students in astronomy or physics.
Topic this year: Radiative Transfer and Stellar Atmospheres.

## PHYS 670 Instrumentation Seminar

Spring. 2 credits. S-U grades only Lecs T R 12:20-2:15. Staff.
Conception, design, and performance of innovative instrumentation in condensed matter and elementary particle physics.

PHYS 680 Computational Physics (also Astronomy 690)
Spring. 3 credits. S-U grades only. Prerequisites: The course assumes a good background in the standard "mathematical methods for physics," and the ability to write programs in any computer language. No previous knowledge of numerical analysis is assumed.

Lecs T R 10:10-11:25. S. Teukolsky. A course designed to familiarize students with numerical techniques for solving diverse problems in physics and related fields. The problems will be drawn from many different branches of physics, but the emphasis will be on common techniques of solution. Numerical techniques discussed in the course will include ordinary and partial differential equations, linear algebra and eigenvalue problems, Monte Carlo techniques, solving nonlinear equations, fast Fourier transforms, etc. In contrast to traditional numerical analysis courses, the flavor of the course will be "how-to," rather than theoretical. No theorems will be proved. Students will be expected to solve, both individually and in small teams, assigned numerical exercises. Text: Numerical Recipes: The Art of Scientific Computing, by Press, Teukolsky, Flannery, and Vetterling.

## PHYS 681-689 Special Topics

Offerings are announced each term. Typical topics are group theory, analyticity in particle physics, weak interactions, superfluids, stellar evolution, plasma physics, cosmic rays, general relativity, low-temperature physics, X-ray spectroscopy or diffraction, magnetic resonance, phase transitions, and the renormalization group.
PHYS 690 Independent Study in Physics Fall or spring. Variable to 4 credits. Students must advise department course coordinator, 121 Clark Hall, of faculty member responsible for grading their project. S-U grades only Special graduate study in some branch of physics, either theoretical or experimental, under the direction of any professional member of the staff.

## PORTUGUESE

See Modern Languages and Linguistics.

## PSYCHOLOGY

D. J. Bem, S. L. Bem, E. M. Blass, U. Bronfenbrenner, J. E. Cutting, R. B. Darlington, T. J. DeVoogd, D. A. Dunning,
H. M. Feinstein, D. J. Field, B. L. Finlay,
E. J. Gibson, T. D. Gilovich, D. F. Gudermuth, B. P. Halpern, A. M. Isen, R. E. Johnston,
F. C. Keil, K. L. Keil, B. Khurana,
C. L. Krumhansl, W. W. Lambert,
D. A. Levitsky, J. B. Maas, H. S. Porte,
D. T. Regan, E. A. Regan, T. A. Ryan,
J. A. Sereno, E. S. Spelke, B. J. Strupp

The major areas of psychology represented in the department are human experimental psychology, biopsychology, and personality and social psychology. These areas are very broadly defined, and the courses are quite diverse. Biopsychology includes such things as animal learning, neuropsychology, interactions between hormones, other biochemical processes, and behavior. Human experimental psychology includes such
courses as cognition, perception, memory, and psycholinguistics. Personality and social psychology is represented by courses and fieldwork in psychopathology as well as courses in social psychology and personality (such as Psychology and Law, Judgment and Decision Making, and Social Construction of Gender). In addition to the three major areas mentioned above, the department also emphasizes the statistical and logical analysis of psychological data and problems.

## The Major

Admission to the major is usually granted to any student in good standing in the college who has passed three or more psychology courses with grades of $\mathrm{C}+$ or better. Provisional admission requires two such courses To apply to the major and receive an adviser, a major application form may be obtained from the department office (211 Uris Hall).

Requirements for the major are:

1) a total of 40 credits in psychology (including prerequisites), from which students majoring in psychology are expected to choose, in consultation with their advisers, a range of courses that covers the basic processes in psychology (laboratory and/or field experience is recommended); and
2) demonstration of proficiency in statistics before the beginning of the senior year. (See the section below on the statistics requirement.)

Normally it is expected that all undergraduate psychology majors will take at least one course in each of the following three areas of psychology:

1) Human experimental psychology
2) Blopsychology
3) Social, personality, and abnormal psychology

The following classification of Department of Psychology offerings is intended to help students and their advisers choose courses that will ensure that such breadth is achieved.

1) Human experimental psychology: Psychology 205, 209, 214, 215, 305, 309, $311,316,342,412,414,415,417,418$, 419, 436, 492.
2) Biopsychology: Psychology 123, 276, $307,322,324,326,332,361,375,396$, 422, 424, 425, 429, 431, 492.
3) Social, personality, and abnormal psychology: Psychology 128, 265, 275, 277, 280, 325, 327, 328, 380, 402, 404, $450,467,468,481,489,491$
4) Other courses: Psychology 101, 199, $347,350,389,410,440,441,470,471$, $472,473,475,476,478,479,490$. The major adviser determines to which group, if any, these courses may be applied

With the permission of the adviser, courses in other departments may be accepted toward the major requirements.
Fieldwork, independent study, and teaching. The department requires students to observe the following limits on fieldwork, independent study, and teaching.

1) Undergraduates may not serve as teaching assistants for psychology courses if they are serving as teaching assistants for any other course during the same semester.
2) An undergraduate psychology major cannot apply more than 12 of the credits earned in independent study (including honors work) and fieldwork toward the 40 credits required by the major.
Statistics requirement. Proficiency in statistics can be demonstrated in any one of the several ways listed below.
3) Passing Psychology 350 .
4) Passing an approved course or course sequence in statistics in some other department at Cornell. The approved list of courses and sequences may change. It has usually included Sociology 301, and the sequences Education 352 and 353, and Industrial and Labor Relations 210 and 211. Requests that a particular course be added to this list may be made to Professor Gilovich.
5) Passing a course or course sequence in statistics at some other college, university, or college-level summer school. The course or sequence must be equivalent to at least 6 semester credits. The description of the course from the college catalog and the title and author of the textbook used must be submitted to Professor Gilovich for approval.
6) Passing an exemption examination. This examination can be given at virtually any time during the academic year if the student gives notice at least one week before. Students who have completed a theoretical statistics course in a department of mathematics or engineering and who wish to demonstrate competence in applied statistics usually find this option the easiest. Students planning this option should discuss it in advance with Professor Gilovich.

Concentration in biopsychology. Psychology majors interested in psychology as a biological science can elect to specialize in biopsychology. Students in this concentration must meet all of the general requirements for the major in psychology and must also demonstrate a solid background in biology; the physical sciences, including at least introductory chemistry; and mathematics. Students will design with their advisers an integrated program in biopsychology built around courses on physiological, chemical, anatomical, and ecological determinants of human and nonhuman behavior offered by the Department of Psychology. Additional courses in physiology, anatomy, biochemistry, neurochemistry, neurobiology, and behavioral biology may be designated as part of the psychology major after consultation between the student and his or her biopsychology adviser.

Concentration in personality and social psychology. This concentration is offered in cooperation with the Department of Sociology. Psychology majors who wish to specialize in social psychology are expected to meet the general requirements set by their department, including statistics. To ensure a solid interdisciplinary grounding, students in the concentration will be permitted to include some major courses in sociology and related fields. Advisers will assist students in the selection of a coherent set of courses from social organization, cultural anthropology, experimental psychology, social methodology, and several aspects of personality and social psychology. Seniors in the concentration may
elect advanced and graduate seminars, with the permission of the instructor.
Undergraduate honors program. The honors program is designed for those exceptionally able students who wish to pursue an intensive and independent program of research in psychology. Successful participation in this program serves as evidence of the student's facility in the two most important skills of an academic psychologist: the capacity to acquire and integrate a substantial body of theoretical and factual material and the ability to engage in creative research activity. All qualified students planning on a graduate education in psychology or other academic fields should consider the honors program seriously. The program offers most students the closest contact and consultation with faculty that they will receive during their time at Cornell.
The core of the honors program is a research project that the student carries out in close collaboration with a faculty member in the field of psychology. It is assumed that most students will do so while enrolled in
Psychology 470 (Undergraduate Research in Psychology). A written report of the research is to be given to the chair of the honors committee (currently Professor Field) toward the end of the last semester of the student's senior year. An oral defense of the thesis is then given before a committee of three faculty members, and the student presents his or her work in a public forum. Final honors standing (summa cum laude, magna cum laude, cum laude) is indicated on the student's diploma. The T. A. Ryan Award, accompanied by a cash prize, is awarded to the student who conducts the best honors project in a given year.
A student may formally apply to the honors program at any time during the senior year provided that she or he is actively engaged in independent research. However, students must do so by the second week of November. Applications should be given to Professor Field and should be made directly by the student.

## Distribution Requirement

The distribution requirement in the social sciences is satisfied by any two courses in psychology with the exception of Psychology 123, 276, 307, 322, 324, 326, 332, 350, 361, $396,422,425,429,470,471,472,473,475$, $476,479,491,492$.

## Courses

PSYCH 101 Introduction to Psychology: The Frontieqrs of Psychological Inquiry
Fall. 3 credits. Students may not receive credit for both Psychology 101 and Education 110. Students who would like to take a discussion seminar should also enroll in Psychology 103.

MW F 10:10. J. B. Maas. Prelims:
7:30 p.m., Sept. 27, Nov. 1.
The study of human behavior. Topics include brain functioning and mind control, psychophysiology of sleep and dreaming, psychological testing, perception, learning, cognition, memory, language, motivation, personality, abnormal behavior, psychotherapy, social psychology, and other aspects of applied psychology. Emphasis is on developing skills to critically evaluate claims made about human behavior.

## PSYCH 103 Introductory Psychology Seminars

Fall. 1 credit. Limited to 400 students. Prerequisite: concurrent enrollment in Psychology 101

Hours to be arranged; 32 different time options. J. B. Maas and staff. A weekly seminar that may be taken in addition to Psychology 101 to provide an indepth exploration of selected areas in the field of psychology. Involves extensive discussion and a term paper related to the seminar topic. Choice of seminar topics and meeting times will be available at the second lecture of Psychology 101.

## PSYCH 111 Freshman Writing Seminar:

 Perspectives in PsychologyFall and spring. 3 credits. Limited to 17 students.

M W F 11:15. J. Beale.
Psychological theories do not develop in a vacuum. The lives of 'great people' in any field are just as chaotic and unpredictable as are our own individual lives. By looking at specific figures in the history of psychology, their backgrounds and cultural settings, we will attempt to develop a deeper understanding of the dynamic social contexts in which our views are formed. In readings and discussion this seminar will focus on social figures and events that have shaped our conceptions of our world(s) and lives. Beginning with early theoretical perspectives (e.g., Freud; Jung), we will work our way into more contemporary perspectives, such as sexuality, prejudice, sub-culture, drug use, etc.

## PSYCH 113 Freshman Writing Seminar:

 Reproductive Decision Making in the 90sSpring. 3 credits. Limited to 17 students. T R 11:40-12:55. R. O'Brien McElwee. The art and science of human reproduction is more complex in the 1990s than ever before. Modern technology and changing family and social systems afford nontraditional options for the bearing and rearing of children, and Americans are struggling with practical as well as ethical repercussions. In this seminar we will explore baby-making at the turn of the millennium. Some specific topics will be historical changes in the composition of the family, the decision-making processes involved in becoming a parent, the effects of parenthood on marriage, nontraditional families, and ethical issues in modern technology. We will gain understanding of these topics through class discussions, essays, and research papers

## PSYCH 115 Freshman Wrlting Seminar: What Do Animals Tell us about Ourselves?

Fall. 3 credits. Limited to 17 students. T R 1:25-2:40. D. Gudermuth.
The course will involve reading (and occasionally viewing films) about various aspects of research conducted with nonhuman animals that seem to relate rather directly to human behavior. We will discuss this relationship in class-is it valid? in what way?-and students will choose specific positions and write essays that clearly outline their arguments and opinions on the covered topics. Examples of planned topics include comparing learned helplessness in animals to human depression, ape language learning and tool use to that of humans, and various social interactions such as parenting, competition, and altruism.

## PSYCH 123 Introduction to

 BiopsychologyFall. 3 credits. No prerequisites. Can be used to satisfy the psychology major breadth requirement and as an altemative prerequisite for upper-level biopsychology courses. Students who would like to take a discussion demonstration seminar should also enroll in Psych 125; a one hour per week one-credit section.

M W F 10:10. E. A. Regan.
An introduction to psychology from a biological perspective, including both evolutionary and physiological approaches to behavior. Topics include the structure, function, and development of the nervous system, genetic and biochemical models of behavior, hormones and behavior, biological bases of learning, cognition, communication, and language, and the ecology and evolution of social organization and social development

## PSYCH 125 Introductory to

 Biopsychology SeminarsFall. 1 credit. 2 sections with a maximum of 16 students in each. Prerequisite: concurrent enrollment in Psychology 123.

Hours to be arranged. D. F. Gudermuth. A weekly seminar that may be taken in addition to Psychology 123 to allow and encourage "hands-on" involvement with some of the course material, including interactive computer programs and use of models to get a clearer picture of basic neuroanatomy, visits to the laboratories of biopsychology faculty, films, reading, writing, and discussion of course material. Involves several small assignments equivalent to a 10 -page paper

## PSYCH 128 Introduction to Psychology: Personality and Social Behavior

 Summer only. 3 credits.M-F 11:30-12:45 plus another time to be arranged. Staff.
Personality: the behavioral similarities and differences among people and how they develop; Freudian, learning, and humanistic theories of personality; research in personality; and personality assessment through testing. Social behavior: how people behave in interactions with others; attitudes, persuasion, attraction, aggression, and conformity. How personality and social behavior influence each other and cause many interesting social and psychological phenomena.

## [PSYCH 199 Sports Psychology

Summer only. 3 credits. Not offered summer 1994.

M-F 11:30-12:45. Staff.
Research and theory in sports psychology Combines clinical psychology, social psychology, exercise physiology, and biochemistry. Aggression, stress, drug abuse, injury and injury rehabilitation, youth sports, and the importance of winning. Fieldwork experiences in exercise physiology and exercise testing, biofeedback, and current intervention strategies.]
Introductory courses in cognitive psychology. Each of the following four courses $(205,209,214,215)$ provides an introduction to a major area of study within cognitive psychology. These courses are independent of one another, and none has any prerequisites. Students may take any one of the courses or any combination of them (including all four). Courses may be taken in any order or simultaneously

## PSYCH 205 Perception

Spring. 3 credits. Open to first-year students. Graduate students, see Psychology 605.

T R 2:55-4:10. J. E. Cutting. One of four introductory courses in cognitive psychology. Basic perceptual concepts and phenomena are discussed with emphasis on stimulus variables and sensory mechanisms. All sensory modalities are considered. Visual and auditory perception are discussed in detail.

## PSYCH 209 Developmental Psychology

Spring. 4 credits. Graduate students, see Psychology 709.

T R 11:40-12:55; sec to be arranged
F. C. Keil.

One of four introductory courses in cognition and perception. A comprehensive introduction to current thinking and research in developmental psychology that approaches problems primarily from a cognitive perspective. The course focuses on the development of perception, action, cognition, emotion, personality, social understanding, language, and moral reasoning

## [PSYCH 214 Issues in Cognitive

Psychology
Fall. 3 credits. Sophomore standing required. Limited to 125 students. Graduate students, see Psychology 614. Not offered 1994-95.

## M W F 1:25. Staff.

Various approaches to the study of cognition will be discussed. Basic concepts in how humans process different kinds of information such as visual, auditory, and symbolic will be introduced. These concepts will then be used to explore topics such as attention and consciousness, concept formation and representation, memory processes and systems, imagery and cognitive maps, problem solving and reasoning, judgment and choice, language acquisition and comprehension, intelligence and creativity, and social cognition.]

## PSYCH 215 Psycholinguistics

Fall. 3 or 4 credits ( 4 -credit option involves term paper). Graduate students, see Psychology 715.

M W F 11:15. J. A. Sereno.
One of four introductory courses in cognitive psychology. Introduction to the psychological study of language. Covers basic linguistic theory and contemporary research into language comprehension, production, and acquisition.

## [PSYCH 265 Psychology and Law

Fall. 3 credits. Prerequisite: an introductory psychology course. Not offered 1994-95.

M W F 1:25. D. A. Dunning.
This course examines the implications of psychological theory and methods for law and the criminal justice system. We concentrate on psychological research on legal topics (e.g., confession, eyewitness testimony, jury decision making, homicide, aggression, the prison system), social issues (e.g., death penalty, affirmative action), as well as on psychologists as participants in the legal system (e.g., assessing insanity and dangerousness and for expert testimony).]

PSYCH 275 Introduction to Personality Psychology
Fall. 3 credits. Prerequisite: an introductory psychology course.

T R 10:10-11:25. D. J. Bem
An introduction to research and theory in personality psychology, emphasizing
contemporary approaches. Topics include the dynamics, structure, and assessment of personality as well as personality development and change. Biological and sociocultural influences on personality are also considered.

## [PSYCH 276 Motivation (also Nutritional Science 276)

Spring. 3 credits. Graduate students, see Psychology 676/Nutritional Science 676. Not offered 1994-95.

T R 10:10-11:25. E. M. Blass.
The course surveys traditional and contemporary approaches to motivational behavior from Aristotle to Freud to Skinner to Lorenz. It also draws upon field studies, laboratory analyses, clinical cases and developmental stages to establish a scientific basis for motivation analysis. Normal and pathological feedings will serve as a target behavior.]

## PSYCH 277 Social Construction of

 Gender (also Women's Studies 277)Spring. 3 credits. Limited to 400 students.
T R 2:55-4:10. S. L. Bem.
This course addresses the very broad question of how an individual's gender and sexuality are constructed. Although some attention is given to biological perspectives, the course emphasizes the social-psychological processes by which the culture transforms male and female newborns into "masculine" and "feminine" adults. In addition to being quite interdisciplinary, the course is also oriented to questioning the "naturalness" of not only masculinity and femininity, but exclusive heterosexuality as well. Among some of the specialized topics discussed are psychological androgyny, equalitarian relationships, genderliberated child-rearing, the male-centeredness of the workworld, female sexuality, sexual harassment, and homophobia.

## PSYCH 280 Introduction to Social Psychology

Spring. 3 credits. Prerequisite: an introductory psychology course.

T R 10:10-11:25. D. T. Regan.
An introduction to research and theory in social psychology. Topics include processing of social information; social influence, persuasion, and attitude change; social interaction and group phenomena. The application of social psychological knowledge to current events will also be discussed.

## PSYCH 305 Visual Perception

Fall. 4 credits. Limited to 20 students. Prerequisite: Psychology 205 or permission of instructor.

M W F 10:10. J. E. Cutting.
A detailed examination of theories and processes in visual perception. Topics will include the perception of color, form, and motion; perceptual constancies; adaptation; pattern perception; and photography, television, and film.

## [PSYCH 307 Chemosensory Perception

Fall. 3 or 4 credits; the optional (or fourth) credit is for an independent laboratory project. Registration for the 4 -credit option requires permission of the instructor; students will read, analyze, and discuss difficult original literature in the areas covered. Graduate students, see Psychology 607. Not offered 1994-95.

T R 9:05. B. P. Halpern.
An examination of basic theory, data, and processes for perception of the chemosensory environment. After a very brief (about two weeks) lecture survey of the anatomy and
physiology of human taste and olfaction, the remainder of the course uses the Socratic method, in which the instructor asks questions of the students, to cover topics such as chemosensory psychophysics, saliva, chemosensory bases for the tastes of foods, taste-smell interactions, chemosensory function in neonates and in the aged, temporal aspects of tasting, sweetness, effects of pollution of the chemosensory environment, and interactions between body state and chemosensory stimuli. At the level of Smell and Taste in Health and Disease, edited by T. V. Getchell et al., Sensory Science Theory and Applications in Foods, edited by H. T. Lawless and B. Klein; Sensory Analysis of Foods, 2nd edition, edited by J. R. Piggott.]

## [PSYCH 309 Development of Perception

 and RepresentationFall. 3 credits. Prerequisite: Psychology 205, 209,214 , or 305 , or permission of instructor. Graduate students, see Psychology 609. Not offered 1994-95.

T R 2:55-4:10. E. S. Spelke.
An introduction to theories and research on the origins and development of knowledge of the immediately surrounding world. The course focuses on knowledge of the world as an arrangement in space and time, knowledge of the world as a space that can be encountered through multiple sensory modes, knowledge of the world as a place that can be acted upon, and organization of the world into meaningful objects and events.]

## PSYCH 311 Introduction to Human Learning and Memory

Fall. 3 credits. Limited to 40 students. Some familiarity with statistical methods and experimental design and with the study of cognition is desirable. Graduate students, see Psychology 611.

T R 12:20-1:10. E. S. Spelke.
This course offers an overview of experimental findings and theoretical issues in the study of human learning and memory. Coverage includes topics such as the nature of memory, various memory systems, coding and retrieval processes, practice and habit acquisition, organization for learning and memory, interference and forgetting, models of learning and memory, memory dysfunction and its relation to normal memory.

## PSYCH 316 Auditory Perception

Fall. 3 or 4 credits; the 4 -credit option involves a laboratory project or paper. Prerequisite: Psychology 205, 209, 214, or 215 (other psychology, linguistics, or biology courses could serve as prerequisite with permission of the instructor). Limited to 30 students. Graduate students, see Psychology 716.

T R 10:10-11:25. C. L. Krumhansl. Basic approaches to the perception of auditory information, with special consideration of complex patterns such as speech, music, and environmental sounds.

## PSYCH 322 Hormones and Behavior (also BIONB 322)

Spring. 3 or 4 credits; the 4 -credit option involves a one-hour section once a week in which students will be expected to read original papers in the field and participate in discussion. Limited to juniors and seniors; open to sophomores only by permission. Prerequisites: BIONB 221 or 222 or one year of introductory biology plus a course in psychology. S-U grades optional. Graduate students, see Psychology 722.

M W F 11:15. D. F. Gudermuth. Following a review of the neural and endocrine systems, this course connects endocrine physiology to specific behaviors observed in various species, including humans. Although the relationship between sexual physiology and behavior is strongly emphasized, the lectures also describe hormonal contributions to parental behavior, aggression, stress, learning and memory, homeostasis and biological rhythms. Topics for the discussion sections are chosen by the students within the context of hormonal influences on behavior.

## PSYCH 324 Biopsychology Laboratory

 (also BIONB 324)Fall. 4 credits. Limited to 20 juniors and seniors. Prerequisites: Psychology 123 or BIONB 221 or 222 , and permission of instructor.

TR 1:25-4:25. T. J. DeVoogd Experiments designed to provide research experience in animal behavior (including learning) and its neural and hormonal mechanisms. A variety of techniques, species, and behavior patterns are included.

## PSYCH 325 Psychopathology

Fall. 4 credits. Prerequisite: 2 courses in psychology

M W F 11:15; sec to be arranged.
K. L. Keil.

This course examines the nature and symptoms of the major forms of psychopathology. Etiological factors are studied from a variety of different perspectives, e.g.,
psychological, biological and socio-cultural.
Treatment approaches to psychopathology are covered in weekly discussion sections.
PSYCH 326 Evolution of Human Behavior
Fall. 4 credits. Prerequisite: Psychology 123, or an introductory biology course, or an introductory anthropology course. Graduate students, see Psychology 626.

T R 2:55-4:10. R. E. Johnston. A broad comparative approach to the behavior of animals and humans with special emphasis on the evolution of human behavior. Topics covered will vary but will include some of the following: human evolution, evolutionary and sociobiological theory, animal communication, nonverbal communication, language, cognitive capacities, social behavior and organization, cooperation and altruism, sexual behavior, mating and marriage systems, aggression, warfare.

## PSYCH 327 Fieldwork in

Psychopathology and the Helping Relationship
Fall, spring, 4 credits. Prerequisites: Psychology 225 or 325 , HDFS 370 or concurrent registration in 325 or HDFS 370 and permission of instructor. S-U grades only. Students do not enroll in advance for this course. Field placement assignments are made during the first two weeks of the semester. Students who have already taken Psychology 225, 325 or HDFS 370 must contact the instructor during the first week of the semester. Enrollment is limited by the fieldwork placements available. Fee, $\$ 25$ each semester.

T R 12:20-1:10. K. L. Keil.
This is a year-long lecture and discussion course. The year-long commitment is mandatory. Psychology 328 will be for students taking the course a second time. An " R " grade will be assigned in the fall semester,
and a S-U grade will only be assigned in the spring semester. An introductory fieldwork course for students currently enrolled in or who have taken Psychology 225, 325 or HDFS 370. Fieldwork placements include the school system, psychiatric institutions, halfway houses, and other mental health oriented facilities. In addition to fieldwork, weekly supervisory/seminar meetings are held to discuss fieldwork issues and assigned readings.

## PSYCH 328 Continuing Fieldwork in Psychopathology and the Helping Relationship

Fall, spring. 4 credits. Prerequisites
Psychology $225,325,327$, or HDFS 370 and permission of instructor. S-U grades only. May not be taken more than twice. Students do not enroll in advance for this course. Fee, $\$ 25$ each semester

T R 12:20-1:10. K. L. Keil and staff. Designed to allow students who have done fieldwork as part of Psychology 327 to continue their field placements or begin new field placements under supervision for academic credit. An "R" grade will be assigned in the fall semester, and a S-U grade will only be assigned in the spring semester.

PSYCH 332 Biopsychology of Learning and Memory (also BIONB 328)
Spring. 3 credits. Prerequisites: one year of biology and either a biopsychology class or BIONB 222. Graduate students, see Psychology 632.

M W F 11:15. 'T. J. DeVoogd. This course will survey the approaches that have been or are currently being used in order to understand the biological bases for learning and memory. Topics will include invertebrate, "simple system" approaches, imprinting, avian song learning, hippocampal and cerebellar function, and human pathology. Many of the readings will be from primary literature

## PSYCH 342 Human Perception:

## Applications to Computer Graphics,

 Art and Visual DisplayFall. 3 or 4 credits. The 4 -credit option involves a term paper. Prerequisite: Psychology 101 or permission of instructor. Psychology 205 strongly recommended. Graduate students, see Psychology 642.

T R 11:40-12:55. I). J. Field.
Our present technology allows us to transmit and display information over a variety of media. To make the most of these media, it is important to consider the limitations and abilities of the human observer. The course will consider a number of applied aspects of human perception with an emphasis on the display of visual information. Topics to be covered include: "Three-dimensional" display systems, color theory, spatial and temporal limitations of the visual systems, attempts at subliminal communication, and "visual" effects in film and television.

## PSYCH 347 Psychology of Visual Communications

Spring. 4 credits. Limited to 12 students. Prerequisites: Psychology 101 and permission of instructor.

R 10:10-12:05; lab to be arranged. J. B. Maas.

An exploration of theories of education, communication, perception, attitude, and behavior change as they relate to the effectiveness of visually based communication systems. Emphasis is on the use of photogra-
phy and computer graphics to deliver educational messages

## PSYCH 350 Statistics and Research Design

Fall. 4 credits. Prerequisite: a course in the behavioral sciences.

M W F 2:30. T. D. Gilovich
Acquaints the student with the elements of statistical description (measures of average, variation, correlation, etc.) and more important, develops an understanding of statistical inference. Emphasis is placed on those statistical methods of principal relevance to psychology and related behavioral sciences.
[PSYCH 361 Biopsychology of Normal and Abnormal Behavior (also Nutritional Sciences 361)
Fall. 3 credits. Prerequisites: an introductory neurobiology and behavior course, and an introductory psychology course, or permission of instructor. S-U grades optional. Juniors and seniors only. Not offered 1994-95.

M W F 10:10. B. J. Strupp.
A critical evaluation of factors thought to underlie normal and abnormal behavior and/ or cognitive functioning. Psychological, biological, and societal influences will be integrated. Topics include: (1) psychiatric disorders (e.g., depression, schizophrenia, eating disorders); (2) the psychobiology of learning, memory, and intelligence; (3) nutritional influences on behavior (sugar, food additives, malnutrition, dieting); (4) cognitive dysfunction (e.g., amnesia Alzheimer's disease); (5) psychoactive drugs (e.g., hallucinogens, stimulants), and (6) developmental exposure to environmental toxins and drugs of abuse.]

## PSYCH 375 Developmental

Psychobiology: Motivational Processes (also Nutritional Sciences 375)

Spring. 3 credits. Prerequisite: Psychology 276 or Nutritional Sciences 276. Graduate students, see l'sychology 675/Nutritional Sciences 675.

T R 10:10-11:25. E. M. Blass
This course focuses on maturational and experiential influences on motivational processes in animals and humans. Emphasis is placed on the mechanisms underlying mother-infant interactions, and the develop ment of feeding, drinking, and reproduction behaviors.

## PSYCH 380 Community Mental Health (also Muman Development and Family Studies 380)

Summer only. 3 or 4 credits ( 4 -credit option involves term paper)

M-F 9:30-12. Staff.
Basic concepts in the field of community mental health. Social models of mental illness, epidemiology, the role of culture and social class in mental illness, public attitudes, and civil liberties.

## [PSYCH 389 Reading Freud: Race,

Gender, and Psychoanalysis (also Comparative Literature 347, English 347, German Studies 347)
Spring. 3 credits. Not offered 1994-95
M 12:20-2:15. S. L. Gilman.
This course will trace the development of psychoanalytic theory and practice through a close reading of selected works of Sigmund Freud (beginning with the Studies in Hysteria and concluding with Moses and Monotheism) This course will provide a general introduction to the basic concepts of Freudian
psychoanalytic theory. Close attention will be paid to the cultural, scientific, as well as polemical literature on the ideas of race and gender in the late nineteenth century as one of the contexts in which psychoanalysis evolved. All of the primary readings are available in English.]
[PSYCH 391 Clinlcal Discussion Section
Spring. 1 credit. Prerequisite: must be concurrently enrolled in Psychology 389. Not offered 1994-95.

T 12:20-2:15. S. L. Gilman and visiting faculty from the Department of Psychiatry, CUMC
This optional discussion session will examine the clinical context and significance of psychoanalysis in the light of contemporary clinical practice. Depending on the faculty members collaborating on this section, the topics covered may include dream theory and analysis, transference and counter transference, gender-orientation, masochism. Students enrolled in this section must simultaneously be enrolled in the lecture course.]

## [PSYCH 396 Introduction to Sensory

 Systems (also BIONB 396)Spring. 3 or 4 credits ( 4 credits with term paper). Registration for the 4 -credit option requires permission of instructor. Prerequisites: an introductory course in biology or biopsychology, plus a second course in neurobiology or behavior or perception or cognition or biopsychology. Students will be expected to have elementary knowledge of perception, neurophysiology, behavior, and chemistry. No auditors. Offered alternate years. Graduate students, see Psychology 696. Not offered 1994-95.

M W F 10:10. B. P. Halpern.
The course will be taught using the Socratic method, in which the instructor asks questions of the students. Students read, analyze, and discuss in class difficult original literature dealing with both those characteristics of sensory systems that are common across living organisms and those sensory properties which represent adaptations of animals to particular habitats or environments. Classroom discussion can increase, but not decrease, a student's final grade. There are two preliminary exams and a final exam. The principles and limitations of major methods used to examine sensory systems will be considered. General principles of sensory systems, and auditory, visual, and somesthetic systems are covered. One aspect of each system (e.g. localization of objects in space by sound, color vision, thermoreception) will be selected for special attention. Two or more texthooks and a course packet of reproduced articles will be used. At the level of An Introduction to the Pbysiology of Hearing. 2nd edition by
J. O. Pickles; Hearing: Physiological

Acoustics, Neural Coding, and
Psychoacoustics, by W. L. Gulick,
G. A. Gescheider, and R. D. Frisina; The

Retina: An Approachable Part of the Brain, by
J. E. Dowling; Handbook of Physiology-Tbe

Nervous System. III. Sensory Processes, edited
by J. M. Brookhard and V. B. Mountcastle.]

## [PSYCH 402 Current Research on

 Psychopathology: DepressionSpring. 4 credits. Limited to 20 students
Prerequisite: Psychology 225 or 325 or HDFS 270. Not offered 1994-95.

W 1:25-4:25. K. L. Keil
Current research and theory on the nature and etiology of depression. Approaches from
various perspectives (biological, psychological, socio-cultural) are considered. Minimal attention to psychotherapy and
symptomatology.]

## PSYCH 404 Psychopathology and the

 FamilySpring. 4 credits. Limited to 20 students Prerequisite: Psychology 225 or 325 or HIDFS 270.

M 1:25-4:25. K. L. Keil.
This course will explore familial influences on the development of abnormal behavior. It will examine how psychological, biological, and cultural factors in a family might contribute to such disorders as anorexia nervosa, depression, sexual abuse, psychopathy, and psychosomatic illnesses. Emphasis will be placed on early childhood experiences in the family and their impact on the development of later psychopathology The course will also discuss how the evolution of family structures in more recent times (e.g., the rise in day care and divorce) influences the individual. Family therapy approaches and techniques will also be examined.

## PSYCH 410 Undergraduate Seminar in Psychology

Fall or spring. 2 credits. Written permission of section instructor required for registration. Nonmajors may be admitted, but psychology majors are given priority

Hours to be arranged. Staff.
Information on specific sections for each term, including instructor, prerequisites, and time and place, may be obtained from the Department of Psychology office, 211 Uris Hall.

## [PSYCH 412 Laboratory in Cognition and

 PerceptionSpring. 4 credits. Limited to 15 students Prerequisite: statistics and one course in cognition or perception is recommended. Graduate students, see Psychology 612. Not offered 1994-95.

T R 1:25-2:40. D. J. Field. A laboratory course is designed to introduce students to experimental methods in perception and cognitive psychology Stuclents will take part in a number of classic experiments and develop at least one independent project. Computers will be available and used in many of the experiments although computer literacy is not required. Projects will be selected from the areas of visual perception, pattern recognition, memory, and concept learning.]

## PSYCH 414 Comparative Cognition

Spring. 3 credits. Prerequisites: Psychology $205,209,214$, or permission of instructor. Graduate students, see Psychology 714.

T R 2:55-4:10. E. S. Spelke.
Studies of animal behavior, human development, and human pathology may shed light on the nature of knowledge and reasoning. This seminar will focus on knowledge and reasoning about space, time, number, physical objects, and persons. Questions will include: (1) How do such comparative studies of cognitive abilities vary across species: Are there ways of reasoning that are distinctly human? (2) Do humans and/or other animals reason in the same way about entities in different domains (e.g., numbers, physical objects, and persons)? (3) How do knowledge and reasoning change throughout
human development: Is knowledge enriched, or more radically restructured, as children grow and gain experience?

## [PSYCH 415 Concepts, Categories, and

 Word MeaningsFall. 4 credits. Prerequisites: Psychology 205, 209,214 , or 215 , or permission of instructor. Graduate students, see Psychology 615. Not offered 1994-95.

T 1:25-4:25. F. C. Keil.
A consideration of what types of categories are psychologically important, of how they are represented and used through concepts, and of how concept structure and semantic structure are interrelated. Different models of concept structure and categorization processes are evaluated, as are models of conceptual change and concept acquisition. Other topics include: relations between concepts and broader knowledge representation systems such as scripts, mental models, and intuitive theories; relative roles of associative information and beliefs in concept structure; categorization in other species;
neuropsychological studies of categorization; comparisons of categorization systems across cultures; and comparisons of concept structures across different types of categories.]

## PSYCH 417 The Origins of Thought and

 KnowledgeFall. 4 credits. Prerequisites: Psychology 205, 209,214 , or 215 , or permission of instructor. Graduate students, see Psychology 717. M 1:25-4:25. F. C. Keil.
An indepth analysis of current theories concerning the growth of thought and knowledge in childhood. Several controversies will be discussed in detail, including: Are mental abilities organized in local domains or modules that have their own patterns of development, or is cognitive development a more general process? Do comparative studies with other species and evolutionary models provide any useful insights into cognitive development in humans? Are there qualitative restructurings of thought and knowledge with development, or is the process more continuous in nature? What restrictions should these developmental considerations place on models of thought and knowledge in aclults?

## PSYCH 418 Psychology of Music

Spring. 3 or 4 credits, depending on whether student elects to do an independent project. Prerequisites: junior or senior standing with major in psychology or music and some background in both, or permission of instructor. Graduate students, see Psychology 618.

T R 10:10-11:25. C. L. Krumhansl. Detailed analysis of topics in the psychology of music, including theories of consonance, perception of tonal-harmonic structure, memory for music, and effects of musical training. Emphasis given to experimental methodologies.
PSYCH 419 Neural Networks Laboratory Spring. 4 credits. Prerequisites: at least one course in biology or biological psychology, one year of calculus, and permission of instructor. Limited to 15 students. Graduate students, see Psychology 619.

T R 2:55-4:10. D. J. Field
The course will take a hands-on approach to understanding the limitations and successful applications of neural networks to problems in cognitive and biological psychology. A variety of neural network architectures will be
discussed and explored using computer simulations. Applications of networks to perceptual recognition and representation will be emphasized. We will consider the class of problems that different networks can solve and consider the accuracy with which they model real nervous systems. Students will complete weekly lab reports and develop one independent project demonstrating the application of a neural network to a problem discussed in the course.

## PSYCH 422 Developmental

 BiopsychologyFall. 4 credits. Prerequisites: a course in introductory biology and a course in biopsychology or neurobiology (such as 1sychology 123 or BIONB 221). Graduate students, see Psychology 622.

M W F 9:05. B. L. Finlay.
We will discuss the relationship of the development and evolution of the brain to the development of behavior. Topics include how neurons are generated, find targets, and establish connections; the emergence of reflexive and complex behavior; how experience affects the developing brain; evolutionary perspectives on the development of perception, memory, and communication systems; and abnormal development.

## PSYCH 424 Neuroethology (also BIONB

 424)Spring. 3 credits. Prerequisites: BIONB 221 and 222. $\mathrm{S}-\mathrm{U}$ grades optional for graduate students only.

M W F 9:05. C. D. Hopkins.
From the 1950s to the 1970s, ethologists attempted to understand the mechanisms of animal behavior through the use of comparative methods, evolutionary analysis, careful observations of animals in their native habitats, and clever experimentation. Now, with the explosion of knowledge and techniques in the neurosciences, many of the ethologist's mechanisms are being explained in terms of neural systems. This course will review the current status of research in neuroethology, including: mechanisms of acoustic communication in insects and in vertebrates; echolocation in bats and sound localization in owls; electroreception and electrolocation; chemical communication; and visual processing. In addition, it will review studies of the neural systems involved in decision making, in initiating action, and in coordinating fixed acts. Assigned readings will include original articles from the scientific literature. A term paper/poster on neuroethology will be required.

## [PSYCH 425 Brain and Behavior

Fall. 3 or 4 credits ( 4 -credit option includes a discussion section and requires an additional paper). Prerequisites: a course in introductory biology and a course in biopsychology or neurobiology (such as Psychology 123 or BIONB 221). Graduate students, see Psychology 625. Not offered 1994-95.

M W F 9:05. B. L. Finlay.
We will study the relation between structure and function in the central nervous system. The importance of evolutionary and mechanistic approaches for understanding the human behavior and cognition will be stressed. The course will focus on issues in cognitive neuroscience: mechanisms of perception, particularly vision, and the neuropsychology of everyday acts involving complex cognitive skills such as recognition of individuals, navigation in the world, language, memory, and social interaction.]

PSYCH 429 Olfaction and Taste: Structure and Function (also BIONB 429)

Fall. 3 or 4 credits ( 4 -credit option requires a term paper or research project. The research project can, but does not need to, study nonhuman vertebrates). Preference given to junior and senior psychology and biology majors and graduate students. Prerequisite one 300-level course in biopsychology or equivalent. Graduate students, see Psychology 629. Not offered 1994-95

T R 9:05. B. P. Halpern
The structural and functional characteristics of olfaction and taste will be explored by reading and discussing current literature in these areas. Structure will be examined at the light levels of electron microscopes as well as at the molecular level. Function will be primarily neurophysiological and biochemical aspects. The emphasis will be on vertebrates, especially air-breathing vertebrates in the case of olfaction, but there will be some coverage of invertebrate forms. A textbook and a course packet of reproduced articles will be used. At the level of Smell and Taste in Health and Disease, edited by T. V. Getchell, R. L. Doty, L. M. Bartoshuk, and J. B. Snow The Neurobiology of Taste and Smell, edited by T. E. Finger and W. L. Silver.]

## PSYCH 431 Effects of Aging on Sensory and Perceptual Systems (also BIONB 431)

Fall. 3 or 4 credits; the optional (or fourth) credit involves a term paper. Prerequisites: an introductory course in biology or psychology, plus a second course in perception or neurobiology or cognition or psychology. No auditors. Limited to 25 students. Graduate students, see Psychology 631.

T R 10:10-11:25. B. P. Halpern. A literature-based examination of postmaturation changes in the perceptual, structural, and physiological characteristics of somesthetic, chemosensory, visual, and auditory systems. Emphasis will be on human data, with non-human information included when especially relevant. Current developments in human sensory prosthetic devices, and in regeneration of receptor structures, will be examined. Brief written statements (preferably by electronic mail) of questions and problems related to each set of assigned readings will be required at least one day in advance of each class meeting. This course will be taught using the Socratic Method, in which the instructor asks questions of the students. Students read, analyze, and discuss in class difficult original literature dealing with the subject matter of the course. Students are expected to come to each class having already done, and thought about, the assigned readings.

## PSYCH 436 Language Development (also Human Development and Family

 Studies 436 and Linguistics 436) Spring. 4 credits. Prerequisite: at least one course in developmental psychology, cognitive psychology, cognitive development, or linguistics. Open to undergraduates and graduate students. S-U grades optional. Offered alternate years. Graduate students should also enroll under HDFS 700 /Linguistics 700 (2 credits).T R 3:10-4:25. B. Lust.
This course surveys basic issues, methods, and research in the study of first language acquisition. Major theoretical positions in the field are considered in the light of experimental studies in first-language acquisition of
phonology, syntax, and semantics from infancy on. The fundamental linguistic issues of "universal grammar" and the biological foundations for acquisition are discussed, as are the issues of relations between language and thought. The acquisition of communication systems in nonhuman species such as chimpanzees is addressed, but major emphasis is on the child.

## PSYCH 440 Sleep and Dreaming

Fall. 4 credits. Prerequisites: junior or senior standing and at least Psychology 123 or BIONB 221-222. A second course in biopsychology or neurobiology is recommended. S-U grades optional. Graduate students, see Psychology 640.

> T R 11:40-12:55. H. S. Porte.

The first part of this course emphasizes the neurobiology of sleep. Topics include neural mechanisms of behavioral state change; the anatomy and physiology of the states and rhythms of sleep; theories of the evolution and plausible functions of sleep. Students will keep and analyze records of their own sleep patterns. The second part of the course emphasizes psychological experience in sleep. Topics include night terror and other experiences originating in non-REM sleep, and dreams originating in REM sleep. Students will examine the data of dreams-including their own-in light of what they have learned about the neurobiology of dreaming sleep They will evaluate dream theories from Freud's to Francis Crick's, and will consider whether dreaming is meaningful or meaningless, encrypted or transparent, better remembered or better forgotten.

## PSYCH 441 Laboratory in Sleep and Dreaming

Spring. 4 credits. Prerequisites: Psychology 440 or comparable preparation, and permission of the instructor during preregistration. Laboratory fee: \$35

W 7:30-10:00 p.m. H. S. Porte. Emphasizing the neurobiology of sleep state, the course introduces the laboratory study of human sleep and dreaming. Serving as both experimenter and subject, each student will learn the rationale and techniques of electroencephalography and other bioelectric measures of behavioral state. Using computerized data analysis, students will complete weekly laboratory reports and a collaborative term project. Sleep recordings will be done during the day or evening when possible. Occasional overnight recording sessions will follow the regular class meeting.

## PSYCH 450 The Lenses of Gender (also

 Women's Studies 450, Psychalogy 650, and Women's Studies 650)Fall. 4 credits. Permission of instructor.
Limited to 12 seniors and graduate students. No preregistration; interested students should attend the first class session. Graduate students, see Psychology/Women's Studies 650.

W 2:30-4:30. S. L. Bem.
This seminar analyzes the ideological, institutional, and psychological mechanisms that are responsible for the social reproduction of male power in Western-and especially American-culture. It is very interdisciplinary, covering material from biology, history, anthropology, law, sociology, psychology, psychiatry, philosophy, and feminist theory. Part 1 analyzes three important organizing principles or "cultural lenses" that have come to be embedded in the social institutions and the cultural discourses
of Western culture: (1) biological essentialism; (b) androcentrism; and (c) gender polarization (including the stigmatizing of homosexuality). Part 2 analyzes how the individuals living within the context of these lenses are transformed from being male or female newborns to being "masculine" and "feminine" adults-how, in other words, the culture's gender lenses are subtly transferred from the practices of the culture to the psyche of the individual. Part 3 considers possibilities for social and personal change.

## [PSYCH 467 Seminar: The Examined

Self-A Psychohistorical View Spring. 4 credits. Prerequisites: 9 credits of psychology including Psychology 225, 325 or equivalent, and permission of instructor before course enrollment. Not offered 1994-95.

T 2:30-4:25. Staff.
Based primarily on American autobiographies dating from the seventeenth century to the twentieth century, this seminar will explore the shifting interface between self and historical context. Students should be prepared to write and talk about their own lives as well as the historical figures selected for study.]

## [PSYCH 468 American Madness

Spring. 4 credits. Limited to 15 students Prerequisites: Psychology 225, 325 and permission of instructor. Not offered 1994-95 T 2:30-4:25. Staff
The seminar will be devoted to an analysis of insanity as a psychological and historical phenomenon. Selected writings by the mentally ill and their definers will be studied.]

## PSYCH 470 Undergraduate Research in

 PsychologyFall or spring. 1-4 credits. S-U grades optional. Written permission from the staff member who will supervise the work and assign the grade must be included with the course enrollment material. Students should enroll in the section listed for that staff member. A section list is available from the Department of Psychology

Hours to be arranged. Staff
Practice in planning, conducting, and reporting independent laboratory, field, and or library research.

## PSYCH 471 Advanced Undergraduate Research in Psychology

Fall or spring. 1-4 credits. S-U grades optional. Written permission of the staff member who will supervise the work and assign the grade must be included with the course enrollment material. Students should enroll in the section listed for that staff member. A section list is available from the Department of Psychology.

Hours to be arranged. Staff. Advanced experience in planning, conducting and reporting independent laboratory, field, and/or library research. One, and preferably two, semesters of Psychology 470 is required The research should be more independent and/or involve more demanding technical skills than that carried out in Psychology 470.

## PSYCH 472 Multiple Regression

Spring, weeks $1-7.2$ credits. Prerequisite one solid semester of introductory statistics Analysis of variance is helpful but not required.

M W F 10:10. R. B. Darlington Uses and pitfalls of multiple regression in causal analysis, path analysis, and prediction Emphasis on analyzing data collected under uncontrolled conditions. Includes colinearity,
indicator variables, sets, adjusted and shrunken $\mathrm{R}^{2}$, suppressors, hierarchical analysis, overcontrol, experimental design. Very little hand computation; uses MYSTAT computer program.

## PSYCH 473 General Linear Model

Spring, weeks 8-14. 2 credits. Prerequisite: Psychology 472 or equivalent

M W F 10:10. R. B. Darlington.
Includes multicategorical variables, corrections for multiple tests, diagnostic methods,
nonlinear relationships, interaction, main and simple effects, and basic power analysis.
Emphasizes MYSTAT and SYSTAT, briefly discusses SAS PROC REG and SAS PROC GLM.

## [PSYCH 475 Multivariate Analysis of Psychological Data

Fall. 2 credits. Prerequisite: Psychology 473 or permission of instructor. Not offered 1994-95

R 10:10-12:05. R. B. Darlington. Students vote on topics to cover, choosing among cluster analysis, multidimensional scaling, component analysis, factor analysis, MANOVA, canonical correlation, repeated measures, logistic regression, log-linear models, corrections for unreliability in regression, nesting, power analysis, influence analysis, and other topics. First class sketches all these topics before vote.]

## [PSYCH 476 Representation of Structure

 in DataFail. 3 credits. Prerequisites: one year of college mathematics (finite mathematics or calculus) and a course in the social sciences. Not offered 1994-95.

W 2:30-4:30. Staff.]

## PSYCH 478 Psychometric Theory

Fall. 2 credits. Prerequisite: Psychology 472 or permission of instructor.

M 2:30-4:25. R. B. Darlington.
Statistical methods relevant to the use, construction, and evaluation of psychological tests.

## [PSYCH 479 Multisample Secondary

 AnalysisFall, weeks 11-14. 1 credit. Prerequisite: Psychology 350 or equivalent. Not offered 1994-95.

T R 10:10-12:05. R. B. Darlington. Statistical methods for analyzing and integrating the results of many independent studies on related topics.]

PSYCH 481 Advanced Social Psychology Fall. 4 credits. Limited to 20 students, by application. Senior psychology majors have priority. Graduate students, see Psycholgoy 681.

T R 10:10-11:25. D. T. Regan. Selected topics in social psychology are examined in depth with an emphasis on the relationship between experimental research and the development of theory. Readings will be mostly primary sources. Among the theoretical approaches to social behavior we may discuss are social comparison theory, cognitive dissonance, attribution processes and social judgment, social exchange theory, dramaturgy and impression management, and biological perspectives.
PSYCH 489 Seminar: Selected Topics in Social Psychology and Personality Spring. 4 credits. Prerequisites: by application. Senior psychology majors have priority. Graduate students, see Psychology 689.

Hours to be arranged. D. J. Bem.

Currently, the topic of this seminar is the psychological, sociological, and cultural analysis of beliefs, attitudes, and ideologies.
[PSYCH 490 History and Systems of Psychology
Fall. 4 credits. Intended for juniors, seniors, and graduate students, majors and nonmajors. Prerequisites: at least three courses in psychology or related fields or permission of instructor. Not offered 1994-95.

W 2-4:30. Staff.I

## PSYCH 491 Research Methods in Psychology

Spring. 4 credits. Enrollment limited to 25 students. Recommended: permission of instructor, Psychology 350, experience in upper-division psychology courses, or graduate standing. Graduate students, see Psychology 691.

T R 10:10-11:25. D. A. Dunning. An intensive examination of the basic research methods used in social, personality, cognitive, and developmental psychology. The course will focus on designing and conducting experiments, i.e., how to turn vague theories into concrete and testable notions, evaluate studies, avoid common pitfalls, and, finally, remain ethical. Beyond learning methods of "correct" and rigorous experimentation, we will also discuss what makes a research study actually interesting. The course will, in addition, cover test construction, survey methods, and "quasi experiments." Students will concentrate on completing a small research project in which they conduct an experiment, interpret its data, and write up the results.

## PSYCH 492 Sensory Function (also

 BIONB 492)Spring. 3 credits. Prerequisite: a 300 -level course in biopsychology, or BIONB 222 or 311, or permission of the instructors. Students are expected to have a knowledge of elementary physics, chemistry, and behavior. S-U grades optional. Offered alternate years. Graduate students, see Psychology 692.

M W F 10:10. B. P. Halpem,
H. C. Howland.

This course covers classical topics in sensory function such as vision, hearing, touch and balance, as well as some more modern topics like sensory coding, location of stimulus sources in space, the development of sensory systems, and non-classical topics such as electroreception and internal chemoreceptors. Both human and nonhuman systems are discussed. In all cases the chemical, physical, and neurophysiological bases of sensory information are treated, and the processing of this information is followed into the central nervous system. At the level of The Senses, edited by Barlow and Mollon, and $A n$
Introduction to the Pbysiology of Hearing, 2nd edition, by lickles.

## Advanced Courses and Seminars

Advanced seminars are primarily for graduate students, but with the permission of the instructor they may be taken by qualified undergraduates. The selection of seminars to be offered each term is determined by the needs of the students.

A supplement describing these advanced seminars is available at the beginning of each semester and can be obtained from the department office. The following courses may be offered either term and carry 4 credits unless otherwise indicated.

PSYCH 502 Professional Writing in Psychology
PSYCH 510-511 Perception
PSYCH 512-514 Visual Perception
PSYCH 513 Learning
PSYCH 515 Motivation
PSYCH 517 Language and Thinking
PSYCH 518 Psycholinguistics

## PSYCH 519-520 Cognition

PSYCH 521 Psychobiology
PSYCH 522 Topics in Perception and Cognition
PSYCH 523 Hormones and Behavior
PSYCH 524 Sex Differences in Brain and Behavior (also BIONB 626)
Spring. 2 credits. Limited to 12 seniors and graduate students.

Hours to be arranged. T. DeVoogd. A survey of the newly discovered animal models for sex differences in the brain.
Topics include the role of steroids in brain development, whether hormones can modify the structure of the adult brain, and the consequences of such sex differences in anatomy for behavior.

## PSYCH 525 Mathematical Psychology

PSYCH 531 History of Psychology
PSYCH 535 Animal Behavior
PSYCH 541 Statistical Methods
PSYCH 543 Psychological Tests
PSYCH 544 Topics in Psychopathology and Personality
PSYCH 545 Methods In Social Psychology

PSYCH 547 Methods of Child Study
PSYCH 551 Distinguished Speakers
PSYCH 561 Human Development and Behavior

PSYCH 580 Experimental Social Psychology (also Sociology 580)

## PSYCH 591 Educational Psychology

PSYCH 595 Teaching of Psychology
PSYCH 596 Improvement of College Teaching

PSYCH 600 General Research Seminar
Fall or spring. No credit.

## PSYCH 605 Perception (also Psychology

 205)Spring. 4 credits.
T R 2:55-4:10. J. E. Cutting.
[PSYCH 607 Chemosensory Perception (also Paychology 307)
Fall. 4 credits. Not offered 1994-95. T R 9:05. B. P. Halpern.]
[PSYCH 609 Development of Perception (also Psychology 309)
Fall. 4 credits. Not offered 1994-95.
T R 2:55-4:10. E. S. Spelke.]

PSYCH 611 Introduction to Human Learning and Memory (also Psych 311)

Fall. 4 credits.
T R 12:20-1:10. E. S. Spelke.
[PSYCH 612 Laboratory in Cognition and Perception (also Psychology 412)
Spring. 4 credits. Not offered 1994-95. T R 1:25-2:40. D. J. Field.]
[PSYCH 613 Obesity and the Regulation of Body Weight (also Nutritional Sciences 315)
Spring. 3 credits. Limited to 30 students. Prerequisites: one course in psychology and one course in nutrition. Undergraduate students may register with permission of instructor. S-U grades optional. Offered alternate years. Not offered 1994-95.

T R 1:30-3. D. A. Levitsky.
This course is a multidisciplinary discussion of the causes, effects, and treatments of human obesity. Topics include the biopsychology of eating behavior, the genetics of obesity, the role of activity and energy metabolism, psychosocial determinants of obesity, anorexia nervosa, therapy and its effectiveness, and social discrimination.]

## [PSYCH 614 Issues in Cognitive

 Psychology (also Psychology 214)Fall. 4 credits. Not offered 1994-95.
M W F 1:25. Staff.]
[PSYCH 615 Concepts, Categories, and Word Meaning (also Psychology 415)
Fall. 4 credits. Not offered 1994-95.
T 1:25-4:25. F. C. Keil.]
PSYCH 618 Psychology of Music (also Psychology 418)
Spring. 4 credits.
T R 10:10-11:25. C. L. Krumhansl.
PSYCH 619 Neural Networks Laboratory (also Psychology 419)
Spring. 4 credits.
T R 2:55-4:10. D. J. Field.
PSYCH 622 Developmental Biopsychology (also Psychology 422)
Fall. 4 credits.
M W F 9:05. B. L. Finlay.
[PSYCH 625 Brain and Behavior (also Psychology 425)
Fall. 4 credits. Not offered 1994-95.
M W F 9:05. B. L. Finlay.]
PSYCH 626 Evolution of Human Behavior (also Psychology 326)
Fall. 4 credits.
T R 2:55-4:10. R. E. Johnston.
[PSYCH 629 Olfaction and Taste: Structure and Function (also Psychology 429 and BIONB 429)
Fall. 4 credits. Not offered 1994-95. T R 9:05. B. P. Halpern.]
PSYCH 631 Effects of Aging on Sensory and Perceptual Systems (also Psychology 431 and BIONB 421)
Fall. 4 credits.
T R 10:10-11:25. B. P. Halpern.
PSYCH 632 Biopsychology of Learning and Memory (also Psychology 332 and BIONB 328)
Spring. 4 credits.
M W F 11:15. T. J. DeVoogd.

PSYCH 640 Sleep and Dreaming (also Psychology 440)
Fall. 4 credits.
T R 11:40-12:55. H. Porte.
PSYCH 642 Human Perception: Applications to Computer Graphics, Art, and Visual Display (also Psychology 342)
Fall. 4 credits.
T R 11:40-12:55. D. J. Field.
PSYCH 650 The Lenses of Gender falso Psychology 450 and Women's Studies 450 and Women's Studies 650)

Fall. 4 credits.
W 2:30-4:30. S. L. Bem.

## PSYCH 675 Developmental

 Psychobiology: Motivational Processes (also Psychology 375, Nutritional Sciences 375 and Nutritional Sciences 675)Spring. 4 credits.
T R 10:10-11:25. E. M. Blass.
[PSYCH 676 Motivation (also Psychology 276, Nutritional Sciences 276, and Nutritional Sciences 676).
Spring. 4 credits. Not offered 1994-95 T R 10:10-11:25. E. M. Blass.]
PSYCH 681 Advanced Soclal Psychology (also Psychology 481)
Fall. 4 credits.
T R 10:10-11:25. D. T. Regan.
PSYCH 689 Seminar: Selected Topics in Social Psychology and Personality (also Psychology 489)
Spring. 4 credits.
Hours to be arranged. D. J. Bem.
PSYCH 691 Research Methods in Psychology (also Psychology 491)
Spring. 4 credits.

> T R 10:10-11:25. D. A. Dunning.

PSYCH 692 Sensory Function (also Psychology 492 and BIONB 492)
Spring. 4 credits.
MW F 10:10. B. P. Halpern,
H. C. Howland.
[PSYCH 696 Introduction to Sensory Systems (also Psychology 396 and BIONB 396)
Spring. 4 credits. Not offered 1994-95. M W F 10:10. B. P. Halpern.]
PSYCH 700 Research in Biopsychology
PSYCH 709 Developmental Psychology (also Psychology 209)
Spring. 4 credits.
T R 1:25-2:40. F. C. Keil.
PSYCH 710 Research in Human Experimental Psychology
PSYCH 714 Comparative Cognition (also Psychology 414)
Spring. 4 credits.
TR 2:55-4:10. E. S. Spelke.
PSYCH 715 Psycholinguistics (also Psychology 215)
Fall. 4 credits.
M W F J. A. Sereno.
PSYCH 716 Auditory Perception (also Psychology 316)
Fall. 4 credits.
T R 10:10-11:25. C. I. Krumhansl.

PSYCH 717 The Origins of Thought and Knowledge (also Psychology 417)
Fall. 4 credits.
M 1:25-4:25. F. C. Keil.
PSYCH 720 Research in Social Psychology and Personality
PSYCH 722 Hormones and Behavior (also Psychology 322 and BIONB 322)

Spring. 4 credits.
M W F 11:15. D. F. Gudermuth.
PSYCH 773-774 Proseminar in Cognitive Studies I and II (also Cognitive Studies 773/774, Philosophy 773/774, Linguistics 773/774, and Computer Science 773/774)
Fall: R. grade. Spring: S-U only. 4 credits.
T 1:25-2:40. Staff.
The Cognitive Studies Proseminar consists of two semesters of meetings with the graduate faculty in the field of Cognitive Studies. The proseminar will consist of a general introduction to the field of Cognitive Studies including an introduction to each of the major disciplines that make up the minor: i.e., computer science, linguistics, philosophy, and psychology. In each of these disciplines, faculty members from the field will introduce the theoretical and methodological issues that underlie the field and its relation to Cognitive Studies; in addition, they will introduce various labs in which active research is being conducted in their field at Cornell.
The proseminar will include suggestions from faculty in each field for further advanced interdisciplinary research that can be pursued at Cornell during a Cognitive Studies minor. It will conclude (end of second term) with individual student presentations in which students initiate a critique of some interdisciplinary research, after consultation with a faculty member of their choice.
Although suitable to entering graduate students, the proseminar is also open to graduate students beyond their first year. Advanced undergraduates with a Cognitive Studies concentration may also be admitted. This is a year-long lecture and discussion course. The year-long commitment is mandatory. An " $R$ " grade will be assigned in the fall semester, and a S-U grade only will be assigned in the spring semester.
PSYCH 775 Proseminar in Social Psychology I
Fall. 2 credits. Limited to 10 graduate students in social psychology.

Hours to be arranged. D. A. Dunning,
T. D. Gilovich, and D. T. Regan.

This is the first term of a year-long discussionseminar course intended to give graduate students an in-depth understanding of current research and theory in social psychology. The course will emphasize social cognition, but other topics, such as group dynamics, social influence, the social psychology of language, emotional experience, etc., will be covered.

## PSYCH 776 Proseminar in Social

 Psychology IISpring. 2 credits. Limited to 10 graduate students in social psychology.

Hours to be arranged. D. A. Dunning,
T. D. Gilovich, and D. T. Regan.

This is the second half of a year-long
discussion-seminar course intended to give graduate students an in-depth understanding of current research and theory in social psychology. The course will emphasize social
cognition, but other topics, such as group dynamics, social influence, the social psychology of language, emotional experience, etc., will be covered.

## PSYCH 900 Doctoral Thesis Research in Biopsychology

PSYCH 910 Doctoral Thesis Research in Human Experimental Psychology

PSYCH 920 Doctoral Thesis Research in Social Psychology and Personality

## Summer Session Courses

The following courses are also frequently offered in the summer session, though not necessarily by the same instructor as during the academic year. Not all of these courses will be offered in a particular summer. Information regarding these courses and additional summer session offerings in psychology is available from the department before the end of the fall semester.

PSYCH 101 Introduction to Psychology: The Frontiers of Psychological Inquiry

PSYCH 123 Introduction to Biopsychology
PSYCH 128 introduction to Psychology Personality and Social Behavior

PSYCH 199 Sports Psychology
PSYCH 265 Psychology and Law
PSYCH 280 Introduction to Social Psychology
PSYCH 281 Interpersonal Relations and Small Groups (also Sociology 281)

PSYCH 350 Statistics and Research Design
PSYCH 380 Community Mental Health

## RELIGIOUS STUDIES MAJOR

See "Special Programs and Interdisciplinary Studies."

## ROMANCE STUDIES

The Department of Romance Studies (Alice Colby-Hall, chair) offers courses in French literature, Italian literature, and Spanish literature. In addition, the department's program includes courses in the French and Spanish languages, French linguistics, semiotics, and in French, Italian, and Hispanic culture. Through its course offerings and opportunities for independent study, the department seeks to encourage study of the interactions of the Romance literatures among themselves, with other literatures, and with other fields of inquiry

## French

J. Béreaud (director of undergraduate studies), A. Berger, A. M. Colby-Hall, N. Furman,
D. I. Grossvogel, R. Klein, P. Lewis, K. Long, J. Ngate, A. Seznec, S. Tarrow, L. R. Waugh.

## The Major

The major in French is divided into three options: French area studies, French linguistics, and French literature. For a description of the linguistics option, see Modern Languages and Linguistics, French.

The area studies and literature options are described below.
While prospective majors should try to plan their programs as far ahead as possible, especially if they intend to study abroad, no student will be refused admission merely because of a late start. Students wishing to major in French area studies or French literature should consult the director of undergraduate studies of the Department of Romance Studies, Professor Jacques Béreaud.

## The Literature Option

The major in French, literature option, is designed to give students proficiency in the oral and written language, to acquaint them with French literature and culture, and to develop skills in literary analysis.

## Admission

To be admitted to the major, students should have completed French Literature 221-222 (formerly 201-202) and French Language 200, 203 or 205 plus 213 (formerly 204) or their equivalents by the end of their sophomore year.
For completion of the major, a student must:
(1) acquire a sound degree of competence in French language. This competence is demonstrated by the successful comple tion of French 311-312 or their equivalents, such as properly accredited study abroad or the passing of a special language test, the CASE examination.
(2) take six courses in French literature or civilization at the 300 level or above in addition to French 221-222. These courses, selected in consultation with the student's major adviser, will normally include at least one course from each of the three major periods of French literature: Medieval to Renaissance, the seventeenth and eighteenth centuries, and the nineteenth and twentieth centuries.
(3) take two connected courses in one of the following related areas; (a) French literature or linguistics, (b) general linguistics, history of language, psycholinguistics, (c) courses in comparative literature, history, history of art, music, or government which have a significant French component. Students who are double majors are exempted from this last requirement.

## The French Area Studies Option

Admission
To be admitted to the major, students should have completed French Literature 220 and French Language 200, 203 or 205 plus 213 (formerly 204) or their equivalents by the end of their sophomore year.

## For completion of the major, a student must.

(1) acquire a sound degree of competence in the French language. This competence is demonstrated by the successful completion of French 311-312 or their equivalents, such as properly accredited study abroad or the passing of a special language test, the CASE examination.
(2) take two courses in Romance Studies (literature or civilization)
3) take six courses (at least two of which must be at an advanced level) in areas of interest such as-but not limited toAfricana Studies, anthropology, comparative literature, economics, government, history, history of art, music, theater arts, women's studies.

## Administration of French Area Studies

After being admitted to the major by the director of undergraduate studies of the Department of Romance Studies, students will have an adviser in Romance Studies and another faculty member from their main area of interest. These two faculty members will constitute the committee that will help students design an academically coherent program and will supervise their progress toward graduation. A copy of each student's individual program will be given to the director of undergraduate studies for approval and safekeeping.

## Study Abroad in France

French majors or other interested students may study in France for one or two semesters during their junior year. Opting for one of several study-abroad plans recognized by the departments of Romance Studies and Modern Languages and Linguistics facilitates the transfer of credit. Information about these plans is available from the director of undergraduate studies.

Students must be Cornell undergraduates with a strong academic record. The minimum French preparation is the completion of French 213 (formerly 204) or its equivalent in advanced credit or placement by the Comell CASE examination. The taking of French 311 and/or 312 is, however, strongly recommended.

Students interested in studying in France are encouraged to consider the special benefits offered by EDUCO, the program in Paris cosponsored by Cornell and by Duke University. EDUCO offers advanced students a challenging course of study and the experience of total immersion in French life and culture in Paris. Participants in this program spend the year or the semester as fully matriculated students at the University of Paris and other institutions of higher learning in Paris, including the Institut d'Etudes Politiques (Sciences Po), selecting courses in many fields from the regular university course offerings. Students begin the academic year with an intensive three-week orientation into French history, society, and daily life. While it is possible to enroll in the EDUCO Program for one semester, admission will be given first to students planning to study abroad for the full academic year.
EDUCO maintains a center in Paris with appropriate support staff. The resident director, chosen annually from the Cornell and Duke faculties, teaches a special seminar each semester, provides academic advice, and helps ensure the quality of the courses. The center, which includes a small library and wordprocessing facilities, is regularly used by students for special tutorials, seminars, and lectures, as well as informal gatherings

## Study Abroad in Geneva

French majors or other students with a commitment to international experience may study abroad in Geneva, Switzerland. Geneva is an especially appropriate location for students with an interest in international affairs, as many international organizations maintain offices there, among them the United Nations, the Red Cross, the headquarters of the World Health Organization, the International Labor Organization, the International Telecommunications Union, the World Intellectual Property Organization, the European Nuclear Research Center, and the Ecumenical Center at Grand-Saconnex Cornell students enroll full-time in the University of Geneva, where they take yearlong courses in conjunction with Swiss students. They can choose classes in many subjects, including literature, economics and other social sciences, law, theology, psychol ogy, education, architecture, physical education, and French language, civilization, and history.
Interested students can participate in internships at international organizations, and qualified participants may be able to work under the direction of officials on research studies that are of mutual interest. Beginning in mid-July, the University of Geneva offers four consecutive three-week language and civilization summer courses which prepare students for the mandatory French exam given in early October. Cornell students must attend the last of these sessions, from mid-September to early October, but earlier sessions are recommended for students who need additional language preparation
Students must be Cornell undergraduates with a strong academic record. The minimum French preparation is the completion of French 213 (formerly 204) or its equivalent in advanced credit or placement by the Cornell CASE examination. The taking of French 311 and/or 312 is, however, strongly recommended. Students should plan to study abroad for the entire academic year. Students interested in the study abroad program in Geneva should contact the Comell Abroad office for further information.

Honors. The honors program encourages well-qualified students majoring in French literature or culture to do independent work in French outside the structure of courses The preparation of the senior honors essay, generally spread over two terms, provides a unique learning opportunity, since it allows for wide reading, and extensive rewriting to a degree not possible in the case of course papers.
No special seminars or courses are required of honors students, but they will have regular meetings with the faculty advisers who have agreed to supervise their work. They may receive course credit by enrolling in French 429-430, but these independent study courses must be taken in addition to the courses that meet the minimum requirements for the major. At the end of the senior year, each honors student is examined orally on the honors essay by a jury consisting of his or her faculty adviser and two other faculty members. The awarding of honors is determined by the student's grades in the major and the quality of the honors essay
Fees. Depending on the course, a small fee may be charged for copies of texts used in course work.

## Language and Linguistics

Most language courses and French linguistics courses are offered by Modern Languages and Linguistics. Further language courses (conversation and advanced level), French linguistics courses, and all literature courses are listed below
Note: Students placed in the 200-level courses bate the option of taking language and/or literature courses; see listings under "Literature" for descriptions of the literature courses, any of which may be taken concurrently with French Language 200, 203, 205, 213, 290, or 291 (offered by Modern Languages and Linguistics).

## FRROM 210 Intermediate French

 ConversationFall or spring. 2 credits. Limited to 15 students. Prerequisite: French 200, 203, 205 or equivalence ( $\mathrm{Q}^{+}$) on the Cornell Advanced Standing Examination (CASE).

Fall: T R 8:40-9:55 or 11:40-12:55; spring: T R 8:40-9:55 or 11:40-12:55. J. Béreaud and staff.
The course is based on audiovisual materials used in class; slides, video strips, and recordings will accompany extensive discussions. A modest amount of reading each week will aim at increasing students' active vocabulary

## FRROM 310 Advanced French

 ConversationSpring. 2 credits. Limited to 15 students. Priority given to seniors. Prerequisite: French 213 or Cornell Advanced Standing Examination (CASE) placement of $\mathrm{Q}^{++}$.

T R 8:40-9:55, 11:40-12:55, 1:25-2:40 or
2:55-4:10. J. Béreaud and staff.
This course is based on discussion of articles published in the French press. A few audio and video recordings and films will also be used.

## FRROM 311 Advanced French I

Fall. 4 credits. Limited to 15 students.
Prerequisite: French 213 or placement by the Cornell Advanced Standing Examination (CASE).

M W F 9:05, 10:10, or 12:20. J. Bereaud and staff.
All-skills course. Detailed study of presentday syntax. Reading and discussion of texts of cultural relevance. Weekly papers.

## FRROM 312 Advanced French II

Spring. 4 credits. Limited to 15 students.
Prerequisite: French 311 or placement by the Cornell Advanced Standing Examination (CASE).

M W F 10:10 or T R 10:10-11:25.
J. Bēreaud and staff.

Continuation of work done in French 311 Less emphasis will be placed on study of grammar, more on the examination of texts, on questions of style, and on oral presentation by students. Weekly papers.

## FRROM 400 Semiotics and Language (also Comparative Literature 410 and Linguistics 400)

Spring. 4 credits. Prerequisite: some background in an area relevant to semiotics: e.g., linguistics, philosophy, literature, psychology, or anthropology or permission of the instructor

To be arranged. L. Waugh. An introduction to the study of semiotics in general and to particular semiotic theories (for example, those of Saussure, Peirce, Barthes, Jakobson) and to language as a semiotic
system. The particular topics to be discussed will depend on the interests of the students.

## [FRROM 408 Linguistic Structure of French I (also Linguistics 408) <br> 4 credits. Not offered 1994-95.]

FRROM 410 Structure of French II (also French 410 Modern Languages and Linguistics)
Fall. 4 credits. Prerequisite: permission of instructor.

To be arranged. L. Waugh
A synchronic study and analysis of modern
French, with emphasis on semiotics, pragmatics, and discourse analysis.

## FRROM 424 Composition and Style

Fall. 4 credits. Conducted in French.
M W F 12:20. J. Béreaud.
Designed primarily for graduate students and for undergraduates who have advanced beyond the level of French 312, this course is intended to promote a more nuanced and analytic general competence in both written and oral expression. Students will be assigned weekly papers, either translations into French or pastiches, and will occasionally present oral explications de textes in class. Selected readings in the area of stylistics will be discussed, and their applicability to the analysis of some literary texts will be tested.

## [FRROM 604 Contemporary Theories of French Grammar <br> 4 credits. Not offered 1994-95.]

FRROM 700 French Linguistics (also French 700 Modern Languages and Linguistics)
Spring. Credit to be arranged.
To be arranged. L. Waugh. Seminars are offered according to faculty interest and student demand. Topics in recent years have included current theories in French phonology, current theories in French syntax, and semantics of French.

## Literature

FRLIT 220 Introduction to French and Francophone Culture
Fall or spring. 3 credits. Prerequisite: CPT score of 600 or French 200, 203 or 205.
Conducted in French.
Fall: M W F 10:10, S. Tarrow; spring: T R 11:40-12:25, J. Ngate.
This course serves as an introduction to
French Area Studies. It provides an overview of Francophone culture and society from 1945 to the present. Readings will include a selection of articles dealing with issues of current concern in France; works by French and Maghrebine or African writers; poetry or drama; two films will also be discussed.

## FRLIT 221 Introduction to French

 LiteratureFall, spring, or summer. 3 credits. Prerequisites: a CPT score of 630 or French 200, 203, 205 or 220 . French 221 serves as a prerequisite for all 300-level courses in French literature and is required (as well as French 222) of all French literature majors. Conducted in French.

Fall: M W F 9:05, 10:10, or T R 10:10-
11:25, R. Klein and staff; spring: M W F
$10: 10,11: 15$ or $12: 20$. K. Long and staff. This course, divided into small sections, is intended as a first introduction to French literature, the Modern Period. Texts have been chosen both as a function of their centrality to the traditional literary canon and
with an eye to its current transformation. The course focuses on different theoretical approaches to reading literature, without neglecting to situate works in their historical, philosophical, and cultural context. The course considers literary genres (poetry, drama, and the novel) as solicitations to read texts differently, at different speeds, with diverse claims on our attention. It is designed to satisfy a general interest in modern French literature as well as to prepare students to pursue a French major in literature. Readings will include works of authors such as Baudelaire, Cêsaire, Sartre, Proust, Duras

## FRLIT 222 Studies in French

## Literature

Fall or spring. 3 credits. Prerequisite: French 221 or a CPT achievement score of 650 or more (students who have not taken French 221 should obtain consent of instructor; those with scores in the $560-649$ range should see the description of French 200, 203, 205, and 220). Required of all literature majors, hut not limited to them. Conducted in French.

Fall: M W F 11:15 or M W F 12:20,
K. Long, and staff; spring: T R 2:55-4:10. P. Lewis.

Study of the classic literature of seventeenthcentury France (Corneille, Racine, Moliere, Mme de Lafayette, La Fontaine) and of eighteenth-century Enlightenment literature (Voltaire, Rousseau, Diderot, Beaumarchais) Special attention is paid to the ways in which these various works represent or deal with the shift from an aristocratic cultural code of values to modern bourgeois ideology and aesthetics. The course will also invite reflection on the status and centrality of female characters in classical and neo-classical French literature; it will attempt to trace the evolution from the classical tragic heroine, to more modern (but no less problematic) representations of women
[FRLIT 309 Mystery and the Mystery Story (also Comparative Literature 309)

4 credits. Not offered 1994-95.]

## [FRLIT 320 French Civilization

Spring. 4 credits. Prerequisite: proficiency in French (typically taken after French 204 or 213). Conducted in French. Not offered 1994-95.]

## [FRLIT 325 The Modern French Novel: A Form in Search of Itself

4 credits. Not offered 1994-95.]
[FRLIT 329 Francophone Caribbean Literature 당
4 credits. Not offered 1994-95.]
[FRLIT 330 Francophone African Literature (a)
4 credits. Not offered 1994-95.]
[FRLIT 331 Masterpieces of French Drama I: The Classical Era \#
4 credits. Not offered 1994-95.]
[FRLIT 332 Masterpieces of French Drama II: The Comic in the Modern Era
4 credits. Not offered 1994-95.]

## ERLIT 333 Contemporary French

 ThoughtFall. 4 credits. Conducted in French
T R 1:25-2:40. R. Klein
This course is intended to introduce students to the work of some of the major figures in contemporary French thought, in writing
published since the events of May 1968. A broad range of topics and issues will be examined, with particular attention to those that have transformed traditional academic disciplines. Books have been selected not only with a view to their theoretical interest, but with an eye to the quality of their French prose. Readings will include works by LéviStrauss, Foucault, Cixous, Irigaray, Kristeva, Derrida, Barthes, Baudrillard.
[FRLIT 334 The Novel as Masterwork \# 4 credits. Not offered 1994-95.]
[FRLIT 335 Romance to Revolution: The French Novel before 1789 \# 4 credits. Not offered 1994-95.]
[FRLIT 338 French Poetry from Its Origins to the Revolution of 1789 4 credits. Not offered 1994-95.]

FRLIT 354 New Prose, Old Prose \# Spring. 4 credits. Conducted in French. M W F 11:15. K. Long.
Readings in Rabelais and Montaigne (Gargantua, the Tiers Livre, and about two dozen Essais) and in ancient authors they drew on: Plato, Plutarch, Seneca, Lucian, and the poet Virgil. Greek and Latin texts will be read in French translation. Critical (or skeptical) consideration of such concepts and issues as literary influence, posterity and legacy, ideals of prose style, history, singing, telling stories, chatting, philosophizing, the psychopathology of everyday life, reading, and the "Renaissance."
[FRLIT 356 Lyon and Paris in the Sixteenth Century *
4 credits. Not offered 1994-95.]

## [359 Georges Simenon

4 credits. Not offered 1994-95.]

## FRLIT 365 The Contemporary Novel (also

 Comparative Literature 365)Fall. 4 credits. Lectures in English, discussion section in French

M W F 10:10. D. Grossvogel.
A continuation of Comparative Literature 363-364 (The European Novel). Probable authors: Barthes, Böll, Calvino, Camus, Cardinal, García Marquez, Hemingway, Kerouac, Kundera, Modiano, Nabokov, Robbe-Grillet, Sartre, Yourcenar. An attempt to interpret these authors through questions like those raised by Roland Barthes on writing, structuralism, criticism, the role of the reader, the death of the author, etc. Lectures and seminar discussions
[FRLIT 369 Comic Theater in the Seventeenth Century \#
4 credits. Not offered 1994-95.]
[FRLIT 370 Perspectives on the Age of Enlightenment: "Enlightened" Literature "
4 credits. Not offered 1994-95.]
[FRLIT 371 Eighteenth-Century Theater \#
4 credits. Not offered 1994-95.]
[FRLIT 375 Eighteenth-Century Novel \# 4 credits. Not offered 1994-95.]
[FRLIT 379 Victor Hugo-Romantic Movement \#
4 credits. Not offered 1994-95.]
[FRLIT 380 Introduction to French Romanticism \#
4 credits. Not offered 1994-95.]

FRLIT 381 Nineteenth-Century French Women Writers (also Women Studies 381)

Fall. 4 credits. Conducted in French. T R 11:40-12:55. A. Berger.
While situating the works read within their specific historical and literary context, this course will attempt to address two sets of questions: 1) How does the inscription of literature as a Public Institution within a phallocentric cultural order affect women authors' status and writing strategies? 2) To what extent and at what levels does being a woman inform or shape the text produced? In what ways is literary writing concerned with sexual difference? Writers will include Mme de Staël, George Sand, M. Desbordes-Valmore, Flora Tristan, and Rachilde.
[FRLIT 385 Gustave Flaubert *
4 credits. Not offered 1994-95.]
[FRLIT 388 The French Lyric Romance from Symbolism to Surrealism
4 credits. Prerequisite: French 221 or 222. Not offered 1994-95.]

## [FRLIT 389 French Romanticism (also

 Women's Studies 493) *4 credits. Prerequisite: French 222 or permission of instructor. Conducted in French. Not offered 1994-95.]
[FRLIT 390 Modern French Criticism 4 credits. Not offered 1994-95.]
[FRLIT 394 Sartre and Existentialism 4 credits. Not offered 1994-95.]

## FRLIT 395 Camus and His

 ContemporariesSpring. 4 credits. Prerequisite: French 221 or permission of instructor. Conducted in
French.
T R 10:10-11:25. S. Tarrow
The course will examine Camus's major works of fiction together with those of such writers as J. P. Sartre, Simone de Beauvoir, Albert Memmi, Emmanuel Roblés, Assia Djebar and others. In the context of a historical period marked by war-World War II, the Cold War the Algerian War of Independence-we will discuss some of the debates Camus sparked among his contemporaries in France and North Africa. Issues to be addressed include the question of political commitment in literature; colonialism, racism, and their expression in fiction; problems of identity, bilingualism, and audience.
[FRLIT 396 The Contemporary French Novel: 1950 to the Present 4 credits. Not offered 1994-95.]
[FRLIT 398 Six French Poets
4 credits. Not offered 1994-95.
[FRLIT 399 French Cinema: Semiotics of Realism, Surrealism, Existentialism
4 credits. Not offered 1994-95.]
[FRLIT 404 Cogito Ergo Sum: Thought and Existence from Descartes to Sartre (also Comparative Literature 404 and Romance Studies 404) *
4 credits. Not offered 1994-95.]

## FRLIT 406 Reading the Pleasures of the

 Listener (also Society for the Humanities 406 and Music 406) Fall. 4 credits.R 2:30-4:25. N. Furman.
From the lure of the Sirens to the failed cries of Echo, the voice has been a means of expression and seduction, a sign of recogni-
tion and loss. From elocution to auditory reception, vocalized fragments testify to the subjectivities of both speaker and listener and reveal the cultural inscription of gender, class sexuality, and ethnicity. The purpose of this course will be to understand the voice as a cultural perceptual phenomenon and to note its affective registers in literature, film, and the stage. Readings will include essays by linguists, musicologists, psychoanalysts, philosophers, film and literary critics, and opera fans, and the study of the vicissitudes of the story of Carmen as it moves from literary text to the operatic stage and onto the silver screen

FRLIT 417 Cultural Transformation and Conflict in the Caribbean from Slavery to the Present (also Society for the Humanities 417)
Spring. 3 credits. Limited to 17 students. To be arranged. R. D. E. Burton. Using historical, anthropological, sociological, and literary materials, this course is intended to introduce students to the main issues in contemporary Caribbean studies. Taking the study of slavery as its starting-point, it will examine the processes of cultural creation, transformation and conflict in the Caribbean with particular emphasis on the following areas and issues: slavery and the culture of resistance; language in the Caribbean; AfroCariblean religions (principally vodun and Rastafarianism); male and female culture 'spheres' in the Caribbean; the place of 'East Indians' in the Caribbean; 'Africanist' and 'creolization' theories of Caribbean culture; theories of identity in the contemporary Caribbean (Négritude, Antillanité, Créolité, etc.); literature and identity in the Caribbean (Brathwaite, Walcott, Césaire, Glissant). The course will focus on the Anglophone and Francophone Caribbean with reference, where appropriate, to the Hispanophone Caribbean.

## [FRLIT 418 The Polemics of Gender in Early Modern Europe (also Society for the Humanities 418) \#

3 credits. Not offered 1994-95.

## FRLIT 419-420 Special Topics in French

 Literature419, fall; 420, spring. $2-4$ credits each term. I'rerequisite: permission of instructor Staff.
Guided independent study of special topics.
[FRLIT 422 Three Ages of Theater (also Comparative Literature 422)
4 credits. Not offered 1994-95]

## FRLIT 426 May '68 and Its

 ConsequencesSpring. 4 credits. Prerequisite: French 220, 221 or 222 or French 311 or 320.

T R 1:25-2:40. J. Bëreaud
The course will first study the students' revolt of May 1968 in France, placing it in its national and international political and ideological context. It will then try to trace the changes brought about by the spirit of May '68 in some areas of French society, especially youth and education. Finally, it will lead to a reflection on current ideologies and the change from modernism to postmodernism.

FRLIT 429-430 Honors Work in French
429, fall; 430, spring. 8 credits year-long course, R grade fall semester, letter grade spring semester, with permission of the adviser. Open to juniors and seniors. Consult the director of the honors program.
R. Klein.
[FRLIT 435 Césaire et Lautrèamont 4 credits. Not offered 1994-95.]
[FRLIT 436 Francophone African Fiction (also French 636) ©
4 credits. Not offered 1994-95.]
[FRLIT 438 La Poésie de la Négritude (also French 638) 당
4 credits. Not offered 1994-95.
FRLIT 439 Oral and Written Traditions in Africa ©
Spring. 4 credits.
T 2:30-4:25. J. Ngate.
Organized around but not limited to two major African epics, Soundjata and Chaka, this course will enable us to investigate the nature the validity, and the implications of many francophone African writers' claims to being modern versions of the griots of the oral tradition. (Reading knowledge of French recommended)
[FRLIT 440 African Cityscapes: Urbanization and Its Literary Representations |also Comparative Literature 440) 훙
4 credits. Not offered 1994-95.]
[FRLIT 447 Medieval Literature \#
4 credits. Prerequisite: French 221 or permission of instructor. First term not prerequisite to the second. Conducted in English. Not offered 1994-95.]

FRLIT 448 Medieval Literature \#
Fall. 4 credits. Prerequisite: French 221 or permission of instructor. Conducted in English

M W F 9:05. A. Colby-Hall
French 448 deals with the romance and the lyric. Facility in reading Old French and appreciation of these two major genres are the primary goals of this course.
[FRLIT 449 Love and Hate in the Late Middle Ages \#
4 credits. Not offered 1994-95.]
[FRLIT 452 Theatre in Sixteenth-Century France \#
4 credits. Not offered 1994-95.]
[FRLIT 453 Masterpieces of French Renaissance Prose \#
4 credits. Not offered 1994-95.]
[FRLIT 454 Montaigne *
4 credits. Not offered 1994-95.]
[FRLIT 455 Rabelais \#
4 credits. Conducted in French. Not offered 1994-95.]

## [FRLIT 456 Diverse Poetries in Sixteenth-Century France \#

4 credits. Not offered 1994-95.]

## FRLIT 458 Baroque Poetry in

 France (also French Literature 658) \#Spring. 4 credits. Conducted in French. M 2:30-4:25. K. Long
Through the works of Theodore Agrippa d'Aubigné, Theophile de Viau, Saint-Amant, and others, we will explore the social and aesthetic reasons for the genesis and
development of such a revolutionary mode of writing. What is the place of such a movement in French cultural history; in particular, how does this movement confront political and religious issues? How do these poets situate themselves in relation to libertin philosophy? What is the place of violence and horror in baroque aesthetics and ideology? We will explore how baroque writers develop a new poetics to cope with such issues

## [FRLIT 459 Petrarchism and the Lyric Experience in France (also French 659) \#

4 credits. Not offered 1994-95.]
[FRLIT 460 The Moralist Tradition (also French 660) \#
4 credits. Not offered 1994-95.]
[FRLIT 461 The Theater of Molière \# 4 credits. Not offered 1994-95.]
[FRLIT 462 Racine
4 credits. Not offered 1994-95.]
FRLIT 463 The Evolution of Tragedy in Seventeenth-Century France
Fall. 4 credits. Conducted in French. W 2:30-4:25. P. Lewis.
The primary axis of this inquiry will be comparison of major tragedies in the theater of Corneille (Le Cid, Horace, Cinna, Polyeucte) to major tragedies in the theater of Racine (Andromaque, Britannicus, Iphigénie, Pbèdre). Its theoretical horizon will be derived from a group of short texts by Corneille, Racine, d'Aubignac, Pascal, and Boileau that are relevant to the tragic genre and to the concept of the tragic. The views of other playwrights (Rotrou, Mairet, Moliére, Quinault) will also be considered.
[FRLIT 470 Perspectives on the Age of Enlightenment "
4 credits. Not offered 1994-95.]
[FRLIT 472 Theater of Eighteenth Century *
4 credits. Not offered 1994-95.]
[FRLIT 473 Diderot and the Enlightenment \#
4 credits. Not offered 1994-95.]
FRLIT 474 Libertines and License (also English 438)
Spring. 4 credits.
To be arranged. R. Parker The course will chart the progress of the libertine chiefly through a number of eighteenth- and early nineteenth-century Finglish and French plays, novels, poems, and graphic works, with particular interest in the aesthetic conventions and cultural contexts for representing intellectual, political, social, and erotic excess and transgression. Works (in translation where appropriate) by such as Moliëre, Richardson, Hogarth, Diderot, Schiller, Sade, "Monk" Lewis, Blake, Coleridge Hoffmann, and Byron.
[FRLIT 476 The Libertine Novel
4 credits. Conducted in French. Not offered 1994-95.]
[FRLIT 485 Reading Workshop: The Short Story
4 credits. Not offered 1994-95.]
[FRLIT 487 Rimbaud and the Question of Reading *
4 credits. Not offered 1994-95.]
[FRLIT 488 Baudelaire \#
4 credits. Not offered 1994-95.]
[FRLIT 490 The Roots of Modernism 4 credits. Not offered 1994-95.]

FRLIT 492 The Textual Sounds of Cultural Identities (also Society for the Humanities 419)
Spring. 4 credits
To be arranged. N. Furman Inscripted in the gaps of a literary text, in the space between what is written and what is read, between what is voiced and what is heard, one can detect traces of trauma and the imprints of ethnic and cultural identities. The aim of this course will be to listen to the expressions of cultural identities in crisis and study their articulations in the works of French writers: Prosper Mérimée, Jules Vallès, Céline, Becketr, Natalie Sarraute, Marguerite Duras, and Patrick Modiano.
[FRLIT 493 French Feminisms (also Women's Studies 493)
4 credits. Not offered 1994-95.]
[FRLIT 494 Surrealism
4 credits. Not offered 1994-95.]
[FRLIT 495 Existentialism
4 credits. Not offered 1994-95.]
[FRLIT 496 The Early Twentieth-Century French Novel (also Comparative Literature 496)
4 credits. Not offered 1994-95.]
[FRLIT 497 Poetry since Baudelaire
4 credits. Not offered 1994-95.]
[FRLIT 498 Dostoevsky, Mann, and Gide (also Comparative Literature 498)
4 credits. Not offered 1994-95.]
[FRLIT 499 Fiction and Film in France (also Comparative Literature 499) 4 credits. Not offered 1994-95.]
[FRLIT 596 Colette: Can She Be a Subject of Masculine Discussion in the ' $80 s$ ?
4 credits. Not offered 1994-95.]
FRLIT 606 Modern Postmodern (also Comparative Literature 608 and German 608)
Spring. 4 credits.
To be arranged. J. Monroe
What does the "post" of postmodernism represent? Is the relation berween modernism and postmodernism one of fundamental continuity? expanding difference? radical rupture? Addressing these and related questions through readings in a range of materials drawn from twentieth-century fiction, poetry, drama, film, theory, and philosophy, we will explore the explanatory power and limits of the terms "modern" and "postmodern" for attempts to understand our current cultural situation in the century's final decade. Exploring as well the way these terms may play themselves out as we move into the twenty-first century, we will consider the extent to which we may be said to be entering a new period, neither modern nor postmodern, that calls for new articulations, modes of action, and individual and collective self-definitions. All texts will be available in English.
[FRLIT 607 Proseminar: The
Interpretation of Texts
4 credits. Not offered 1994-95.]
[FRLIT 608 Proseminar
4 credits. Not offered 1994-95.]
[FRLIT 616 The Concept of Dramatic Tragedy in the Seventeenth and Eighteenth Centuries \#
4 credits. Not offered 1994-95.]

## FRLIT 620 Area Topics in Romance

 Linguistics (also Linguistics 620) Spring. 4 credits. Prerequisite: A reading knowledge of French.M W F 12:20. A. Colby-Hall.
Topic: Translation and linguistic and literary analysis of representative works of such Provençal (Occitan) troubadours as Guillaume IX, Marcabru, Cercamon, Jaufrē Rudel, Bernart de Ventadorn, Raimbaut d'Orange, the Comtessa de Dia, Giraut de Borneth, Arnaut Daniel, Bertran de Born, Peire Vidal, and Raimbaut de Vaqueiras. Some attention will also be given to the relevant vidas and razos, which are in prose.
[FRLIT 628 "Un coup de dés": Mallarmé and His Critics \#
4 credits. Not offered 1994-95.]
[FRLIT 629 History of the French Language (also French 401 Modern Languages)
4 credits. Not offered 1994-95.]
[FRLIT 636 Francophone African Fiction (also French 436)
4 credits. Not offered 1994-95.]
FRLIT 638 La Poésie de la Nègritude (also French 438) ©
4 credits. Not offered 1994-95.]

## FRLIT 639-640 Special Topics in French

 Literature639, fall; 640, spring. 4 credits each term. Staff.
Guided independent study for graduate students.
[FRLIT 644 Medieval Seminar: The Old French Epic
4 credits. Not offered 1994-95.]
[FRLIT 646 Medieval Seminar: Villon 4 credits. Not offered 1994-95.]
[FRLIT 648 Medieval Seminar: Le Roman de la Rose
4 credits. Not offered 1994-95.]

## [FRLIT 656 The Subliterary and the

 Nonliterary in Early Modern France 4 credits. Not offered 1994-95.]FRLIT 658 Baroque Poetry in France (also French 458) "
Spring. 4 credits. Conducted in French. M 2:30-4:25. K. Long.
See French 458 for description.
[FRLIT 659 Petrarchism and the Lyric Experience in France (also French 459) \#

4 credits. Not offered 1994-95.]
[FRLIT 660 The Moralist Tradition (also French 460) "
4 credits. Not offered 1994-95.]
[FRLIT 661 Racine and His Critics \# 4 credits. Not offered 1994-95.]
[FRLIT 662 Racine \#
4 credits. Not offered 1994-95.]
[FRLIT 663 La Fontaine and Perrault: Fables, Tales, and Narrative Traps \#
4 credits. Not offered 1994-95.]
[FRLIT 664 Seminar in Late SeventeenthCentury Literature *
4 credits. Not offered 1994-95.]
[FRLIT 665 The Emergence of Aesthetics 4 credits. Not offered 1994-95.]
[FRLIT 666 Seventeenth-Century Seminar: Moralities in Flction: The Classical Moment (also Comparative Literature 666] \#
4 credits. Not offered 1994-95.]
[FRLIT 669 Seventeenth-Century Seminar: Illusion and Representation
4 credits. Not offered 1994-95.]
FRLIT 673 Inventive Anthropologies of the French Enlightenment
Fall. 4 credits. Conducted in French.
T $2: 30-4: 25$. A. Berger.
Drawing in part on the development of natural history, in part on travel accounts and growing global communications, the French Enlightenment laid the theoretical basis for a modern, secular "general science of mankind." We will study the formation of the conceptual apparatus that still frames contemporary debates over cultural specificity and the idea of ethnic and/or political community. Special attention will be paid to the elaboration of modem notions of otherness, of diversity and its corollary, universality, as well as of dialectical notions of the individual and the community. We will read both essays and fiction featuring foreign encounters and ideal communities by Montesquieu, Voltaire,
Mercier, Diderot, Rousseau, and B. de SaintPierre.

## [FRLIT 676 The Libertine Novel

4 credits. Not offered 1994-95.]
[FRLIT 678 Self-Portraits of Poets and Poems in Nineteenth-Century Lyricism
4 credits. Not offered 1994-95.]
[FRLIT 679 Comedy and Philosophy in the French Enlightenment \# 4 credits. Not offered 1994-95.]
[FRLIT 680 Amours romantiques \# 4 credits. Not offered 1994-95.]
[FRLIT 683 The Appeal of the Exotic 4 credits. Not offered 1994-95.]
[FRLIT 685 Stendhal, Balzac, Flaubert (also Comparative Literature 610) * 4 credits. Not offered 1994-95.J
[FRLIT 686 Le regard et la voix 4 credits. Not offered 1994-95.]
[FRLIT 687 Poetry and the Threat of Modernity: The Case of Rimbaud \# 4 credits. Not offered 1994-95.

## [FRLIT 688 Gérard de Nerval *

4 credits. Not offered 1994-95.]
[FRLIT 689 Bohemians and Dandies 4 credits. Not offered 1994-95.]

FRLIT 690 Questioning the Page: Gide, Valéry, Sartre

## Fall. 4 credits.

M 2:30-4:25. D. Grossvogel.
These three authors, among the most influential of the twentieth century, both invented and contemplated aspects of their art. They were critics whose self-consciousness affected the form and the content of what they were writing, be it in their literary
judgments, philosophy, fiction, poetry, or drama. Likely reading: Gide: L lmmoraliste Les Faux-Monnayeurs, Le Journal des FauxMonnayeurs, Thésée, Valéry: Eupalinos ou l'architecte, L'Ame et la danse, Le Cimetiere marin, Sartre: L'Existentialisme est un bumanisme, Qu'est-ce que la littêrature? L'Idiot de la famille, Huis-clos, La Nausée.
[FRLIT 691 Laughter
4 credits. Not offered 1994-95.J
[FRLIT 692 Sartre and Genet
4 credits. Not offered 1994-95.]

## [FRLIT 693 Nineteenth-Century Seminar \#

4 credits. Not offered 1994-95.]
[FRLIT 694 Surrealism
4 credits. Not offered 1994-95.]

## [FRLIT 695 Theorizing Films (also English 703)

4 credits. Not offered 1994-95.]
[FRLIT 696 Proust and Mystery
4 credits. Not offered 1994-95.]
[FRLIT 697 Philosophy of Money (also Anthropology 625)
4 credits. Not offered 1994-95.1

## FRLIT 698 Oulipo: Forms of Potential Literature <br> Spring. 4 credits.

W 2:30-4:25. R. Klein
"Oulipo (Ouvroir de litterature potentielle)" is a relatively small circle of writers and mathematicians that has been conducting radical experiments in literary form since its beginnings in 1960 . Its members are largely but not exclusively French and its meetings are held in Paris. Its aim is to identify and analyze older, even ancient experiments in literary form and to elaborate new forms or textual principles based on novel combinatories or permutations, including computer algorithms. Its founding and continuing members include some of the most prominent contemporary French writers, poets and novelists, including Raymond Queneau, Jacques Roubaud, Georges Perec, as well as the Italian writer Italo Calvino and the American Harry Mathews. The course aims principally to examine the theoretical claims of Oulipo, its hostility to surrealism, its voluntarism, its preference for formal constraints, its exemplification of rhetorical and literary procedures (lipograms, palindromes, rhopalic verse, holorhymes, Boolian haikus, etc.) At the same time, close readings of selected texts will be encouraged.

## [FRLIT 699 Anti-Semitism in Modern French Literature: Another Kind of Deconstruction

4 credits. Not offered 1994-95.]

## Italian

M. Migiel, director of undergraduate studies

## The Major

Students who wish to major in Italian should choose a faculty member to serve as a major adviser; the general plan and the details of the student's course of study will be worked out in consultation with the adviser. Italian majors are encouraged to take courses in related subjects such as history, art history, music, philosophy, anthropology, classics, linguistics, and other modern languages and literatures. While a major often occupies only the junior
and senior years, it is wise for students to seek faculty advice about the major as early as possible
Students who elect to major in Italian ordinarily should have completed Italian 201 by the end of their sophomore year. Exemptions can be made on the basis of an examination. Students majoring in Italian are expected to become conversant with a fair portion of the masterworks of Italian literature, to acquaint themselves with the outlines of Italian literary history, and to develop some skill in literary analysis. To this end, students will be expected to complete successfully 32 credits of Italian literature courses at the 300 level or higher, with papers to be written in Italian or English. Required courses for the major are Italian 303, 304, and 427. Italian 402, History of the Italian Language, and 403, Linguistic Structure of Italian, may be counted toward the 32 credits required for the major (an introductory linguistics course is a prerequisite of Italian 402 and 403).
Students majoring in Italian will also be expected to acquire competence in the hanclling of the language. That competence may be demonstrated by passing an oral and written examination to be arranged with the adviser
Italian majors will also be required to complete successfully two courses in related fields (for example, Italian history, Italian art history, literary theory).
Italian majors may study in Italy, generally during their junior year, under any of those study-abroad plans organized by American universities that allow the transfer of grades and credit, such as the Comell program in Rome.
The College of Architecture, Art, and Planning maintains a program open to all qualified students attending Cornell. The program is housed in the sixteenth-century P'alazzo Massimo, designed by the architect Baldassare Peruzzi, on the Corso Vittorio Emanuele, in the heart of Rome. Students may enroll for a semester in the fall or spring. Courses regularly taught at the Palazzo Massimo include Italian language (beginning and intermediate); Architecture 300, 401, 402, 500, 502, Design Studio; Architecture 338 and 399. Special Topics in Architectural History; Architecture 458, Special Projects in Design Communications; Architecture 367, Contemporary Italian Culture; Architecture 510, Thesis Introduction; Art 251, 311, 322, and 371; and History of Art 371, Renaissance and Baroque Art in Rome.
To be eligible. students must have completed the first two years of their curriculum requirements and be in good academic standing.

## Study Abroad in Italy

Cornell collaborates with six other major U.S. universities in sponsoring the Bologna Cooperative Studies Program (BCSP) for study abroad in Bologna, Italy. Through BCSP, advanced students can experience total immersion in Italian education and culture in a city that combines a long and rich history with modern prosperity and an active commercial and cultural life. Students attend classes at the University of Bologna, the oldest institution of higher leaming in Europe and one of Italy's most respected. The academic year begins in September and October with an
intensive six-week orientation in Bologna, which includes instruction in Italian grammar, conversation, and history. When the University of Bologna's academic year commences in November, students enroll in three regular, year-long courses with Italian students. In addition, students take one of the special one-semester BCSP courses in contemporary literature, art history, the European Community, and Italian language. University of Bologna faculty members teach the BCSP courses
Housing is arranged through the BCSP program office in Bologna. Students live in rented apartments near the university with other program participants and Italian roommates.
Students with advanced preparation in Italian who hold at least a " $B$ " average and have reached at least junior standing when program participation begins are eligible. The minimum Italian language preparation is the completion of Italian 204 or its equivalent. Students interested in the study abroad program in Bologna should consult the Cornell Abroad office ( 474 Uris) for further information.

## Literature

Most language courses and Italian linguistics courses are offered by Modern Languages and Linguistics. Advanced language courses and all literature courses are listed below.

## ITALL 201 Introduction to Italian

 LiteratureFall, Italian 201; spring, Italian 202. 3 credits. Prerequisite: permission of instructor. Conducted in Italian.

Fall: M W F 11:15; spring: M W F 10:10.
M. Migiel and staff.

In this course, students will develop their language skills in Italian by reading, discussing, and writing about short works of fiction (twentieth-century short stories in ITALL 201; twentieth-century novels in ITALL 202). ITALL 201 is not a prerequisite to ITALL 202.
[ITALL 303 Introduction to Medieval and Renaissance Literature \#
4 credits. Not offered 1994-95.]

## [ITALL 304 Introduction to Modern

 Italian Literature4 credits. Prerequisite: Italian 201 or permission of instructor. Not offered 1994-95.]
[ITALL 357 The Italian Renaissance
Epic \#
4 credits. Not offered 1994-95.]

## [ITALL 370 Eighteenth-Century

 Thought \#4 credits. Not offered 1994-95.]
[ITALL 381 Narrative of Verga, D'Annunzio, Svevo, and Pirandello (also Italian 681)
4 credits. Not offered 1994-95.]
[ITALL 390 Literature to Cinema
4 credits. Not offered 1994-95.]
ITALL 393 The Challenge of Contemporary Fiction (also Italian 693)

Spring. 4 credits.
T R 1:25-2:40. M. Migiel.
Topic for 1995: This course will focus on selected twentieth-century writers who offer unexpected models for reading. In particular
we will examine these writers' conception of the reader as notary to a silenced witness; as traveller on an interrupted joumey; as surprised detective; as victim of a plot; as player in an elusive game. Authors will include P. Levi, Banti, Calvino, Eco, Tabucchi, Borges, Cortazar. All works to be read in English; students who command the pertinent foreign languages may choose to read the books in the original.

## ITALL 409 Misogyny and Its Readers

 (aiso Italian 609 and Comparative Literature 449 and 649)Spring. 4 credits.
R 10:10-12:00. M. Migiel.
How do we know misogyny when we see it? Is it limited to the denunciation and denigration of women? Can the praise of women be misogynistic? Is it misogyny if the author places anti-women statements "in quotation marks"? Might some misogynistic works be just harmless literary jokes? How does awareness of historical context affect our reading of misogyny? How persuasive have women been in the defense of their sex? These are among the questions we will ask as we analyze Western discourses about women and identify the extent to which misogyny can be exposed as a form of misreading. Our readings will include classical, ecclesiastical, and medieval/Renaissance literary works as well as writings by contemporary feminist scholars of literature, history, and law. All works to be read in English; students who command the pertinent foreign languages may choose to read the texts in the original.

## ITALL 419-420 Special Topics in Italian

 Literature419, fall; 420, spring. 2-4 credits each term. lrerequisite: permission of instructor. M. Migiel.

Guided independent study of specific topics.
ITALL 425 The Christian Epic: Dante, Tasso, Milton (also Italian 625 and Comparative Literature 437/637)
Fall. 4 credits.
M W F 11:15. M. Migiel.
In the course of reading the Christian epics of Dante Alighieri (Divine Comedy) [1321], Tasso (Jerusalem Delivered [1581], and John Milton (Paradise Lost [1667], we shall focus on the following issues: how the Christian epic revises classical conceptions of the heroic individual, of community, of fate; how it uses poetry for theological aims; how it makes woman both central and marginal to the epic enterprise; how it reflects on the relation between secular politics and religious institutions. Reading knowledge of Italian is desirable, but the course will be conducted in English and students will be able to read Dante and Tasso in translation.
[ITALL 427 Dante: La Divina Commedia also Italian 627) \#
4 credits. Not offered 1994 -95.]

## ITALL 429-430 Monors in Italian

## Literature

429 fall; 430 , spring. 8 credits. Year-long course, R for fall semester; letter grade for spring semester. Limited to seniors. Prerequisite: permission of instructor.
M. Migiel.
[ITALL 437 Petrarch: Canzoniere \# 4 credits. Not offered 1994-95.]
[ITALL 440 Literature and Society in the Italian Renaissance \#
4 credits. Not offered 1994-95.]
[ITALL 445 Boccaccio (also Italian 645) \#

4 credits. Not offered 1994-95.]
[ITALL 448 Italian Lyric Poetry, 1255-1600: The Formation of the Canon \#
4 credits. Not offered 1994-95.]
[ITALL 458 Tasso (also Italian 658) \# 4 credits. Not offered 1994-95.]
[ITALL 472 Eighteenth-Century Italian Theater: From Melodrama to Tragedy (also Italian 672) \#
4 credits. Not offered 1994-95.1
[ITALL 474 Opera (also German 374/674 and Music 374/674) \#
4 crectits. Not offered 1994-95.1
[ITALL 485 The Nineteenth Century: Foscolo, Manzoni, Leopardi \# 4 credits. Not offered 1994-95.]
[ITALL 488 Giacomo Leopardi and Nineteenth-Century Poetry \# 4 credits. Not offered 1994-95.]
[ITALL 490 Modern Italian Women Writers (also Italian 690)
4 credits. Not offered 1994-95.]
[ITALL 495 Readings in Contemporary Italian Fiction
4 credits. Not offered 1994-95.]
[ITALL 497 Modern Italian Poetry: D'Annunzio to Montale
4 credits. Not offered 1994-95.]
[ITALL 557 The Italian Renaissance Epic (also Italian 357)
4 credits. Not offered 1994-95.]
ITALL 609 Misogyny and Its Readers (also Italian 409 and Comparative Literature 649)
Spring. 4 credits.
R 10:00-12:00. M. Migiel.
See Italian 409 for description.
ITALL 625 The Christian Epic: Dante, Tasso, Milton (also Italian 425 and Comparative Literature 437/637)
Fall. 4 credits.
M W F 11:15. M. Migiel.
See Italian 425 for description.
[ITALL 627 Dante: La Divina Commedia (also Italian 427) \#
4 credits. Not offered 1994-95.]
ITALL 639-640 Special Topics in Italian Literature
639, fall; 640, spring. 4 credits each term. M. Migiel.

ITALL 645 Boccaccio (also Italian 445) \#

4 credits. Not offered 1994-95.]
[ITALL 658 Tasso (also Italian 458)
4 credits. Not offered 1994-951

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ITALL 672 Eighteenth-Century Italian Theater: From Melodrama to Tragedy (also Italian 472) \# 4 credits. Not offered 1994-95.]
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[ITALL 681 Narrative of Verga, D'Annunzio, Svevo, and Pirandello (also Italian 381)
4 credits. Not offered 1994-95.]
[ITALL 690 Modern Italian Women
Writers (also Italian 490)
4 credits. Not offered 1994-95.]

## [ITALL 691 Theater of Verga,

D'Annunzio, Svevo, and Pirandello
4 credits. Not offered 1994-95.]

## ITALL 693 The Challenge of

 Contemporary Fiction (also Italian 393)Spring. 4 credits.
T R 1:25-2:40. M. Migiel.
See Italian 393 for description.

## Romance Studies

Literature
[ROMS 358 Literature and Religion: The
Nature of the Mystic Text falso Comparative Literature 358 and Religious Studies 358)
4 credits. Not offered 1994-95.]
[ROMS 361 The Culture of Early Renaissance (also Comparative Literature 361 and History of Art 350) \#

4 credits. Not offered 1994-95.]
[ROMS 404 Cogito Ergo Sum: Thought and Existence from Descartes to Sartre (also French 404 and Comparative Literature 404) \#
4 credits. Not offered 1994-95.]
ROMS 414 Heidegger: A Reading of Being and Time (also Romance Studies 614 and Comparative Literature 414/614
Fall. 4 credits.
T 2:30-4:25. C. Arroyo.
Heidegger's redefinition of phenomenology in response to Husserl and Scheler:
hermeneutics vs. intuition, Being-in-the-world vs. intentionality, etc. Hermeutics and the reading of literature; language and difference, Ab-bauen and deconstruction. Time and literary history. Author and text: Heidegger's membership in the Nazi party and the thrust of his philosophy.
[ROMS 431 Isms: General Concepts in Modern Cultural History (also
Comparative Literature 431)
4 credits. Not offered 1994-95.]
[ROMS 459 Being, God, Mind: Key Terms of Western Thought from Plato to Vico (also Comparative Literature 369) \#

4 credits. Not offered 1994-95.]
[ROMS 460 Biology and Theology: Approaches to the Origin of Life, Evolution, Heritage and Freedom, Sexuality and Death (also Comparative Literature 460)
4 credits. Not offered 1994-95.]
[ROMS 497 Heidegger on Language, Art, and Literature (also Comparative Literature 497)
4 credits. Not offered 1994-95.]

## Spanish

D. Castillo, director of undergraduate studies, C. Moron-Arroyo, L. Carrillo, U. J. DeWinter, J. W. Kronik, A. Monegal, J. Piedra, M. Stycos, J. Tittler

## The Major

The major is designed to give students proficiency in the oral and written language, to acquaint them with Hispanic culture, and to develop their skill in literary and linguistic analysis. Satisfactory completion of the major should enable students to meet language and literature requirements for teaching, to continue with graduate work in Spanish or other appropriate disciplines, or to satisfy standards for acceptance into the training programs of the government, social agencies, and business concerns. A Spanish major combined with another discipline may also allow a student to undertake preprofessional training for graduate study in law or medicine. Students interested in a Spanish major are encouraged to seek faculty advice as early as possible. For acceptance into the major, students should consult the director of undergraduate studies in Spanish-Professor Castillo-who will admit them to the major and choose an adviser from the Spanish faculty. Spanish majors will then work out a plan of study in consultation with their advisers. Previous training and interests as well as vocational goals will be taken into account when the student's program of courses is determined.
Spanish 201 and 204 or 212 (or equivalent) are prerequisite to entering the major in Spanish. All majors will normally include the following core courses in their programs:

1) Spanish 315-316-318
2) Spanish 311 and 312 (or equivalent)

Spanish majors have great flexibility in devising their programs of study and areas of concentration. Some typical options of the major are:

1) Spanish literature, for which the program of study normally includes at least 20 credits of Spanish literature beyond the core courses. Literature majors are strongly urged to include in their programs courses in all the major periods of Hispanic literature.
2) A combination of literature and linguistics.
3) Either of the above options with certain courses in other disciplines counted toward the major. Whichever option a student chooses, he or she is encouraged to enrich the major program by including a variery of courses from related fields or by combining Spanish with related fields such as history, philosophy, sociology, anthropology, art, music, Classics, English. comparative literature, and other foreign languages and literatures. The interdepartmental programs in Latin American Studies and Hispanic American Studies sponsor relevant courses in a variety of areas.
The J. G. White Prize and Scholarships are available annually to students who achieve excellence in Spanish.
For the major in Spanish linguistics, see Modern Languages and Linguistics-Spanish.
Study abroad in Spain. Comell and the University of Michigan cosponsor an academic
year in Spain program. Students enrolled in this program spend the first three weeks before the fall semester begins in a residential college located on the campus of the University of Madrid, where they take a course in Spanish language and contemporary society and take advantage of special lectures and field trips in Madrid and Castile. This course carries three credits. In early October the program moves to Seville, where students enroll in as many regular classes at the University of Seville as their language competency and general education permit. Their academic work is supplemented by courses designed explicitly for the program by Seville faculty, as well as a seminar regularly offered by the resident director, who is chosen from the faculty of either Cornell or Michigan. The special courses normally include history of art and architecture, Spanish composition and syntax, and modern Spanish history. In Seville students live with selected families or in a few cases in "colegios mayores." Cornell-Michigan also maintains a center in Seville, which is used by students for special seminars, tutorials, lectures, and informal gatherings.
Applicants are expected to have attained at least proficiency in Spanish prior to departure. Students are strongly encouraged to study abroad for the entire year rather than for one semester. Students interested in the study abroad program should consult with the Comell Abroad office for further information.
Honors. Honors in Spanish may be achieved by superior students who want to undertake guided independent reading and research in an area of their choice. Students in the senior year select a member of the Spanish faculty to supervise their work and direct the writing of their honors essays (see Spanish 429-430).
Fees. Depending on the course, a small fee may be charged for film use or for copies of texts for course work.

## Language

Most language courses and Spanish linguistic courses are offered by Modern Languages and Linguistics. Advanced language courses and all literature courses are listed below.
Note: Students placed in the 200-level courses have the option of taking language and/or literature courses; see listing under Spanish 201 for description of the literature course that may be taken concurrently with the 203-204 (offered by Modern Languages and Linguistics) or 211-212 language courses described belou.

## [SPANR 211 Intermediate Spanish

3 credits. Not offered 1994-95.]
[SPANR 212 Intermediate Spanish
3 credits. Not offered 1994-95.]

## SPANR 311 Advanced Composition and

## Conversation

Fall. 4 credits. Prerequisite: Spanish 204 or 212 or equivalent.

M W F 10:10, 12:20 or T R 10:10-11:25. M. Stycos and staff.

Advanced language skills, developed through reading, grammar review, and intensive practice in speaking, writing, and translation. Analysis of present-day Spanish usage in a wide variety of oral and written texts.

## SPANR 312 Advanced Composition and Conversation

Spring. 4 credits.

M W F 9:05, 11:15 or T R 1:25-2:40.
M. Stycos and staff.

Readings and class discussion will focus on the stylistic analysis of modern texts.
Increased emphasis, through weekly essays, on students' development of an effective Spanish prose style.

## Literature

## SPANL 201 Introduction to Hispanic Literature (:)

Fall or spring. 3 credits. Prerequisite: qualification in Spanish or permission of instructor. The course is divided into small sections and is conducted mainly in Spanish (Fulfills both the language proficiency requirement and, followed by a 300 -level Spanish literature course, the humanities distribution requirement. The literature course that normally follows Spanish 201 is either 315,316 , or 318 .)

Fall: M W F 9:05, 11:15, 12:20 or T R
10:10-11:25, M. Stycos and staff; spring:
M W F 9:05, 10:10, 11:15 or T R 8:40-9:55,
A. Monegal and staff.

An intermediate reading course designed to improve reading, writing, speaking, and comprehension skills in Spanish through the reading and discussion of contemporary literary works of various genres (narrative prose, drama, poetry) from Spain and Spanish America. Emphasis is placed on the development of fluency in reading and of critical and analytical abilities. The cultural, sociological, and aesthetic implications of texts by authors such as Borges, Cortazar, Fuentes, García Mârquez, García Lorca, and Cela are considered.

## SPANL 210 Introduction to Hispanic

 American Studies (also HASP 210)
## Fall. 3-4 credits.

## T R 1:25-2:15. L. Carrillo.

This course offers a survey of topics and issues relevant to the historical, social, cultural and educational development of Hispanic groups in the United States. Topics to be examined may include: Latinos and the environment; culture, language and multiculturalism; gender and society. Readings may include selections from historical travel journals, contemporary literature and relevant social science documents. Guest speakers from Cornell's staff as well as visiting writers and lecturers will broaden the scope of the course.
SPANL 241 Introduction to Chicano/a Poetry and Poetics (also English 241 and Hispanic American Studies Program 241)
Spring. 3 credits.
To be arranged. B. V. Olguin.
This survey course will introduce students to Chicano and Chicana poetry across time, space, and format. The course will examine verse at different periods in Chicano/a literature from the pre-Aztlan, and post-Aztlăn generations. The course places special emphasis on examining the links between poetics and politics, as well as the relationship between mimesis and resistance. Some of the poets examined include Teresa Acosta, Fray Angélico Chảvez, Abelardo "Lalo" Delgado, Ricardo Sảnchez, José Montoya, Rodolfo "Corky" Gonzalez, Alurista, Raûl Salinas, Judy A. Lucero, Evangelina Vigil-Pinon, Lorna Dee Cervantes, Gloria Anzaldua, Ana Castillo, Gary Soto, Alicia Gaspar de Alba, and
Francisco X. Alarcon.

SPANL 242 Introduction to U.S. Latino Literature (also Hispanic American Studies Program 240 and English 240)

Fall. 3 credits
M W F 12:20. B. V. Olguin.
It is estimated that by the year 2030, the Latino/a population in the United States will be the largest "minority group" in the country This course seeks to introduce students to the growing body of literature across time, space, and genre, by the various U.S. Latino/a communities. Of particular interest are the manner and degree to which Latino/a literatures converge and diverge as they explore issues of "race," ethnicity, gender, sexuality, class, nationality, and identity in general, at a time when the American profile is increasingly becoming "latinized." Authors examined include Juan Seguin, Alurista, Gloria Anzaldūa, Cherrie Moraga, Bernardo Vega, Miguel Piñero, Nicolasa Mohr, Cristina García, Oscar Hijuelos, Julia Alvarez, Rubén Martínez and several others.
[SPANL 300 Gender and Sexuality in Latin America (also Spanish Literature 400) @ \#
4 credits. Not offered 1994-95.]
[SPANL 313 Approaches to Spanish Culture
4 credits. Not offered 1994-95.]
[SPANL 314 Visual Vernacular (also HASP 312)
4 credits. Not offered 1994-95.
SPANL 315 Readings in Sixteenth- and Seventeenth-Century Hispanic Literature
Fall or spring. 4 credits. Prerequisite Spanish 201, four years of high school Spanish, or permission of instructor. Taught in Spanish. This course is not a prerequisite for Spanish 316 or 318

Fall: M W F 10:10; Spring: M W F 11:15 M. A. Garces.

Readings and discussion of representative texts of the period from both Spain and her colonies in the New World: Garcilaso de la Vega, Lazarillo de Tormes, San Juan de la Cruz, Cervantes, Lope de Vega, Calderon, and others.

SPANL 316 Readings in Modern Spanish Literature
Fall or spring. 4 credits. Prerequisite Spanish 201 or 4 years of high school Spanish or permission of instructor. Taught in Spanish.

Fall: M W F $10: 10$, D. Castillo or
T R 11:40-12:55, J. Kronik; spring: M W F 12:20, D. Castillo or T R 11:40-12:55, C. Arroyo.

Readings and discussion of representative texts from Spain from the romantic period to the present. Becquer, Galdos, Unamuno, García Lorca, Cela, and others

## [SPANL 317 Readings in Colonial

Spanish-American Literature 웅
4 credits. Not offered 1994-95.]

## SPANL 318 Readings in Spanish.

 American Literature 웅Fall or spring. 4 credits.
Fall: M W F 11:15, M. A. Garcès; spring: T R 11:40-12:55, M. Stycos or T R 1:25-2:40, J. Kronik
Readings and discussion of representative texts of the nineteenth and twentieth centuries from Spanish America: Dario, Borges,

Neruda, Paz, Cortazar, García Márquez, and others.

## [SPANL 323 Readings in Latin American

 Civilization 상4 credits. Not offered 1994-95
Note: The prerequisite for the following courses, unless otherwise indicated, is Spanish 315,316 , or 318 , or permission of instructor.]

SPANL 332 The Modern Drama in Spanish America (also Hispanic American Studies Program 332) (1) \#
Fall. 4 credits. Conducted in Spanish
T R 2:55-4:10. J. Kronik
Representative plays of recent decades from several Spanish American countries, including Puerto Rican and Latino writers, will be read closely and discussed. The tensions between vanguard experimentation and the expression of a Spanish American social identity will be studied in the light of modern currents such as the epic theater, the theater of the absurd, the theater of cruelty, and meta-theater.

## SPANL 333 The Spanish-American Short Story <br> Fall. 4 credits.

M W F 12:20. D. Castillo
A study of the short narrative genre as it has been practiced in Spanish America during the past two centuries. In addition to representatives of the Romantic, Realist, Modernist, and criollista schools, the course focuses on contemporary writers such as Arreola, Borges, Cortazar, Fuentes, García Marquez, and Rulfo.

SPANL 339 Muslims, Christians, and Jews in Islamic Spain: Literature and Society (also Near Eastern Studies 339, Jewish Studies 339, Comparative Literature 334, and Religious Studies 334) 랑
Fall. 3 credits. S-U option. This course can also be used to fulfill the requirements of the Medieval Studies Program. Taught every other year.

M W F 12:20. R. Brann.
Islamic Spain was a frontier society comprising six distinct ethnic-religious communities: Arabs, muualladun (native descendants of Iberian converts to Islam), Berbers, musta'ribun (Arabicized Christians), Jews and "Slavs" (European slave soldiers and their descendants). This course will examine the literature, culture, and society of al-Andalus (Islamic Spain) from the Umayyad emirate until the close of the Reconquista (711-1248). The development of Arabic (and Hebrew) poetry will be surveyed with focus on style, genres, and motifs. Conflicting theories of the origin and identity of Hispano-Arabic poetry and culture will also be considered.
[SPANL 345 Contemporary Spanish-
American Novel (i)
4 credits. Not offered 1994-95.]
[SPANL 346 Hispanic Caribbean Culture and Literature 숭
4 credits. Not offered 1994-95.]
[SPANL 347 Spanish America in Black and White
4 credits. Not offered 1994-95.]
[SPANL 351 Spanish Drama of the Golden Age \#
4 credits. Not offered 1994-95.]
SPANL 355 Cervantes: Don Quijote (also Spanish Literature 455) \#
Fall. 4 credits. Conducted in Spanish T R 11:40-12:55. C. Arroyo

Close reading of Cervantes' masterpiece.
Discussions will consider the text as a mirror of its historical moment, of its self-conscious author, and of its readers' search for meaning.

## [SPANL 356 Spanish Lyric Poetry of the Golden Age * <br> 4 credits. Not offered 1994-95.1

## [SPANL 368 The Birth of the Novel in Spain \#

4 credits. Not offered 1994-95.]
SPANL 375 Fictions of the Picaresque in Spain and America (also Spanish Literature 475) \#
Spring. 4 credits
M W F 12:20. M. A. Garcés
While one critic defines the picaresque novel as the autobiography of "an unscrupulous wretch," narrated as a sequence of episodes, others have described it as a drama of consciousness. By tracing the constitution and transformation of the genre that we call "picaresque," we will explore its relationships with such genres as travel literature, satiric poetry, romance, soldierly adventure, autobiography, and semidocumentary fictions, like some chronicles of the conquest. Such reading implies approaching the genre as a cultural text that probes the relation of self. role, and society in totally new ways. The study of Lazarillo de Tormes, Alemán, Cervantes, Quevedo, and Rodríquez Freyle, among others, will be supplemented with theoretical and critical readings.

## SPANL 376 Studies in the Spanish and

 Latin American EssaySpring. 4 credits. Prerequisite: a course taught in Spanish at the 300 level or equivalent.

T R 10:10-11:25. U. J. DeWinter A study of essays written in the first half of the twentieth century by Spanish and latin American intellectuals, many of whom maintained an active dialogue across the Atlantic. The course will emphasize their contributions to our understanding of cultural identity and civilization; the relation of language to culture; Don Ouijote as symbol of Spanish and Hispanic life and culture; education as guardian or representative of cultural values; and the development of the individual personality and human dignity Principal essayists include Unamuno, Ortega y Gasset, A. Castro, S. Ramos. J. Rodō, J. Vasconcelos, and O. Paz. Related essays by other writers. Readings, discussions, and papers. Course taught primarily in Spanish.

## [SPANL 377 The Contemporary Spanish Novel (Part 1)

4 credits. Not offered 1994-95.]

## SPANL 378 The Contemporary Spanish Novel (Part II)

Fall. 4 credits.
T R 10:10-11:25. A. Monegal A thematic and structural study of the Spanish novel of the last years of the Dictatorship and the beginning of the new democratic period, including works written by Juan and Luis Goytisolo, Benet, Marse, Martín Gaite, Espinosa, and Ortiz from the late 1960s to the present. The texts will be discussed in relation to the political transition and social transformation, and as experimental narrative models. Supplementary theoretical and critical readings
[SPANL 379 Luis Buñuel and the Cinema of Poetry (aiso Theatre Arts 389)
4 credits. Not offered 1994-95.1
[SPANL 380 Spain during the Franco Regime
4 credits. Not offered 1994-95.]
[SPANL 385 The Nineteenth-Century Spanish Novel (also Spanish Literature 485) \#
4 credits. Not offered 1994-95.]
[SPANL 386 Studies in Spanish Realism and Naturalism \#
4 credits. Not offered 1994-95.]
[SPANL 389 The Generation of 1898 \# 4 credits. Not offered 1994-95-]
[SPANL 390 Fiction of Manuel Puig (also Spanish Literature 496) (e)
4 credits. Not offered 1994-95.]
[SPANL 391 The Post-Civil War Drama in Spain
4 credits. Not offered 1994-95.]
[SPANL 392 The Spanish Vanguard Theater: Lorca and Valle-Inclàn
4 credits. Not offered 1994-95.]

## [SPANL 393 Modern Spanish Short

 Fiction4 credits. Not offered 1994-95.]
[SPANL 394 Trans-Atlantic Renaissance (also Comparative Literature 394) \# 4 credits. Not offered 1994-95.]
[SPANL 396 Modern U.S.-Hispanic Prose Fiction
4 credits. Not offered 1994-95.]
SPANL 397 Colombian Literature © Spring. 4 credits. Conducted in Spanish. TR 2:55-4:10. J. Tittler.
Readings from the rich Colombian tradition will include such renowned texts as Isaacs' Maria, Rivera's La voragine, and Garcia Márquez's El amor en los tiempos del colera, as well as works by authors of national prominence, such as León de Greiff, Porfirio Barba-Jacob, Enrique Buenaventura, Alvaro Cepeda Samudio, and Gustavo Alvarez Gardeazābal. Several "Neo-Colombian" (U.S. Hispanic) authors, such as Jaime Manrique, Silvio Martínez Palau, and Andrés Berger, will also be included.

## SPANL 398 Post-Revolutionary Mexican

 Novel (1)Spring. 4 credits. Conducted in Spanish. M W F 1:25. D. Castillo.
This course will be concerned with the rapport between literary, historical, and sociocultural systems. We will reflect on these themes in the context of recent Mexican writing, starting with a study of the nature and role of history (and/or propaganda) in the literature and examining how post-revolutionary Mexican prose represents a struggle for (1) a new conception of Mexico (as a geographical and socio-historical entity), and (2) a new mode of writing, a new use of language. We will read essays by Vasconcelos, Reyes, and Paz, selections from Guzmann's memoirs of the Revolution, and novels by authors such as Fuentes, Rulfo, Sainz, Garro, Poniatowska, and Castellanos.

## SPANL 399 Spanish Film

Spring. 4 credits.
M W F 2:30. A. Monegal.
Examines the evolution of Spanish cinema during and after Franco's dictatorship, both
from a historical and a cinematic perspective. The focus will be on film as document, taking into account its potential for the representation of reality. and on film as fiction, analyzing its narrative techniques. Special attention will be given to the encoding of political discourse under a system of censorship. Selected films include works by Buñuel, Saura, Erice, and Almodóvar, among others.
[SPANL 400 Gender and Sexuality in Latin America (also Spanish Literature 300) 상
4 credits. Not offered 1994-95.]
[SPANL 402 Latin American and Latino Video (also HASP 402 and Theatre Arts 402)
4 credits. Not offered 1994-95.]
SPANL 406 Literature and Philosophy Spring. 4 credits. Conducted in Spanish. W 2:30-4:25. C. Arroyo.
Study of the need to know the canonical texts of European philosophy-and theology-to be able to read European literatures with rigor. The very notion of "rigorous reading"; philosophical ideas on humans and the universe, and literary structure and character. Criteria of hierarchy according to philosophers and their reflection on the role of the women, black, Indian, and new Christian in literature. Similar problems in the twentieth century. Readings include: Aristotle, Aquinas, Erasmus, Huarte de San Juan, Tirso's Le prudencia en la mujer, La vida es sueno, Unamuno, Heidegger, Ortega, J. A. Valente.
[SPANL 415 The Black Within: Hispanic Race and Literature
3 credits. Not offered 1994-95.]

## SPANL 418 Multiculturalism (also

Society for the Humanities 418)
Spring. 3 credits. Lectures and readings will be conducted in Spanish. Limited to 17 students.

To be arranged. N. Garcia-Canclini. The different types of multi-culture, multiethnicity, postclassicism, transnationalization. The development of the national and local cultures in an era of globalization. Theoretical and methodological challenges for the cultural studies in the humanities and social sciences. New demands for the political cultures in the United States and Latin America.
SPANL 419-420 Special Topics in Hispanic Literature
419. fall; 420 , spring. $2-4$ credits each term. Prerequisite: permission of instructor. Staff.
Guided independent study of specific topics. For undergraduates interested in special problems not covered in courses.
SPANL 429-430 Honors Work in Mispanic Literature
429, fall; 430 , spring. 8 credits. Year-long course, R grade fall semester, letter grade spring semester. Limited to seniors. Prerequisite: permission of instructor.

## J. Kronik.

## [SPANL 440 Medieval Spanish Literature \#

4 credits. Not offered 1994-95.]
[SPANL 445 Spanish-American Mystery Fiction
4 credits. Not offered 1994-95.]
[SPANL 450 Literature of Conquest \# 4 credits. Not offered 1994-95.]
[SPANL 451 Spanish Theater of the Golden Age \#
4 credits. Not offered 1994-95.]
SPANL 455 Cervantes: Don Quijote (also Spanish Literature 355) \#
Fall. 4 credits.
T R 11:40-12:55. C. Arroyo.
See Spanish 355 for description.
[SPANL 466 Golden Age Spanish Short
Fiction \#
4 credits. Not offered 1994-95.]

## [SPANL 468 Spanish Poetry of Golden Age \#

4 credits. Not offered 1994-95.]
[SPANL 469 Mystics and Moralists \#
4 credits. Not offered 1994-95.]
SPANL 475 Fiction of the Picaresque Novel in Spain and Spanish America (also Comparative Literature 475) " Spring. 4 credits.

M W F 12:20. M. A. Garces.
See Spanish 375 for description.
SPANL 479 Colonial Spanish-American Literature: Voices of the Colonized \# ©
Fall. 4 credits. Conducted in Spanish.
T R 1:25-2:40. J. Piedra.
The birth of dissent within Spanish colonial literature as a semi-official, alternative compendium of other vehicles of expression: history and philosophy, grammar and religion, "anthropology" and "ethnology." The emphasis is on the dissenting voices of Native Americans, Blacks, and women, as well as other "minorities" as they converge in the emergence of a "Creole" conscience. The textual selections or complete works to be considered emphasize the aspects of colonial texts that attempted to side with the "colonized" or that were indeed written by them. The list includes the following authors: Columbus, Pané, Las Casas, Inca Garcilaso, Guamân Poma, Silvestre de Balboa, Madre Castillo, Motolinía, Concolorcorvo, Mateo Alemản, Sor Juana, and Lizardi.
[SPANL 481 Eighteenth and NineteenthCentury Spanish Drama \#
4 credits. Not offered 1994-95.]
[SPANL 485 The Nineteenth-Century Spanish Novel (also Spanish Literature 385) "
4 credits. Not offered 1994-95.]
[SPANL 488 The Novel in Early Twentieth-Century Spain
4 credits. Not offered 1994-95.]
[SPANL 489 Hispanic Romanticism *
4 credits. Not offered 1994-95.]
[SPANL 490 Surrealism in Spain
4 credits. Not offered 1994-95.]
[SPANL 491 The Poetics of Tragedy in Contemporary Spanish Drama
4 credits. Not offered 1994-95.]
[SPANL 492 Latin-American Women Writers (also Women's Studies 481 and Comparative Literature 482) 4 credits. Not offered 1994-95.]
SPANL 494 Testimonial Narratives: U.S. Latinos at War (also English 442 and Hispanic American Studies Program 442)

Spring. 4 credits.
TBA. B. V. Olguin.

This course examines multi-media representations of U.S. Latinos at war in contexts that range from their roles in foreign conflicts as "U.S. Government Issue Personnel" (G.I.'s), to their emergence as nationalist and internationalist cadres in certain wars of national liberation. The texts examined include memoirs, testimonial narratives, testimonial fiction, narrative poetry, drama, feature and documentary film, and also various aural vernacular texts from corridos to rap. Students will consider the broader implications of the dramatic ruptures manifested by, and represented in the cultural production associated with warfare, where hegemonic notions of aesthetics and subjectivity, nation and nationality, as well as identity and ideology are called into question.

## SPANL 495 Gabriel Garcia Márquez

Spring. 4 credits.
T R 11:40-12:55. J. Tittler.
The full range of genres of the 1982 Nobel laureate will be examined, including selections from his journalistic writings, his short stories, his screenplays, and his novels. The immense body of critical studies on the Colombian master, especially with respect to Cien años de soledad, will be incorporated into class discussions and lectures. Reaching an informed assessment of his place in Hispanic and Western letters will be the aim of our investigation.
[SPANL 496 The Fiction of Manuel Puig (also Spanish 390) ©
4 credits. Not offered 1994-95.]
[SPANL 497 Modern Spanish Poetry and Poetics
4 credits. Not offered 1994-95.]
[SPANL 498 Mallarmé in Latin
America (a)
4 credits. Not offered 1994-95.]

## SPANL 639-640 Special Topics in Hispanic Literature

639, fall; 640, spring. 4 credits each term. Staff.
[SPANL 642 Libro de Buen Amor and Celestina \#
4 credits. Not offered 1994-95.]
[SPANL 667 Seminar in Golden Age Literature: Golden Age Poetry and Poetics \#
4 credits. Not offered 1994-95.]

## [SPANL 669 Mystics and Moralists (also Spanish 469) " <br> 4 credits. Not offered 1994-95.]

[SPANL 686 Seminar in NineteenthCentury Spanish Literature " 4 credits. Not offered 1994-95.]
[SPANL 690 Hispanic Feminisms (also Women's Studles 692)
4 credits. Not offered 1994-95.]
SPANL 691 The Poetics of Tragedy in Contemporary Spanish Drama
Fall. 4 credits.
R 2:30-4:25. A. Monegal.
Examines redefinitions of tragedy by three twentieth-century Spanish playwrights: Unamuno, Valle Inclản, and García Lorca. The dramatic and theoretical formulations of their poetics will be analyzed in comparison with classical models. Reference will be made to precedents in the Spanish tradition and to later manifestations of the tragic mode in the works of Buero Vallejo, Sastre, and Arrabal.
[\$PANL 693 Freud in Latin America (also Comparative Literature 697) ©
4 credits. Not offered 1994-95.]
SPANL 694 Seminar in Modern Spanish Literature: Madern Critical Theory and Its Practice
Spring. 4 credits. Conducted in Spanish T R 2:55-4:10. J. Kronik.
On the basis of selected key readings, the participants in this seminar will discuss the changing character of modern literary theory from formalism to the present. A series of texts, concentrated on narrative from both Spain and Spanish America, will be read in the light of these successive currents. Participants' interests will be taken into account in the selection of texts. There will be several written exercises and a term paper.

## [SPANL 695 Postmodern Spanish American Fiction ©

4 credits. Prerequisite: permission of instructor. Conducted in Spanish. Not offered 1994-95.]

## [SPANL 697 Hispanic Poetry and The Vlsual Arts <br> 4 credits. Not offered 1994-95.]

## RUMANIAN

See Department of Modern Languages and Linguistics-Romanian.

## RUSSIAN

E. W. Browne, P. Carden (director of undergraduate studies [literature], 235 Goldwin Smith Hall, 255-8350), G. Gibian, R. L. Leed, N. Pollak, M. Scammell, S. Senderovich, G. Shapiro

## The Russian Major

Russian majors study Russian language, literature, and linguistics, emphasizing their specific interests. It is desirable, although not necessary, for prospective majors to complete Russian 101-102, 201-202, and 203-204 as freshmen and sophomores, since these courses are prerequisites to most of the junior and senior courses that count toward the major. Students may be admitted to the major upon satisfactory completion of Russian 102 or the equivalent. Students who elect to major in Russian should consult both Professor Carden and Professor Leed as soon as possible. For a major in Russian, students will be required to complete (1) Russian 301-302 or 303-304 or the equivalent, and (2) 18 credits from 300 - and 400 -level literature and linguistics courses, of which 12 credits must be in literature in the original Russian.
Certain courses may, with the permission of the instructor, be taken for one additional hour's credit. Such courses will involve a one-hour section each week with work in the Russian language. These courses count one hour each of credit toward the 12 courses of Russian literature in the original language required for the major

## Study Abroad

Cornell Abroad has opened a program at the Russian Theatre Academy in Moscow for Cornell students to study the Russian language
and selected topics connected with Russian culture. Further information is available from the Cornell Abroad office, 474 Uris Hall.
Comell is an affiliated institution in the Council on International Educational Exchange program for Russian language study at St. Petersburg State University. Cornell students also frequently go on the American Council of Teachers of Russian program in Moscow and other Russian language programs. Opportunities are available for study during the summer, a single semester, or the full year. Further information is available from Professor Wayles Browne.
Honors. Students taking honors in Russian undertake individual reading and research and write an honors essay.
Fees. Depending on the course, a small fee may be charged for photocopied texts for course work.
Freshman writing seminar requirement.
The following courses will satisfy the freshman writing seminar requirement: Russian 103, 104, 105, 108, and 109.

## Russian and Soviet Studies Major

See "Special Programs and Interdisciplinary Studies," which follows the department listings.

## Russian Literature

P. Carden (director of undergraduate studies, 235 Goldwin Smith Hall, 255-8350), G. Gibian, N. Pollak, M. Scammell, S. Senderovich, G. Shapiro.

The Department of Russian Literature offers a variety of courses: some with readings in English translation, others in the original Russian, or both. The connection between Russian history, society, and literature is particularly close, so instruction and discussion in class often include a variety of topics, such as culture and intellectual history, as well as literature. Several courses are interdisciplinary, cosponsored with the departments of History, Economics, Government, Comparative Literature, etc. Students interested in majoring in Russian are strongly urged to take Russian 101-102 as soon as possible, preferably in their first year, or by their second at the latest. Russian 203-204, offered by the Department of Modern Languages and Linguistics, and Russian 201-202, offered by the Department of Russian Literature, complete basic language instruction and introduce students to literature. A further sequence of literature courses in Russian follows Russian 202.
For further information about courses and majors, see Modern Languages and Linguistics.

## RUSSL 103 Freshman Writing Seminar: Classics of Russian Thought and

 LiteratureFall or spring. 3 credits.
Fall: M W F 10:10 or T R 10:10-11:25. Spring: M W F 10:10. Staff. Russian society has always seen its literature as having a mission important to the development of the nation. In this course we will examine Russian literature as it participates in the debate, whither Russia? We will look in particular at the conflict between the Slavophiles, those who thought Russia had its own unique destiny, and the Westernizers, those who thought Russia should look to the West for a model in its development. We will be reading such Russian authors as Turgenev,

Dostoevsky, Herzen, and Solzhenitsyn in English translation. The course will examine the rhetorical means each author uses to make his argument. All reading is in English translation.

## RUSSL 104 Freshman Writing Seminar: Nineteenth-Century Russian Literary Masterpieces

## Fall or spring. 3 credits

Fall: M W F 9:05 or 12:20. P. Carden and
staff. Spring: M W F 11:15. Staff.
This course will introduce students to a broad selection of the major works of the Russian literary tradition. Our emphasis will be on what makes each work interesting as writing, what themes have been particularly interesting to Russians, and how we recognize the distinctive voice of each of the writers we are studying. Among the authors read are
Pushkin, Gogol, Turgenev, Dostoevsky
Tolstoy, and Chekhov. All reading is in English translation.

## RUSSL 105 Freshman Writing Seminar: Twentieth-Century Russian Literary Masterpieces

Fall or spring. 3 credits.
Fall or spring: T R 11:40-12:55. Staff. Russian literature in the twentieth century has endured many ups and downs. At times it has produced great masterpieces of modern art. At times it has been forced into the dry mode of "socialist realism," in which it had to voice the ideas forced upon it by a totalitarian government. Russian authors have been glorified as the voice of the nation, and they have also perished in concentration camps in the far north of Siberia. In this course we will read a representative selection of these authors, including those who took the path of art, those who bent to the "social command," and those who assumed a politically dissident stance. Among the authors read will be Babel, Pasternak, Olesha, and Solzhenitsyn. All reading is in English translation.
[RUSSL 108 Freshman Writing Seminar: 100 Years of Russian Fiction (1830-1930)
Fall. 3 credits. Not offered 1994-95
M W F 10:10. N. Pollak.
What is the "truth" of the work of fiction? Native responses to Russian literature in the nineteenth and twentieth centuries have included two apparently antithetical-and passionately proclaimed-responses to this question. According to one view, that truth lies in the ideal content of the work, its fidelity to "objective" reality, and its social relevance. According to the other view, which arose in part as a response and counterweight to the first, the truth is inseparable from the stylistic aspects of the work. In reading short fiction by such writers as Pushkin, Gogol, Tolstoy, Chekhov, and Babel, we will attempt to examine the ways each of them asserts his conception of the truth-and the ways these approaches must overlap in the determination of the complex truth that is the work of art.]

## RUSSL 109 Freshman Writing Seminar: Russian Science Fiction

Spring. 3 credits.
T R 10:10-11:25. P. Burge.
This course will explore the rich and prophetic tradition of science fiction in Russian literature. Beginning with Dostoevsky's "Legend of the Grand Inquisi tor," Russian authors used fictional discourse to probe questions of social organization and human destiny. Zamiatin's We prefigured
twentieth-century anti-utopias like Orwell's 1984 and Huxley's Brave New World. Other authors as various as Bogdanov,
Chernyshevsky, and Bulgakov proposed alternative societies. Modern writers like the Strugatsky brothers investigate the effects of technology on society. We will identify and analyze the distinctive themes of Russian science fiction from the mid-nineteenth century to the present, and investigate the literary methods each author uses when writing in the genre. Attention will be paid also to the historical, social, and political situations in which the works were produced.

## RUSSL 201-202 Readings in Russian

 Literature \#201, fall; 202, spring. 3 credits each term. Prerequisites: qualification in Russian; 201 is prerequisite to 202. Open to freshmen.

Fall or spring: M W F $1: 25$, G. Shapiro These courses are designed as the initial courses students take after qualification in Russian and are conducted mainly in Russian. Considerable guidance is provided, however, and there is no presumption of fluency. The goals of the courses are to introduce students to Russian literature in the original, to sample differing literary styles, and to accomplish both with minimal recourse to English in class. Several short papers in Russian and English will be assigned. Readings from nineteenthand twentieth-century masters of prose and verse such as Pushkin, Lermontov, Tiutchev, Tolstoy, Chekhov, Babel, and Zoshchenko.

## RUSSL 207 Themes from Russian Culture \#

Spring. 3 credits.
M W F 2:30. G. Shapiro.
This course is based on lectures, discussions, and audio-visual presentations (slides, tapes, films). It includes within its scope various aspects of Russian culture such as literature, art, music, religion, philosophy, and social thought from its very beginnings through the eighteenth century. The course is designed to give undergraduates a broad familiarity with the cultural traditions of the country which plays a major role in the world today. Russian culture will be presented as part of Western civilization with attention given to its distinctive character. The basic texts are literary works of moderate length in English translation.
[RUSSL 208 Themes from Russian Culture II
Spring. 3 credits. Not offered 1994-95. M W F 1:25. G. Shapiro.
This course is based on lectures, discussions, and audiovisual presentations (slides, tapes, films). It includes various aspects of Russian culture such as literature, art, music, religion, philosophy, and social thought over the last two hundred years. The course is designed to give undergraduates a broad familiarity with the cultural traditions of the country that plays a major role in the world today. Russian culture w'ill be presented as part of Western civilization with attention given to its distinctive character. The basic texts are literary works of moderate length in English translation.]

RUSSL 274 Jewish Civilization in Eastern Europe, 1814-1939 (also JWST 274)
Fall. 2 credits.

> R 1:25-4:25. A. Nadler.

An introduction to the social, intellectual and literary history of the Jews of Eastern Europe
in the modern period, as reflected in primary texts (in English translation). The course will explore the full range of Jewish religious, cultural, and political movements of this period, such as hasidism, the haskala (Jewish enlightenment), and the varieties of modern Jewish nationalism, through the prism of their greatest literary works.
[RUSSL 314 Intellectual Background of Russian Literature, 1825-1930 \# Not offered 1994-95.1

## [RUSSL 331 Introduction to Russian

 PoetryFall. 4 credits. Prerequisites: Russian 202 or equivalent and permission of instructor. This course may be counted toward the 12 credits of Russian literature in the original language for the Russian major. Also open to graduate students. Not offered 1994-95.

T R 2:55-4:10. S. Senderovich
A survey of Russian poetry with primary emphasis on the analysis of individual poems by major poets.]
[RUSSL 332 Russian Drama and Theatre Fall. 4 credits. Not offered 1994-95.

T R 2:55-4:10. S. Senderovich.
Selected topics. Discussion of a number of the most representative Russian plays of the nineteenth and twentieth centuries in chronological order. Introductions to the historical period, cultural atmosphere, literary trends, and crucial moments in the history of the Russian theater will be especially
emphasized. Among the works we will be studying will be Gogol's Inspector General. Ostrovsky's The Storm, and Chekhov's The Cherry Orchard. All readings will be in English translation. Additional assignments in critical literature will be made for graduate students.]
[RUSSL 333 Twentieth-Century Russian Poetry
Spring. 4 credits. Not offered 1994-95.
T R 11:40-12:55. N. Pollak.
Close readings of lyrics by major twentiethcentury poets. All reading is in Russian. Geared towards undergraduates.]
RUSSL 334 The Russian Short Story \# Fall. 4 credits. I'rerequisites: Russian 202 or equivalent and permission of instructor. This course may be counted toward the 12 credits of Russian literature in the original language for the Russian major. Also open to graduate students.

M W F 2:30. G. Gibian.
A survey of two centuries of Russian story telling. Emphasis on the analysis of individual stories by major writers, on narrative structure, and on related landmarks of Russian literary criticism.
[RUSSL 335 Gogol \#
Spring. 4 credits. There may be a special section for students who read Russian; if they are Russian majors, they may count this course as one in the original language. Also open to graduate students. Not offered 1994-95

M W 2:30-3:45. Staff.
Selected works of Gogol read closely and viewed in relation to his life and to the literature of his time. Readings in English translation.]

## [RUSSL 350 Education and the Western Literary Tradition (also Comparative Literature 350) <br> Spring. 4 credits. Not offered 1994-95.

T R 2:55-4:10. P. Carden
A major philosophical tradition has conceived of education as encompassing the whole of our lives. What we should do or be is seen as the result of every choice we make. The whole of our human contacts is understood as a school in which we form ourselves. This all-encompassing vision of education has been embodied in the works of the great philoso-pher-fantasts who use the forms of fiction to explore fundamental issues of education. In this course we will examine several key philosophical fantasies, among them Plato's Republic, Rousseau's Emile, and Tolstoy's War and Peace. Our aim will be to understand how the discourse on education became a central part of our Western tradition.]

## RUSSL 367 The Russian Novel (also

 Comparative Literature 367)Fall. 4 credits. Also open to graduate students. Special discussion section for students who read Russian.

M W F 11:15. G. Gibian
Sentimentalism, Romanticism, Realism, Modernism. Novels and short stories by Gogol, Turgenev, Tolstoy, Dostoevsky, Chekhov, and others. Readings in English translation.

## [RUSSL 368 Soviet Literature from

 Revolutionary Times to "Glasnost" Fall. 4 credits. Also open to graduate students. There will be a special section for students who read Russian. Not offered 1994-95.T R 1:25-2:40. M. Scammell.
An introductory survey of Soviet literature, beginning with the revolutionary fervor of the twenties, continuing through the dark days of the thirties and the war years of the forties, and ending with an account of Khrushchev's "thaw," the rise of the dissident movement and the introduction of "glasnost." Writers and movements to be discussed include Mayakovsky and the Futurists; Zamyatin, Platonov and anti-utopian fiction; Gorky and Socialist Realism; Gulag literature; Pasternak Solzhenitsyn and the dissidents; the meaning of "glasnost."]

## [RUSSL 369 Dostoevsky (also <br> Comparative Literature 383) \# <br> Fall. 4 credits. Not offered 1994-95.

[RUSSL 373 Chekhov in the Context of Contemporary European Literature and Art (also Comparative Literature 395) \#

Spring. 4 credits. Not offered 1994-95
T R 1:25-2:40. S. Senderovich.
Reading and discussion of Anton Chekhov's short stories in the context of the European art of the short story and painting of that era. The course is designed for nonspecialists as well as literature majors. All reading is in English translation.]

## [RUSSL 375 Literature of the Soviet

 Period, 1917-1945Fall. 4 credits. Prerequisite: permission of instructor. Also open to graduate students. Russian majors may do part or all of the reading in Russian by prior agreement with the instructor. Not offered 1994-95

T R 11:40-12:55. M. Scammell. A survey of the development of Russian literature during the second quarter of the twentieth century, with the emphasis on attempts to create a purely Soviet literature but also taking into account the achievements of non-Soviet writers, including emigrés and the so-called fellow travelers.]

## [RUSSL 376 Literature of the Soviet

 Period, 1945-1985Spring. 4 credits. Prerequisite: permission of instructor. Also open to graduate students. Russian majors may do part or all of the reading in Russian by prior agreement with the instructor. Not offered 1994-95.

T R 11:40-12:55. M. Scammell. A survey of the development of Soviet literature after World War II, including the thaw, the literature of the Gulag, the rise of the dissident movement, and the creation of the "third emigration."]
[RUSSL 377 Baltic Literature (also German Studies 377)
Fall. 4 credits. Not offered 1994-95.
T R 11:40-12:55. I. Ezergailis
Estonia, Latvia, and Lithuania have created a rich literary tradition since the beginning of a written indigenous culture in the nineteenth century. We will read texts from each of these literatures, selected for their quality, importance, and the availability of acceptable translations, representing, as much as possible, writers from the pre-Soviet independence period, those writing under Soviet rule, and emigres.]
[RUSSL 379 The Russian Connection (also Comparative Literature 379) * Spring. 4 credits. Not offered 1994-95. T R 2:55-4:10. P. Carden.
Our topic will be the development of a poetics of introspection in European prose in the course of the 19th century, culminating in two major Russian novels: Tolstoy's War and Peace and Dostoevsky's The Idiot. Among other works we will read: Constant's Adolphe, Stendhal's Cbarterbouse of Parma, and several short works relevant to the theme.]
[RUSSL 380 Soviet Dissident LiteratureIts Role in the Collapse of the USSR Fall. 4 credits. Not offered 1994-95.

T R 1:25-2:40. M. Scammell.
A study of the dissident movement 1963-83. Defining the varieties of dissidence: literary, cultural, religious, and political. Literature as a social force as seen in the works of Pasternak, Solzhenitsyn, Sinyavsky-Tertz, Voinovich, Zinoviev. The role of the third emigration in forcing change. The course is intended for students of government as well as of Russian and Soviet literature.]

## [RUSSL 384 Dialogue in/as Text (also

 Comparative Literature 384)Spring. 4 credits. Not offered 1994-95. M W F 10:10. P. Carden.
An examination of the principle of dialogue and dialogism as it appears in fictional discourse. Using the theories of Mikhail Bakhtin as a point of departure, we will examine the use of dialogue as a form of discourse beginning with Plato's Pbaedrus Dostoevsky's novels Notes from Underground, The Possessed, and Brothers Karamazov will be discussed as dialogic, or polyphonic forms of discourse. Finally, we will discuss selected works of Gide, Sartre and Camus, who acknowledged their debt to Dostoevsky, to see if they are indeed polyphonic in structure.]

## RUSSL 385 Reading Nabokov (also Comparative Literature 385 and English 379)

Fall. 4 credits.
T R 2:55-4:10. G. Shapiro
This course offers an exciting trip to the intricate world of Nabokovian fiction. After establishing himself in Europe as a distinguished Russian writer, Nabokov, at the
outbreak of WWII, came to the United States where he reestablished himself, this time as an American writer of world renown. In our analysis of the Nabokovian artistic universe, we shall focus on his two splendid achievements as a Russian writer, The Defense (1930) and Despair (1934) (both in their English form), and then examine the two widely read novels that he wrote in lthaca while teaching literature at Comell-Lolita (1955) and Pnin (1957).
[RUSSL 388 Ideas and Form in Novels of Social Inquiry (also Comparative Literature 388)
Spring. 4 credits. Not offered 1994-95. M W F 9:05. G. Gibian.
From the French Revolution to the present. Problems of relations between politics and the writer. Literary representations of conflict between political ideologies (ideas of revolution, justice, nationalism) and private needs (art, nature, love, order). Marx, Flaubert, Dostoevsky, Conrad, Trotsky, Lenin, V. S. Naipaul, Richard Wright, Solzhenitsyn, Kundera, and others. Some poetry will also be included.]
[RUSSL 389 Contemporary Literature in Central and East Europe (also Comparative Literature 389)
Fall. 4 credits. Not offered 1994-95.
T R 1:25-2:40. G. Gibian.
The course will study developments in literature (and to some extent in other areas of culture) in Hungary, Poland, Slovakia, the Czech Republic, Croatia, and Serbia in the most recent periods. We shall focus on novels and short stories, but some consideration will also be given to drama and poetry. No knowledge of Eastern European languages is required. The reading will be done in English transtation.]
[RUSSL 390 The Power of Nationalism: Expressions of National Feelings in Politics, Literature, History, and the Arts (also Comparative Literature 390)

Fall. 4 credits. Not offered 1994-95.
T R 2:55-4:10. G. Gibian and others.
The course will deal with various aspects of the general subject of national identity and feeling. In addition to studying the political phenomenon of nationalism, we will also study the roles played by national awareness in the perception of one's identity, the selfimages of national character, stereotypes of national and ethnic qualities, and the relation between a sense of belonging to a nation and various other groups. Case studies of several nations and ethnic groups. There will be guest lecturers.]
RUSSL 393 Honors Essay Tutorial
Fall and spring. 8 credits. Must be taken in two consecutive semesters in senior year. Credit for the first semester will be awarded upon completion of second semester. For information, please see Director of Undergraduate Studies

Hours to be arranged. Staff

## [RUSSL 400 Reading the Great Tradition \#

Spring, 4 credits. Prerequisite: Russian 202 or equivalent. Recommended: a course at the 300 or 400 level in which reading has been done in Russian. This course may be counted toward the 12 credits of Russian literature in the original language required for the Russian major. Not offered 1994-95.

T R 11:40-12:55. S. Senderovich.

The course is designed to improve the reading facility of advanced undergraduates and beginning graduate students who will read their first novel in Russian, while paying close attention to stylistic qualities.]

## RUSSL 404 History and Nationality in

 Russia and Eastern Europe (also S Hum 404)Fall. 3 credits. Limited to 17 students.
T 12:20-2:15. L. S. Chekin.
Ethnicity and nationality appear as the main forces behind the recent dramatic changes on the map. The seminar addresses these issues in Belarus', Russia and Ukraine, mainly from a historical perspective (starting in the Middle Ages), but also in the context of rising ethnic and national consciousness throughout the world.

## [RUSSL 409 Russian Stylistics

Fall. 4 credits. Also open to graduate students. Prerequisite: three years of Russian Not offered 1994-95.

T R 1:25-2:40. S. Senderovich.
A few steps beyond normative grammar. Introduction to the subtleties of idiomatic Russian on the levels of morphology, syntax, vocabulary, and phraseology. Introduction to the genres of live colloquial and written language. Development of writing skills through short assignments and their analyses. First notions of literary stylistics and their practical application.]

## [RUSSL 415 Postsymbolist Russian Poetry

Spring. 4 credits. Open to graduate students. Prerequisite: permission of instructor. Not offered 1994-95.

M W 2:30-4. N. Pollak
We will examine works by three poets in the first quarter of this century: Innokentij Annenskij, the Symbolist whom the Acmeists considered their mentor; Osip Mandelstam, a founding Acmeist; and Boris Pasternak, associated, at least for a time, with the Futurists. Through close readings of their verse, and also critical prose and manifestos, we will attempt to determine some of the general features that link poets of such diverse orientations in the years following the crisis of Symbolism. We will also outline the features that distinguish them as representative of their respective movements.]

## [RUSSL 423 Russian Formalism (also

 Comparative Literature 423)Fall. 4 credits. Not offered 1994-95.
M W F 1:25. N. Pollak.
This is a course on Russian Formalism, a trend in literary interpretation that flourished in the 1910 s and the first part of the 1920 s. We will read the writings of such scholars as Tynianov, Eikhenbaum, Shklovsky, and Jakobson, as well as the works they studied. The course provides a historical examination of a school that gave rise to some of the most important movements in twentieth-century Western criticism-and in other disciplines, such as linguistics and anthropology. The course also provides both a look at classics of Russian prose and an approach to literature that has something to offer readers today. No knowledge of Russian is required.]

RUSSL 431 Contemporary Russian Prose Spring. 4 credits. Prerequisites: Russian 301-302 or 303-304, and permission of instructor. This course may be counted towards the 12 credits of Russian literature in
the original language for the Russian major Graduate students may audit the course.

T R 2:55-4:10. M. Scammell.
This course is designed to acquaint students with the way Russian prose has developed during the past forty years. Although the emphasis will be on comprehension of the text, we will also discuss literary structure, modern literary history, social and political problems, and the ways in which life in the Soviet Union is reflected in its literature. Authors to be read include Viktor Nekrasov, Yuri Kazakov, Alexander Solzhenitsyn, Varlam Shalamov, Abram Tertz (Andrei Sinyavsky), Vasili Axyonov, and Tatyana Tolstaya. This course is specifically intended for third- and fourth-year Russian majors.

## [RUSSL 432 Pushkin \#

Spring. 4 credits. Prerequisites: Russian 202 or equivalent, and permission of instructor. This course may be counted towards the 12 credits of Russian literature in the original language for the Russian major. Also open to graduate students. Not offered 1994-95.

T R 11:40-12:55. G. Gibian.
Reading in the original language and discussion of selected works by Pushkin: lyrics, narrative poems, and Eugene Onegin.]

## RUSSL 491 Reading Course: Russian

 Literature in the Original Language Fall or spring. 1 credit each term. Prerequisite: permission of instructor.Hours to be arranged. Staff.
This course is to be taken in conjunction with any Russian literature course in English translation. Students will receive one credit for reading and discussing works in Russian in addition to their normal course work.

## RUSSL 492 Supervised Reading in Russian Literature

Fall or spring. $1-4$ credits each term. Prerequisite: permission of instructor. Hours to be arranged. Staff.
[RUSSL 499 The Avant-Garde in Russian Literature and the Arts
Spring. 4 credits. Open to any student who has completed Russ L 202. May be used in satisfaction of the twelve hours of reading in Russian required for the Russian major. Not offered 1994-95.

T R 1:25-2:40. P. Carden.
In this course we will examine closely representative short texts in Russian by such leading figures of the Russian avant-garde as Blok, Belyi, Remizov, Mayakovsky,
Khlebnikov, Kruchenykh, and Babel. We will also examine related developments in theater. film. and the visual arts.]

## Graduate Seminars

[RUSSL 600 Proseminar: Research Methodology in Russian Literature Fall. 4 credits. Not offered 1994-95. W 3:45-5:45. P. Carden. This course is intended for graduate students beyond the first-year level who want a more advanced training in research methodology. Among the topics to be covered are the research library, its resources and obstacles; bibliography of Russian literature and culture; Russian archives, what they contain and how to use them; finding and evaluating information; reading criticism analytically; evaluating different editions of an author's works; editing and revising a paper to meet professional standards of cogency and format. Each student should be working concurrently on a paper, which might be an upgrading of a
seminar paper, a draft of the master's essay, or a chapter of the dissertation I
RUSSL 603 Graduate Seminar: Neglected Masterpieces of Short Russian Prose
Spring. 4 credits.
T 4:15-6:15. G. Gibian.
Nineteenth- and twentieth-century works chosen according to the needs of the students enrolled. Stress on skills useful in teaching Russian literature.

## RUSSL 611 Supervised Reading and

 ResearchFall or spring. 2-4 credits. Prerequisite: permission of the department.

Hours to be arranged. Staff.

## [RUSSL 615 Postsymbolist Russian

 PoetryNot offered 1994-95.
For description see Russian 415.]
[RUSSL 617-618 Russian Stylistics I and II
Not offered 1994-95.]
[RUSSL 619 Seventeenth-Century Russian Literature
Fall. 4 credits. Not offered 1994-95. W 3:35-5:35. G. Shapiro.
Seventeenth-century Russian literature is often studied together with Medieval literature. Is such an arrangement justified, or does seventeenth-century literature have its own problematic that makes it worth studying separately? In scholarship the seventeenth century is referred to as the Age of Baroque. Did Muscovite Russia experience its own Baroque, and, if so, what are its unique features? These and other important issues will be addressed in the seminar. In the course of the seminar a variety of concepts, genres, and themes characteristic for the epoch will be discussed. We will read the works of such authors as Simeon Polotsky, Silvester Medvedev, Karion Istomin, and the archpriest Avvakum.]

## [RUSSL 620 Twentieth-Century Russian Poetry

Spring. 4 credits. Open to advanced undergraduates with permission of instructor. Not offered 1994-95.

W 3:35-5:35. N. Pollak
An in-depth study of the writings of selected twentieth-century poets. Authors may include Blok, Mandelstam, Pasternak, Tsvetayeva, and Khlebnikov.]
[RUSSL 621 Old Russian Literature
Fall. 4 credits. Not offered 1994-95.
T 4:15-6:15. S. Senderovich.
A survey.l

## [RUSSL 622 Eighteenth-Century Literature

Spring. 4 credits. Not offered 1994-95. T 4:15-6:15. S. Senderovich. Introduction to the first century of modern Russian literature. Cultural identity of the age: Baroque, Neo-Classicism, Enlightenment, Sentimentalism. Reading of representative texts of the major writers of the century: Trediakovsky, Lomonosov, Sumarokov, Novikov, Karamzin, etc. Main connections with nineteenth-century literature: roots, evolution, intertextuality.]

## [RUSSL 623 Early Nineteenth-Century Literature

Not offered 1994-95.]

RUSSL 624 Russian Romanticism
Spring. 4 credits. Taught in Russian. R 4:15-6:15. S. Senderovich.
A survey of concepts, themes, genres, and main individual contributions in Russian literature of the Age of Romanticism. The Age of Romanticism encompasses the first four decades of the nineteenth century. Zhukovsky, Batiushkov, Pushkin, Baratynsky, Gogol, and Lermontov are the major representatives of this style and the most important period of Russian literature. The emphasis is on poetry, its historical and theoretical problems. It was, above all, the golden age of Russian poetry, which prepared and deeply influenced the following age of great Russian prose. Turgenev, Tolstoy, Dostoevsky, and Chekhov are full of allusions to the texts of the golden age and cannot be properly understood without it.
[RUSSL 625 Russian Realism
Fall. 4 credits. Also open to advanced undergraduates with permission of instructor. Not offered 1994-95.

W 3:35-5:35. P. Carden.
A study of the development of psychological realism in Russian prose of the nineteenth century, with some attention to the poetic tradition. In addition to reading representative works, we will pay attention to the historical background of the period. We will approach the works through the critical writings of several important theorists, in particular those of Lydia Ginzburg.!

## [RUSSL 626 The Tradition of Russian

 PoetrySpring. 4 credits. Not offered 1994-95. F 2:30-4:30. N. Pollak.
This course will examine a selection of poems that have been particularly important for the tradition of Russian literature in the nineteenth and twentieth centuries. Our focus will include critical and literary responses to these poems as well as close readings.]

## [RUSSL 630 Gogol

Fall. 4 credits. Taught in Russian. Not offered 1994-95.

W 4:15-6:15. G. Shapiro.
Gogol's artistic career from his "Ukrainian" cycles to Dead Souls. We will examine representative works from each of the major divisions of Gogol's early work, in particular from his cycles Evenings on a Farm near Dikanka and Mirgorod, and will trace the writer's development toward his magnum opus, Dead Souls. Although some of the readings will be done in English to enable the class to cover a significant amount of material, the class work will be focused on close analysis of the Russian text.]
[RUSSL 635 Russian Literary Criticism of the Twentieth Century (also Comparative Literature 635)
Spring. 4 credits. Not offered 1994-95. W 3:35-5:35. P. Carden.
A survey of twentieth-century Russian contributions to critical theory and practice. Texts by the symbolists, the formalists, the school of Bakhtin, the folklorists, and the structuralists will be read and analyzed. A reading knowledge of Russian is desirable, although alternative readings in English translation can be arranged for otherwise qualified students.]
[RUSSL 650 Russian Intellectual History
Spring. 4 credits. Not offered 1994-95. R 4:15-6:15. S. Senderovich.
Nineteenth- and twentieth-century selected topics. Taught mostly in English.]

## [RUSSL 669 Seminar: Dostoevsky

Fall. 4 credits. Also open to advanced undergraduates. Not offered 1994-95.

R 4:15-6:15. G. Gibian.
Study of representative works from various periods of Dostoevsky's life, from Poor Folk and The Double to The Brothers Karamazov, including some articles, speeches, and parts of The Diary of a Writer against the context of nineteenth-century Western European and Russian literature. A variety of critical and scholarly approaches (from Russian formalists to 1980 s Western scholars) will be sampled and evaluated.]

## RUSSL 671 Seminar in NineteenthCentury Russian Literature

Fall. 4 credits.
W 2:30-4:30. Topic: War and Peace. P. Carden.

## [RUSSL 672 Seminar in Twentieth-

 Century Russian LiteratureFall. 4 credits. Open to advanced undergraduates. Not offered 1994-95.

M 4:30-6:30. N. Pollak.]

## [RUSSL 673 The Russian Nabokov

Fall. 4 credits. Also open to advanced undergraduates. Not offered 1994-95. R 4:15-6:15. M. Scammell. Vladimir Nabokov wrote much verse, several plays, numerous short stories, and nine novels in Kussian before switching to English. He is a major Russian writer of the twentieth century. This seminar will examine his work in the context of modern Russian literature, concentrating in particular on the novels. Knowledge of Russian is highly desirable, but all the works discussed also exist in English translation.]

## [RUSSL 674 Solzhenitsyn and the

 Literature of the GulagFall. 4 credits. Not offered 1994-95.
T 4:15. M. Scammell.]

## RUSSL 675 Russian Literature,

 1917-1945Fall. 4 credits.
R 4:15-6:15. Staff.
This semester will focus on the achievements of Russian prose between the two World Wars. Among the authors whose works will be closely read and discussed, there are Babel, Olesha, Zoshchenko, Ilf and Petrov, Bulgakov, and Nabokov,

## [RUSSL 676 Russian Literature, 1945-Present

Spring. 4 credits. Not offered 1994-95.
R 4:15-6:15 p.m. G. Gibian.]

## [RUSSL 698 Russian Symbolism

Fall. 4 credits. Also open to qualified undergraduates with permission of instructor. Not offered 1994-95.

W 3:35-5:35. P. Carden.
Around 1886 the trends in French culture represented by Baudelaire and Mallarme crystallized into a new cultural movement, called in some of its aspects the Decadence and in others Symbolism. The new sentiments about the nature of art spread throughout Europe, drawing in England, the Scandinavian countries, Germany, and Russia. The first stirrings of Symbolism were in the ascendant in Russian cultural life and it
remained the dominant force until 1910. Our task will be to study the phenomenon of Symbolism as it touched the arts in Russia. including not only literature, but dance. theater, and the visual arts. Because Symbolism was a movement that cut across national boundaries, we will study the seminal works of European art that created the climate in which Russian Symbolism was conceived and came to maturity ]

## [RUSSL 699 Russian Modernism

Spring. 4 credits. Also open to qualified undergraduates with permission of insturctor. Not offered 1994-95.

W 3:35-5:35. P. Carden.
We will be investigating the rich and innovative period of the avant-garde in Russia from 1910 to 1925 . In addition to examining outstanding works in a variety of forms, we will look at the movements, social context, and ties to the European avant-garde. Among the writers whose works we will examine are Blok, Bely, Mayakovsky, Khlebnikov, Pilnyak and Babel. We will examine theater through the Futurist performance piece, "Victory Over the Sun," through Meyerhold's productions of Mayakovsky's plays and other experimental pieces, and through mass spectacles. We will discuss the film theories of Eisenstein and Dziga Vertov and see several of their films. In the visual arts we will be examining the experiments of Larionov and Goncharova, Malevich, Kandinsky, and Tatlin. We will also look at the photomontage of Rodchenko.]
[RUSSL 701 Proseminar: Methods in Research and Criticism
Not offered 1994-95]

## RUSSIAN AND EAST EUROPEAN STUDIES MAJOR

See "Special Programs and Interdisciplinary Studies."

## SANSKRIT

See Department of Modern Languages and Linguistics.

## SERBO-CROATIAN

See Department of Modern Languages and Linguistics.

## SCIENCE AND TECHNOLOGY STUDIES

## (History, Philosophy, Sociology, and Politics of Science and Technology)

S. Jasanoff, chair, R. N. Boyd, S. M. Brown Jr., emeritus, P. R. Dear, M. Dennis, H. Gottweis, J. P. Jarrett, R. Kline, B. V. Lewenstein, W. R. Lynn, R. W. Miller, T. J. Pinch,
A. G. Power, M. W. Rossiter, P. J. Taylor,
L. P. Williams, emeritus. Adjunct faculty:
S. R. Barley, J. J. Brumberg, J. F. Maci onald, W. B. Provine, J. V. Reppy, Z. Warhaft

Science and technology profoundly affect our lives, often in ways we scarcely understand or perceive. The study of their historical
formation, their conceptual structure and social organization, and their political and policy implications can yield important insights into the nature of the modern world
Whether one looks at the history of quantum mechanics, the philosophy of evolution, the sociology of laboratory experiments, or the policy options for environmental protection, one learns about science and society by engaging in the study of both. None of the different dimensions of science and technology makes sense on its own; their integration is increasingly necessary in the worlds of research as well as teaching. The Department of Science and Technology Studies provides a focus for such work at Cornell.
The department administers two majors. The major in Science and Technology Studies aims to further students' understanding of the social and cultural meaning of science and technology and their ability to participate meaningfully in policy debates. Students may focus on the historical, philosophical, sociological, or political aspects of science and technology, within an overall plan aimed at providing a full appreciation of the place of science and technology in society. Students in the sciences or engineering also have the option of taking Science and Technology Studies as a minor or double major. Information may be obtained from the Biology and Society office, 275 Clark Hall, 255-6042.
The Biology and Society major is designed for students who desire strong training in biology and who also wish to acquire a background in the social, political, and ethical dimensions of the biological sciences. The undergraduate curriculum in biology and society is a major in the College of Arts and Sciences and in the College of Human Ecology. It is also offered as an optional curriculum for undergraduates entering the General Studies Program of the New York State College of Agriculture and Life Sciences. A full description of the Biology and Society major may be found in the section on Special Programs and Interdisciplinary Studies. Information and application materials may be obtained from the Biology and Society office, 275 Clark Hall (255-6042).

## The Science and Technology Studies Major

Prerequisites: Students intending to major in Science and Technology Studies will be required to complete the following courses before declaration of the major: i) two courses in history, philosophy, sociology, or government. (In choosing these courses students should be attentive to the prerequisites specified for S\&TS courses they may wish to take later.) These courses cannot be used to fulfill the core or other course requirements for the major; ii) the science requirement of the College of Arts and Sciences; iii) mathematics or computer science courses in fulfillment of the Group Four distribution requirement.
Core Courses: Science and Technology Studies majors will be required to take:
(i) either Science and Technology Studies 250 (Technology in Western Society) or Science and Technology Studies 282 (Science in Western Civilization); and
(ii) either Science and Technology Studies 381 (Philosophy of Science: Knowledge and Objectivity) or Science and Technology 389 (Philosophy of Science: Evidence and Explanation); and
(iii) either Science and Technology Studies 390 (also Government 309) or Science and Technology Studies 415 (Politics of Technical Decisions) or Science and Technology Studies 442 (Sociology of Science)
Other Science and Technology Studies Courses: Science and Technology Studies majors will be required to complete at least 21 credit hours of additional courses in Science and Technology Studies, subject to the following restrictions
(i) Breadth requirement: At least one course beyond the core courses in each of the three areas of concentration (history, philosophy, and social studies of science and technology);
(ii) Depth requirement: At least two courses in one area beyond the core courses and intended for advanced undergraduates or graduate students.
Additional Science Requirement: In addition to the science requirement of the College of Arts and Sciences, Science and Technology Studies majors are required to take an additional two semesters of a natural science or engineering (including computer science). Mathematics sufficient to follow the additional science requirement should be completed before undertaking that requirement. Choice of these courses should be made in consultation with the students' major advisers.

## Course Offerings

History
Philosophy
Social Studies of Science
Independent Study

## History

S\&TS 233 Agriculture, Mistory, and Society: From Squanto to Biotechnology
Fall. 3 credits.
M W F 12:20-1:10. M. W. Rossiter This course will survey the major themes in the development of agriculture and agribusiness in the United States in the nineteenth and twentieth centuries. These include particular individuals (such as Liberty Hyde Bailey, Luther Burbank, G. W. Carver, Henry A. Wallace, and Norman Borlaug), the rise of government support and institutions (including U.S.D.A. and Cornell), noteworthy events (the Dust Bowl, World War II, and the environmental movement), and the achievements of the recent Green and "Gene" Revolutions.

## S\&TS 250 Technology in Western Society (also Engineering 250 and Electrical Engineering 250) <br> Fall. 3 credits

M W F 10:10-11:00. K. Ellison. An examination of the history of technology in Western society from ancient Egypt to the present, focusing on Western Europe up to the British industrial revolution in the late eighteenth century, and on the United States thereafter. Topics include the economic and social aspects of industrialization; the myths of heroic inventors such as Morse, Edison, and Ford; the government's promotion and
regulation of technology through such measures as the patent system, the funding of research and development, and regulatory legislation; the origins of modern systems of mass production; and the spread of the automobile and microelectronics cultures in the United States

## S\&TS 281 Science in Western

 Civilization (also History 281)Fall. 4 credits. S\&TS 281 is not a prerequisite to 282.

T R 11:40-12:55 plus disc to be arranged.
P. Dear.

These courses aim to make comprehensible, both to science majors and to students of the humanities, the historical structure and development of modern science and to show science as a cultural phenomenon. Changing perceptions of nature and human knowledge from Greek antiquity to the twentieth century form the framework for current Western views of the world, while the roots of the presentday dominance of "science" as a symbol of progress and modernity lie in an alliance between knowledge of nature and power over nature that took shape in the nineteenth century after a long period of emergence. 281 runs chronologically up to the death of Isaac Newton and focuses on the cultural traditions of Christian Europe and its selective appropriation of a Greek heritage; 282 covers the eighteenth, nineteenth, and early twentieth centuries

## S\&TS 282 Science in Western Civilization (also History 282)

Spring. 4 credits.
T R 11:40-12:55. P. Dear This course deals with the development of modern science since the scientific revolution of the seventeenth century. The evolution of physics, chemistry, biology and medicine will be traced through the eighteenth and nineteenth centuries in a non-technical fashion. Attention will be paid to the social, political, and economic backgrounds. Readings will be from both original scientific papers and modern histories of these sciences. There will be two preliminary and a final examination

## S\&TS 287 Evolution (also Biological

 Sciences 207 and History 287)
## Fall. 3 credits

T R 10:10-11, plus disc. W. B. Provine Evolution is the most central concept in biology. This course examines evolution in historical and cultural context. Aims of the course include understanding of the major issues in the history and current status of evolutionary biology, and exploration of the implications of evolution for culture. Issues range from controversies over mechanisms of evolution in natural populations to the conflict between creationists and evolutionists.

## [S\&TS 288 History of Biology (also

 Biology and Society 288)Spring. 3 credits. Prerequisite: one year of introductory biology. Not offered 1994-95 Staff.]
[S\&TS 292 The Electrical and Electronic Revolutions (also Electrical Engineering 292 and Engineering 292)

Spring. 3 credits. Not offered 1994-95 R. Kline.

The course investigates the history of electricity in society from 1830 to the present by considering the technical and social history of telecommunications, the electric power
industry, microelectronics, radio, television, and computers. Emphasis is placed on the changing relationship between science and technology, the institutional context of research and development, the economic aspects of innovation, and the social relations of this technology.]
S\&TS 433 Comparative History of Science
Spring, 4 credits.
M. W. Rossiter.

A survey of the major scientific institutions in foreign nations, including developing countries. The course covers the period 1660 to the present and gives some attention to who in each country becomes a scientist, who rises to the top, and who emigrates. Weekly readings and a research paper.

S\&TS 444 Historical Issues of Gender and Science (also Women's Studies 444)
Spring. 4 credits. Open to sophomores M. W. Rossiter.

One-semester survey of women's role in science and engineering from antiquity to the 1980s, with special emphasis on the United States in the twentieth century. Readings will include biographies and autobiographies of prominent women scientists, educational writings and other primary sources, and recent historical and sociological studies. By the end of the semester, we shall have attained a broad view of the problems that have faced women entering science and those that still remain.

S\&TS 447 Seminar in the Mistory of Biology (also Biology and Society 447, History 415, and Biological Sciences 467)
Fall. 4 credits. Limited to 18 students. Prerequisites: one year of introductory biology; permission of instructor is required and obtained by preregistering in E139 Corson.

Sem, T R 12:20-2:15. W. Provine. Specific topic will change each year. In fall 1994 the seminar will examine the "evolutionary synthesis" of the 1930s and 1940s and its aftermath up to the present. Readings will be drawn from scientists and from historians, sociologists and philosophers of science. The course will help students to evaluate assertions that the synthesis remains robust and assertions that the synthesis has disintegrated.

## S\&TS 465 Scientific Rhetoric in Historical Perspective (also History 465 and Communication 465)

Spring. 4 credits. No prerequisites
P. R. Dear, B. Lewenstein.

Exploration of the development of scientific discourse since the Scientific Revolution, with special emphasis on understanding the rhetorical purposes served by differing forms and techniques. Readings will include classics from Newton, Darwin, Einstein, and others, along with representative samples of more routine scientific communications. Students will prepare brief reports during the semester and a final term paper.

## [S\&TS 478 The Art of Scientific Biography

Spring. 4 credits. Intended for seniors and graduate students. Not offered 1994-95
L. Pearce Williams.]
[S\&TS 482 The Origins of Modern Science 1500-1700 (also Mistory 482)
Spring. 4 credits. Not offered 1994-95. P. R. Dear.]

## [S\&TS 525 Seminar in the History of

 TechnologyFall. 4 credits. Not offered 1994-95. R 2:30-4:30. R. Kline.
Exploration of the history of technology in Europe and the United States from the eighteenth century to the present. Typical topics include the industrial revolution in Britain, the emergence of engineering as a profession, military support of technological change, labor and technology, the "incorporation" of science and engineering, technological utopias, cultural myths of engineers and inventors, social aspects of urbanization in the city and on the farm, post-war consumerism, and gender and technology. The interests of students and recent literature in the field will be considered in selecting the topics for the seminar.]

## S\&TS 680 Seminar in Historiographical Approaches to Sciences (also History 680)

Fall. 4 credits.
T 2:30-4:30. P. R. Dear.
Examines philosophical, sociological, and methodological dimensions of recent historiography of science.
[S\&TS 687 Seminar in the History of Agricultural Sciences
Fall. 4 credits. Permission of instructor required. Not offered 1994-95.

Hours to be arranged. M. W. Rossiter. Weekly readings and a research paper.

## Philosophy

S\&TS 205 Ethics Issues in Health and Medicine lalso Biology and Society 205 and Biological Sciences, General 205)
Spring. 4 credits. Limited to 75 students. Registered students not attending the first week will be dropped from the course. Open to sophomores, juniors, and seniors.

T R 8:40-9:55. Staff.
We examine ethical problems that emerge from cases of health care and search for practical solutions, while also delving deeper into understanding the nature of ethical responsibility and the tools of ethical analysis. This is a "lab" course in philosophy, with considerable work-both individually and in groups-on specific cases, problems, and fundamental ethical questions. Major sections include: life, death, reproduction and ethics; concepts of health care; health care and society; and research. Note: A more detailed description of this course is available in the Biology and Society office, 275 Clark Hall.

## S\&TS 206 Ethics and the Environment (also Biology and Society 206 and Biological Sciences General 206)

Fall. 4 credits. Limited to 50 students. Open to all undergraduates; permission of instructor required for freshmen.

T R 11:40-12:55. N. Sethi.
We address how ethical analysis helps shape our responses to environmental problems. Case studies will help guide our assessments. This is a "lab" course in philosophy: you will be challenged to develop ethical solutions or approaches on your own and in groups. Major aims include: articulating the relationships between knowledge and values; and
distinguishing between ethics and economics, ecology, ideology, politics, and prudence or wisdom. A background in basic ecology OR environmental issues OR ethics is strongly recommended. Note: A more detailed description of this course is available in the Biology and Society office, 275 Clark Hall.

## S\&TS 286 Science and Human Nature (also Philosophy 286)

Spring. 4 credits.
M W F 10:10-11:00, plus disc. R. N. Boyd. An examination of attempts in the biological and social sciences to offer scientific theories of human nature and human potential and to apply such theories to explain important social and psychological phenomena. Topics vary, and may include issues in psychology, such as behaviorism, Freudianism, and artificial intelligence, or issues in the foundations of historical theory, such as methodological individualism and economic determinism, as well as relevant issues in the biological sciences.

## S\&TS 381 Philosophy of Science:

 Knowledge and Objectivity (also Philosophy 381]Fall. 4 credits.
W 7:30-9:30 p.m., plus discussion.
R. N. Boyd.

An examination of central epistemological and metaphysical issues raised by scientific theorizing: the nature of evidence; scientific objectivity; the nature of theories, models, and paradigms; and the character of scientific revolutions. In addition to the contemporary literature in the philosophy of science, readings are also drawn from the history of science and from the works of classical modern philosophers such as Locke, Hume, and Descartes.

## S\&TS 384 Philosophy of Physics (also Philosophy 384)

Fall. 4 credits.
M W F 10:10-11:00. J. P. Jarrett.
An introduction to issues arising in a philosophical examination of modern physical science. Relevant aspects of classical statistical mechanics, relativity theory, and quantum mechanics will be considered in connection with such topics as microphysical indeterminateness, probabilistic laws, causality, the direction of time, action-at-a-distance, and scientific explanation.
[S\&TS 389 Philosophy of Science: Evidence and Explanation (also Philosophy 389)
Spring. 4 credits. Not offered 1994-95. R. W. Miller.]
[S\&TS 471 Science Reliability and Authority
Fall. 4 credits. Not offered 1994-95. W 1:25-4:25. Staff.]
[S\&TS 472 Biology and Philosophy
Spring. 4 credits. Not offered 1994-95. Staff.]
[S\&TS 481 Problems in the Philosophy of Science (also Philosophy 481)
Spring. 4 credits. Not offered 1994-95.
J. P. Jarrett.J

## S\&TS 661 Reason, Truth, and Science

 (also Philosophy 661)Spring. 4 credits.
W 4:30-6:30. R. Miller.
This seminar will discuss recent work on truth, rationality, and objectivity, including the work of Hilary Putnam. We will look at some

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leading current discussions of what makes a belief rational, what determines its content, what is involved in asserting its truth, and the implications of each of these questions for our access to mind-independent facts. These investigations will include current responses to scientific realism, especially recent efforts to reject both realism and anti-realism as these positions are standardly conceived. (Open to advanced undergraduates.)

## Social Studies of Science

S\&TS 114 FWS: Ecology and Social Change (also Biology and Society 114)
Spring. 3 credits.
T R 1:25-2:40. P. Taylor
The central question of this seminar is: What ecological and social principles can guide our interventions within nature? We examine fundamental ecological ideas such as food chains and webs, ecosystem, feedback stability and disturbance, and we consider the ways they have been drawn into discussions of social-environmental issues related to desertification, famines, rainforest destruction, global warming, economic growth, colonialism, and so on. Through a structured sequence of written assignments, students are encouraged to work the ideas into their own thinking. Readings include pieces by Wolf, Carson, Odum, Glantz, Cronon, Williams, Watts, Hecht and Cockburn, and Pearce.
[S\&TS 118 Civilizing Nature: Race, Gender, and the Cultural Politics of Science (also Biology and Society 118)
Spring. 3 credits. Not offered 1994-95 T R 1:25-2:40. K. Philip.]

## S\&TS 119 FWS: The History and Politics

 of Scientific MethodFall. 3 credits
T R 1:25-2:40. W. Lynch

## SaTS 121 FWS: Designing Future Generations (also Biology and Society 121)

Fall. 3 credits
M W F 11:15-12:05. T. Steen
This course will focus on eugenics, the "improvement" of future generations through the selection of a "superior" breeding pool. We will study the comparative history of eugenics in several countries. First, students will develop a basic knowledge of the topic. Later in the course, we will raise more specific questions. How has the idea of "eugenicsscience" been used to justify racism, nationalism, and class discrimination? Currently, a new concept, "new eugenics," is being discussed. Therefore, we will also discuss the question of whether or not the idea of eugenics has changed since the birth of molecular biology. By the end of the course, students will develop a thorough understanding of eugenics, and will be able to think critically about it from their own perspective.
[S\&TS 123 FWS: Biology on Women and Women in Biology (also Biology and Society 123 and Women's Studies 123)
Spring. 3 credits. Not offered 1994-95.]
S\&TS 124 FWS: Technoculture (also Biology and Soclety 124) (pending EPC approval)
Spring. 3 credits.
S. Cole.

It is a common cultural assumption that new technologies are changing the way humans
relate to their machines, themselves, and one another. The Internet, genetic engineering, artificial intelligence, nanotechnology, virtual reality, space travel, "smart" weapons, and new reproductive technologies are only a few of the emerging technological developments that are currently provoking discussion of the relationship between humans and machines In this course, we will read a wide variety of responses to new technological developments both historical and current. We will examine a variety of fiction and non-fiction genres including history, philosophical tracts postmodern academese, epic journalistic narratives, engineers' reflections, futurology, political arguments, Luddite rants, and science fiction novels and films in order to probe the question of what it means to write about technology. Writing assignments will explore some of these genres with the goal of developing a style conducive to writing about technology. Readings will include Samuel Butler, Lewis Mumford, Buckminster Fuller Walter Benjamin, Kurt Vonnegut, Samuel Florman, Alvin Toffler, and William Gibson.

## S\&TS 136 FWS: From Sand Drawing to Super Computers: Toward an Anthropology of Writing

Spring. 3 credits.
M. Stark
[S8TS 167 FWS: Science in and out of Lab (also Biology and Society 167) Fall. 3 credits. Not offered 1994-95.
T R 2:55-4:10. Staff.]

## [S\&TS 181 Engineering in Context (also

 Engineering 181)Fall. 3 credits. No prerequisites. Illustrated and multimedia laboratory. Not offered 1994-95.

T R 1:25-2:40. R. Lance.
A first course in fundamental engineering principles designed to introduce engineering and other majors to the traditions and practices of the engineering profession and their effect on our culture. (An engineering literacy course for non-engineers.) Development of scientific and engineering design principles in a variety of technological contexts. Overview of the development of engineering as a profession and the evolution of the design process. The relationship between science, technology, and engineering. Civil, mechanical, electrical, chemical, and other engineering project case studies. Information technologies and the implications and use of information technologies in society.]

## S\&TS 350 Atomic Consequences: The Incorporation of Nuclear Weapons in Postwar America (also Government 305)

Spring. 4 credits.
T R 2:55-4:10. M. Dennis This course will explicate the development of atomic weapons from early twentieth-century ruminations about super bombs in science fiction through the Manhattan Project, the postwar development of thermonuclear weapons and civil defense, and more recent plans for strategic defense. Our focus will expand to cover the lives of researchers at such institutions as Los Alamos during and after W'orld War II as well as discussions of national politics. Other topics include the Nazi effort to develop an atomic bomb, the role of technical espionage during and after World War II, and the problems posed by the classification of technical knowledge. We will
seek to understand how the bomb became part of American culture through the use of literature and film, as well as readings in primary historical documents and secondary analyses.

S\&TS 352 Science Writing for the Mass Media (also Communication 352)
Fall. 3 credits. Not open to freshmen. limited to 25 students. Prerequisite: one college writing course.

Lecs, M W 9:05. Lab, F, TBA
B. V. Lewenstein.

How to write about science, technology, and medicine for the mass media. Discussion topics include accuracy, simplicity, comprehensiveness, risk communication, and the history and social structure of science. Weekly writing assignments focus on writing news and feature stories for newspapers and magazines, with excursions into newsletters, radio, TV, and other media.

## [S8TS 360 Ethical Issues in Engineering (also Engineering 360)

Spring. 3 credits. Open to juniors and seniors. Not offered 1994-95.
R. Kline.]

## S\&TS 390 Science in the American Polity, 1800-1960 (also Government 309)

Fall. 4 credits.
T R 2:55-4:10. M. Dennis.
How did America become a leading nation in scientific and technical research? This course charts the development of American science from its origins in gentlemanly societies in the early nineteenth century through the development of large-scale federally funded research or Big Science. Particular attention will be paid to the importance of government patronage in creating new social and intellectual spaces for research; the importance of medicine and the biomedical disciplines for the development of universitybased research; the origins and expansion of research in corporations; and the role of war in the political economy of American science.
S8TS 391 Science in the American Polity, 1960-Now (also Government 309)

Spring. 4 credits
T R 10:10-11:25. S. Jasanoff.
This course reviews the changing political relations between science, technology and the state in America from 1960 to the present. It focuses on the politics of choices involving science and technology in a variety of institutional settings, from Congress to courts and regulatory agencies. The tensions and contradictions between the concepts of science as an autonomous republic and as just another special interest provide the central theme for the course. Topics addressed will include research funding, technological controversies, scientific advice, citizen participation in science policy, and the use of experts in courts.

S\&TS 400 Components and Systems: Engineering in a Social Context (also Mechanical and Aerospace Engineering 400)
Spring. 3 credits. Open to junior-level (and more advanced) students in the physical sciences and engineering areas. Offered alternate years. Next offered 1996-97
Z. Warhaft.

This course will address, at a technical level, broader questions than are normally posed in the traditional engineering/physics curriculum.

Through a series of case studies we will investigate the various interactions between the scientific, technical, political, economic, and social forces that are involved in the development of engineering systems. A central theme will be to contrast the micro and macro aspects of engineering. Much technical education is involved with the components (gears, turbines, integrated circuits) rather than with the system as a whole (the aerospace plane, power stations, ballistic missile defense) and here we will show that new issues, even at the purely technical level, arise as components are built up into systems. Some dichotomies to be explored will be pure vs. applied science, non-military vs. military technology and independent vs. biased decision making and we will discuss how these have been blurred in recent years.

## S\&TS 401 Biology and Society: The Social Construction of Life (also Biology and Society 301 and Biological Sciences 301)

Fall. 4 credits. Prerequisite: one year of introductory biology. Limited to 75 students M W 2:30-4:25. P. J. Taylor.
Controversial issues, past and present, in the life sciences and tools for analysis of the social, historical, and conceptual underpinnings of these issues. Topics include evolution and natural selection, heredity and genetic determinism, biotechnology and reproductive interventions, ecology and environmental change. Analytic themes include bias, metaphor, historical semantics, styles of explanation, determinism, causality, interest, social construction, and gender. Through discussions and writing assignments, students will develop analytic skills and their own responses to current issues.
[S\&TS 402 Investigative Research on the Social Impact of Science (also Biology and Society 300, Textiles and Apparel 301)
Spring. 4 credits. Prerequisite: one year of science and prior consultation with the instructors. Offered alternate years. Next offered 1996.
P. J. Taylor and P. Schwartz

Students choose a current issue in the social impact of biological or physical sciences and work through the steps of investigation from issue definition to spoken presentations and proposals for action. In a workshop setting, students comment on and learn from each other's projects and discuss case studies and articles, with occasional guest speakers and films.]

## [S\&TS 406 Biotechnology and Law (also Biology and Society 406)

Fall. 4 credits. Limited to 16 students Recommended: a course in genetics or rDNA, a course in American government or law, or permission of instructor. Fee for course reading material. Not offered 1994-95. S. Jasanoff.

Biotechnology, with myriad applications in areas such as medicine and agriculture, is developing more rapidly than the social institutions that are capable of controlling it. This course explores the use and potential abuse of biotechnology in areas such as genetic screening and counseling, reproductive technologies, intentional release of genetically engineered organisms, patents, and ownership of human tissue. Particular attention will be given to evolving legal and management strategies for regulating the
applications of biotechnology. Readings are from science, medicine, law, and public policy. A research paper is required.]

## [S\&TS 407 Law, Science and Public Values (also Government 407 and Biology and Society 407)

Fall. 4 credits. Not offered $1994-95$.
T R 1:25-2:40, plus disc. S. Jasanoff.
This course explores the varied interactions between science and the legal process that have developed in recent years as a result of attempts to bring greater public accountability to the use of science and technology. It examines the activities of both legislatures and courts in controlling science and analyzes the values underlying these initiatives. Three major types of science-law interactions form the focus of the course: expert testimony in the courtroom, regulation of hazardous technologies, and legal control of professional standards in science and medicine. Specific topics include the regulation of toxic chemicals and nuclear power, controversies about biotechnology, reproductive technologies and biomedical research, and scientific misconduct.]

## S\&TS 412 The Politics of the Human

 BodySpring. 3 credits
H. Gottweis.

This course discusses the political character of scientific and technological interventions in the human body. We will examine the history of the control of sexuality and reproduction and then focus on the following intersections between politics, body, gender and technology: contraception, AIDS, in vitro fertilization, abortion, embryo research, prenatal screening, gene therapy, and birth technologies.
Students will be encouraged to do small fieldwork projects based on interviews and written sources.

## [S\&TS 415 The Politics of Technical Decisions (also City and Regional Planning 541 and Government 628)

Fall. 4 credits. Not offered 1994-95.
M. Dennis.

Political and social aspects of decision making in technical areas. Examines the historical origins and characteristics of "technical politics," the role of experts in government, and the problem of expertise in a democratic system. Explores the politics and social dimensions of artifacts and cultures as well as government.]

## S\&TS 425 Global and Domestic

 Dimensions of Science and Technology Policy (also Government 468)Fall. 4 credits. Instructor permission for upper-level undergraduates.

M 1:25-4:25. H. Gottweis.
This course examines the global/domestic interface of contemporary science and technology policy. The development of science and technology is increasingly shaped by national as well as transnational forces, such as strategic alliances between companies and supranational institutions like the European Community. Furthermore, many scientific and technological projects, such as the damming of rivers in India or nuclear power generation in the United States, encounter social resistance on a regional level. Is a coherent national science and technology policy possible in this field of apparently centrifugal forces? What values and "philosophies" could guide a socially responsible
science and technology policy in the postcold war era? These questions will be at the center of the course. We will approach the normative questions by looking at the evolution of science and technology policy in a comparative perspective covering the U.S., Japan, Europe, and various Third World countries.

## S\&TS 427 Politics of Environmental Protection in America (also Government 427)

## Fall. 4 credits.

M W F 1:25-2:15. S. Jasanoff. An introduction to the distinctive feature of environmental protection in America, focusing particularly on the role of law, science, and citizen activism in public policymaking. Readings from law, political science, and policy analysis will examine the changing role of expert agencies, courts, public interest groups, Congress, and the states in environmental politics since the late 1960 s. Case studies of specific environmental controversies (nuclear power, siting, pesticides, endangered species) will be used to explore dominant public conceptions of risk and safety, regulatory costs and benefits, and the goals and instruments of environmental policy.

## [S\&TS 431 Introduction to Science and Technology Policy (also Government 401)

Fall. 4 credits. Not offered 1994-95.
M W F 1:25-2:15. H. Gottweis.
Politicians, lobbyists, party strategists, social movements, and other political actors have an important influence on the development of science and technology. At the same time scientific discourse and technological opportunities exert significant impact on politics. The course focuses on this dynamic interrelationship between science, technology, and politics. It provides an introduction to various theoretical approaches and concepts in science and technology policy studies and their application to empirical research. Student research teams will conduct case studies in fields such as technology policy, energy policy, environmental policy, and health policy. Geographically the emphasis will be on the U.S., but case studies on Canada, Japan, Europe, and third World countries will also be included.]

## S\&TS 442 The Sociology of Science

 (also City and Regional Planning 442 and Biology and Society 342)Spring. 4 credits.
T R 10:10-11:25. S. Yearley.
A view of science less as an autonomous activity than as a social institution. We will discuss such issues as controversies in science, analysis of scientific text, gender and the social shaping of scientific knowledge.
S\&TS 465 Scientific Rhetoric in Historical Perspective (also History 465 and Communication 465)
4 credits. No prerequisites.
Spring. P. R. Dear, B. V. Lewenstein.
S\&TS 466 Public Communication of Science and Technology lalso Communications 466)
Fall. 3 credits. Limited to 15 students. Prerequisite: Comm 352 or 360 , or Engineering 350 , or permission of the instructor

W 1:25-4:25. B. Lewenstein. Explore the structure, meanings, and implications of "public communication of science and technology (PCST). Examine the contexts in which PCST occurs, look at
motivations and constraints of those involved in producing information about science for nonprofessional audiences, analyze the functions of PCST. Tie existing ideas about PCST to general communication research, and learn how to develop new knowledge about PCST. Course format is primarily seminar/ discussion.

## [S\&TS 467 Innovation: Theory and Policy

Spring. 4 credits. Open to upper-level undergraduates and any interested graduate students. Prerequisite: Economics 102 or permission of the instructor. Not offered 1994-95.
J. Reppy

Innovation, that is (the introduction of new technology into practice) is a cause of economic growth and social change. In this course we will study the innovation process through the critical analysis of selected theories of innovation and supporting empirical evidence. Economic theories will be contrasted to the insights to be found in science and technology studies. The focus will be on the context of interests and ideology in which the various theories have been framed and their differing implications for technology policy. Authors to be covered include Schumpeter, Solow, Scherer, Nelson and Winters and Bijker and Pinch.]

S8TS 469 Food, Agriculture, and Society (also Biology and Society 469 and Biological Sciences 469)
Spring. 3 credits. Prerequisite: an introductory ecology course or permission of instructor. Limited to 20 students. S-U grades optional.

T' R 1:25-2:40. A. G. Power. A multidisciplinary course that deals with the social and environmental impact of food production in the United States and developing countries. Agroecosystems of various kinds are analyzed from biological, economic, and social perspectives. The impacts of traditional, conventional, and alternative agricultural technologies are critically examined in the context of developed and developing economies. Specific topics include pest management, soil conservation, plant genetic resources, biotechnology, and sustainable development.

## S\&TS 483 The Military and New

 Technology (also Government 483)Fall. 4 credits. Limited to 20 students.
T R 10:10-11:25. J. V. Reppy
In conventional wisdom, military organizations are seen paradoxically both as inflexible institutions and as proponents and consumers of rapid technological change. In this seminar we will examine changes over time in the attitude of the military toward new technology and analyze compering explanations for these changes. Readings will include John Ellis, The Social History of the Macbine Gun; and Donald MacKenzie, Imrenting Accuracy: An Historical Sociology of Nuclear Missile Guidance

## S\&TS 503 Professional Practice in Engineering (also Civil and

 Environmental Engineering 503)
## Spring. 3 credits

W. R. Lynn.

Financial, legal, regulatory, ethical, and business aspects of enginecring practice are examined in detail. Students are expected to develop their understanding of the interrelationships among the physical, social,
economic, and ethical constraints on engineering design.

## [S\&TS 532 Inside Technology: The

 Social Construction of Technology Spring. 4 credits. Not offered 1994-95T. J. Pinch.

Rather than analyze the social impact of technology upon society, in this course we will investigate how society gets inside technology. In other words, is it possible that the very design of technologies embody assumptions about the nature of society? And, if so, are alternative technologies possible which embody different assumptions about society? Do engineers have implicit theories about society? Is technology gendered? How can we understand the interaction of society and technology? Throughout the course the arguments will be illustrated by detailed examinations of particular technologies, such as the ballistic missile, the bicycle, the electric car, and the refrigerator.]

## [S\&TS 626 Workshop on Law, Science, and Technology (also Government 626)

Spring. 4 credits. Prerequisite: Gov 407/ S\&TS $407 /$ B\&Soc 407 or S\&TS 442/CRP 442 , B\&Soc 342. Not offered 1994-95.
S. Jasanoff.

Legal proceedings provide a powerful mechanism for deconstructing, and to some extent reconstructing, a society's understanding about the nature and social role of expertise. the boundaries of science and technology, and the meaning or validity of scientific "facts." Using a combination of primary legal materials and theoretical studies in science and technology, this course will explore how varying scientific realities are constructed in legal forums and what impact these constructions have on the social relations of science and technology. The course will also consider the policy implications of conflicting legal and scientific approaches to the discovery and verification of scientific facts.]

## S\&TS 627 Comparative Methods in Policy Analysis (also Government 627)

## Fall. 4 credits.

W 9:05-12:05. S. Jasanoff
Comparisons, at levels of analysis ranging from individual biographies to national decisionmaking, have emerged as an imporant methodological approach in policy analysis. Focusing primarily on historical and social studies of science and technology, this course seeks to enhance the student's ability to carry out effective comparative analyses at a variety of research sites including laboratories, regulatory agencies, and new social movements. Work in structuralist as well as post-structuralist idioms will be examined in order to sharpen and refine notions such as national styles and political culture that have loomed large in the comparative literature on the politics of science and technology Topical areas will include military research, biotechnology, and environmental controversies.

## [S\&TS 631 Qualitative Research Methods for Studying Science <br> Spring. 4 credits. Not offered 1994-95.

T. J. Pinch.

Much has been learned about the nature of science by sociologists and anthropologists donning lab coats and studying scientists in action. In this course we will look at the
methods used in this new wave of science studies. We will examine what can be learned by interviewing scientists, from videos and from detailed examinations of scientific texts. Scudents will gain hands-on experience by conducting a mini-project in which they investigate some aspect of scientific culture.]

## S\&TS 645 Genetic Engineering: Politics

 and Society in Comparative Perspective (also Government 634) Spring. 4 credits. Instructor permission for upper-level undergraduates.W 9:05-12:00. H. Gottweis.
Today genetic engineering is a standard technology used in many laboratories throughout the world. However, since its development, genetic engineering has been a passionately debated technology, creating high hopes for some and deep anxieties for others. This course will trace the conflicts and power struggles over genetic engineering from its origins to the present. We will use genetic engineering as a case to discuss some crucial issues in the relationships among science, technology, and politics: the political shaping of modern biology; the relationship between eugenics and molecular biology; the regulation of risks; the state and modern biotechnology; university-industry relationships; agriculture and biotechnology; the rise of bioethics; social movements, Green parties and technology; the socioeconomic impacts of genetic engineering; the Third World and biotechnology. We will discuss how modern society deals with high-risk/high-impact technologies and explore the question of the adequacy of the political-legal framework of contemporary "risk-society."

## [S\&TS 660 Social Analysis of Ecological Change (also Biology and Society 460 and Rural Sociology 660)

Fall. 4 credits. Prerequisite: one year of science. Limited to 20 graduate students and seniors with permission of instructor. Offered alternate years. Next offered Fall 1995.

## P. J. Taylor.

Scientific studies of ecological and social processes, together with interpretation of those studies by historians, sociologists, and anthropologists. Topics include ideas of nature, colonial conservation science, systems ecology, the tragedy of the commons, neoMalthusianism, human ecology, local knowledge, nomadic pastoralism, political ecology, women and eco-development, and global environmental discourse.]

## S\&TS 662 Science and Social Theory

 Fall. 4 credits. Limited to 15 students. Offered alternate years.T 9:05-12:05. P. J. Taylor.
Theme for 1994: Changing Life in the Old and New World Dis/orders: Relationships between, on one hand, changes in the ways society has been naturalized and nature socialized and, on the other, the wider social transformations that have taken place this century

## S\&TS 688 International Environmental Policy (also Government 687)

## Spring. 4 credits.

W 2:30-4:25. S. Jasanoff.
This course examines the emergence of the environment as an important item on the political agendas of nations and the evolution of national and international policy responses to environmental issues. Analytically, the course attempts to define the distinctive characteristics of environmental policy and
politics in our time and to identify the factors that promote convergences and divergences among different national approaches to the same environmental problems. The scope of the course is therefore both cross-national and international, embracing developing as well as industrialized countries. Particular attention is given to the role of legal and scientific institutions, processes, and instruments in the resolution of environmental controversies Among the specific issues to be considered are chemical control, risk communication, export of hazards, stratospheric ozone depletion, and global climate change.

## S\&TS 711 Introductory Seminar in Science and Technology Studies

Fall. 2 credits. S-U grades only. Incoming S\&TS graduate students must take this course W 4:30-6:35. H. Gotweis.
This introductory course is designed for incoming graduate students and will run as a weekly seminar. It will serve as a forum for discussion of the main perspectives and approaches in S\&TS as represented by current departmental faculty. Every week a different S\&TS faculty member will introduce a discussion of one of their own pieces of writing. It is expected that all members of the seminar will have read the piece beforehand. One faculty member will be appointed to coordinate the seminar. Other interested faculty and graduate students are encouraged to attend. The seminar will be pass/fail only for two credits. A pass will be awarded to students who satisfactorily attend and participate in the seminar.

## S8TS 751 Ethical Issues and Professional Responsibilities (also Biological Sciences 751 and Toxicology 751)

Fall or spring. 1 credit. Limited to graduate students beyond first year Sem, W 2:30-4:15 (ten weeks). Additional sections may be offered. Organizational meeting: Fall, W, August 31, 3:35 p.m.; Spring, W January 25, 3:35 p.m.
J. Fessenden MacDonald

Ethical issues and integrity in research, and the professional responsibilities of scientists are discussed in a case studies format. Topics to be discussed include regulations, data selection, manipulation, and representation; fraud, misconduct, and whistle-blowing: conflicts of interest and commitment; authorship, ownership, and intellectual property; peer review, privacy and confidentiality; scientific response to external pressure, legal liabilities, and professional codes of ethics.

## Independent Study

S\&TS 399 Undergraduate Independent Study
Fall or spring. 1-4 credits Staff.
Please apply in 275 Clark Hall.
S\&TS 699 Graduate Independent Study Fall or spring. 2-4 credits. Staff.
Please apply in 275 Clark Hall.
S\&TS 700 Special Topics, Spring 1995Visualizing the Dynamics of Science Spring. 4 credits. T 9:05-12:05. P. Taylor.
This course examines visual (pictorial and diagrammatic) versus contrasting textual representations in science, and recent innovations in science studies for mapping the
processes of and influences on scientific practice. Students will evaluate different interpretations and methods in the light of a semester-long practical project developing and refining their own maps of episodes of science.

## Biology and Society Major

The biology and society major is ideally suited for students who wish to combine training in biology with exposure to perspectives from the social sciences and humanities on the social, political, and ethical aspects of modern biology. In addition to providing foundational training in basic biology, biology and society students obtain background in the social dimensions of modern biology and in the biological dimensions of contemporary social issues.
The biology and society major is offered to students enrolled in the College of Arts and Sciences and the College of Human Ecology. Undergraduates in the College of Agriculture and Life Sciences can develop an approved sequence of courses from the biology and society curriculum under general studies. The major is coordinated for students in all colleges through the biology and society office. Students can get information, specific course requirements, and application procedures for the major from the office in 275 Clark Hall, 255-6042.

A cletailed listing of Biology and Society course offerings can be found in the Courses of Study section entitled Special Programs and Interdisciplinary Studies.

## Concentration in Science and Technology Studies

S. Jasanoff, chair; R. Boyd, Philosophy; P. Dear, History; M. A. Dennis, Science and Technology Studies; H. Gottweis, Science and Technology Studies; J. Jarrett, Philosophy; R. Kline, Electrical Engineering; B. Lewenstein, Communications; W. R. Lynn, Civil and Environmental Engineering; R. Miller, Philosophy; T. Pinch, Science and Technology Studies; A. G. Power, Ecology and Systematics; M. Rossiter, Science and Technology Studies; P. Taylor, Science and Technology Studies; and L. P. Williams, emeritus, Science and Technology Studies.

The undergraduate concentration in Science and Technology Studies (S\&TS) is designed for students who wish to engage in a systematic, interdisciplinary exploration of the role of science and technology in modern societies. The concentration is intended for students with varied academic interests and career goals. It offers majors in the natural sciences and engineering an opportunity to explore the social, political, and ethical implications of their selected fields of specialization. At the same time it offers students majoring in the humanities and social sciences a chance to study the processes, products, and impacts of science and technology from varied disciplinary perspectives. Drawing on course offerings in several departments, programs, and colleges, the S\&TS concentration permits students to develop an individualized program of study closely related to their major field. S\&TS courses are organized into three areas: history, philosophy, and social studies of science and technology.
To satisfy the requirements for the S\&TS concentration, students must complete with
letter grades a minimum of four courses selected from the course offerings listed for the major. At least one course should be chosen from the list of core courses. The remaining three courses should be chosen in consultation with an S\&TS faculty adviser and must be drawn from at least two of the three areas.

Interested students may obtain further information about courses by contacting Walter Lynn, faculty adviser, 255-1177 or the S\&TS undergraduate office, 275 Clark Hall, 255-6047.

## SOCIOLOGY

E. Bell, R. L. Breiger, S. Caldwell, S. Han, D. P. Hayes, S. Kanazawa, R. McGinnis, P. Moen, V. Nee, B. C. Rosen, D. Stark, D. Strang, J. M. Stycos, H. A. Walker, R. M. Williams, Jr.

The subject matter of sociology is human social organization and institutions. The Department of Sociology offers courses in social organization that include (among other issues) examination of inequality on the basis of race, ethnicity, income, and occupation; political behavior and public policy; relations and affect in small groups; and contemporary social movements for change. Courses that analyze institutions include the family, politics and issues of public policy, the analysis of voluntary organizations, and the study of networks of political and organizational action.

The Department of Sociology offers the opportunity to develop fundamental theoretical insight and advanced research skills appropriate for the study of social behavior and institutions. Graduates of the department cake up careers in university, government, and business settings and in law, management, architecture, and other professions seeking men and women who demonstrate a disciplined understanding of society and social issues.

## Sociology Courses for Honmajors

The social sciences provide students with particularly effective ways to understand the complexities of modern life. For many students, the undergraduate years are a last opportunity to gain the insights these fields have to offer. The Department of Sociology is continuing to design an array of beginning and advanced courses that convey a broad understanding of the methods and insights of sociological analysis-courses that will be of particular interest to undergraduates who may not major in sociology. First- and second-year students should note that the introductory courses (101, 103, 110, 115) provide substantial focus on the sociological analysis of major issues of public life. A wide selection of general education courses is available at the 200 level. Advanced undergraduates who are majors in other fields should also see, in particular, the descriptions of Sociology 303, 340,354 , for which there are no prerequisites other than junior or senior status.

## Related Courses in Other Departments

Students interested in sociology should consult the course lists of the other social science departments in the College of Arts and Sciences (including Anthropology, Economics,

Government, and Psychology) and of these other departments: Organizational Behavior (College of Industrial and Labor Relations), Human Development and Family Studies (College of Human Ecology), and Rural Sociology (College of Agriculture and Life Sciences)

## The Major

Requirements for general sociology: (1) 101 and any other 100 -level course (excluding Freshman Writing Seminar) with a 2.5 minimum grade-point average; (2) no later than the junior year, the 301 and 303 methods courses; (3) one course in the department at the 400 level or higher ( 491 is recommended); and (4) 20 additional credits in sociology, of which 9 may be taken in related departments if approved by the student's adviser.
Requirements for honors: Potential honor students are encouraged to begin taking the methods and statistics courses during their sophomore year and to take at least 2 credits of Sociology 491, Independent Study, during their junior year. Honors students take Sociology 495-496 during their senior year. Graduation with honors requires a cumulative average of at least $B+$ in all sociology courses and the successful completion of an oral defense of the honors thesis. Interested students should consult the director of undergraduate studies no later than the second semester of their junior year.
Cornell-in-Washington program. Qualified sociology majors may include a semester in the Cornell-in-Washington program, in which students take courses and undertake a closely supervised internship. For further information, see p. 19.
Supervised research. Qualified sociology majors are invited to participate with faculty members in conducting research. Such projects are usually initiated in one of two ways: the student may offer to assist the faculty member in an ongoing project, or the student may request that the faculty member supervise the execution of a project conceived by the student. In either case the student should enroll in Sociology 491. Interested students may direct inquiries to any faculty member.

## Society and Economy Concentration

Sociology majors or students in other disciplines who wish to prepare for graduate study in any of the social sciences or in a profession (business, management, or law) may elect to acquire a concentration in society and economy (including international dimensions). This program is designed to provide training in economic sociology, formal organizations, and social science methods. The requirements for the concentration in society and economy include courses in economic sociology, formal organizations, and methods. For further information, consult Professor Victor Nee, 330 Uris Hall.

## Introductory Couses

## SOC 101 Introduction to Sociology

## Fall and spring. 3 credits.

Fall, H. A. Walker; spring, S. Caldwell. This course provides an introduction to theory and research in sociology. It demonstrates how the insights, theories, and methods of sociological analysis can be brought to bear on major issues of social life. A primary goal is to convey a sense of the manner in which
sociologists formulate theories and how the collection and analysis of data are used to evaluate those theories. The course will provide "hands-on" experience in analyzing sociological issues. Students undertake guided research exercises that involve using computers to analyze actual data. No prior background is presumed; necessary skills are covered in class and section meetings.

## SOC 103 Introduction to Sociology: Microsociology

Fall. 3 credits.
D. P. Hayes

An introduction to microsociology, focusing on social processes within small groups, including the family. Emphasis is on leadership, conformity, social influence, cooperation and competition, distributive justice, and micro analyses of interaction.

## [SOC 110 Introduction to Economy and

 SocietySpring. 3 credits. Not offered 1994-95. V. Nee.

Modern social thought arose out of attempts. to explain the relationship between economic development and the social transformations that gave rise to the contemporary world. Classical theorists from Karl Marx and Max Weber to Karl Polanyi focused their writings on emergent capitalist economies and societies. Contemporary social theorists likewise have sought to understand the interaction between capitalism and the social forces reacting against and emerging from modern economic development. From exchange and rational choice theories to network analysis and institutional theory, a central theme in contemporary social thought has been the relationship between the economy and society, economic action and social structure, rationality and fundamental social processes. This course provides an introduction to social thought and research seeking to understand and explain the relationship between economy and society in the modern era.]
[SOC 115 Utopia in Theory and Practice Spring. 3 credits. Not offered 1994-95. D. Strang.

This course examines imaginings of the "ideal society" and efforts to realize them. We discuss the classic literary utopias, from Plato's Republic to More's Utopia to Bellamy's Looking Backward, and also the dystopias of Huxley and Orwell. We also examine social experiments like the nineteenth-century American intentional communities, various socialisms, and the design of contemporary political constitutions. Throughout, the emphasis is on two sociological questions. What leads people to conceive of particular social arrangements as ideal? How can we tell social structures that can work from those that cannot?]

SOC 204 Race and Ethnic Relations
Fall. 4 credits. Prerequisite SOC 101, SOC 103, or R SOC 101.
H. A Walker.

This course focuses on race and ethnic relations in contemporary perspective. It examines the social and behavioral implications of attributions of race and ethnicity in small group interaction, the world of work. and the larger society. Topics: inequalities in income and employment, affirmative action, ethnic political mobilization, patterns of marriage and family formation.

## General Education Courses

SOC 215 Organizations: An Introduction Spring. 3 credits.
S. Han.

This is an introductory course in the study of organizations. We will start by taking a look at various examples of organizing, including a street gang in a Boston neighborhood, General von Moltke's Prussian army, a government agency, and an industrial corporation. These brief glimpses serve as exercises in looking behind and beyond diverse rhetoric for common patterns in organizational phenomena. We will consider these both from the inside and outside perspectives. The focus of the course is upon research scholarship, not the training of managers. Nonetheless, the analytical skills you will acquire are applicable to work in firms, government agencies, and nonprofit organizations.

## SOC 222 Social Policy and Organization in Mealth, Education, and Welfare

## Fall. 3 credits.

D. Strang.

Introduces the development of three central kinds of social policy: those concerned with delivering medical care, schooling the young, and providing resources for the economically vulnerable. The course treats the historical development of large-scale public programs, regulatory systems, or attempts to stimulate provide action; political struggles over social rights and the allocation of resources; and the organizations that are constructed to carry out policy. The focus is on American policy, but with considerable comparative attention to the health, education, and welfare programs of other nations.

## SOC 230 Knowlege and Power

## Spring. 3 credits.

D. Stark.

Modernity will be studied in this course by examining dual aspects of the rationalization of power 1) as attempts to bring ever-larger spheres of social action under rationalized control, and 2) as the production of rationalized justifications by which power is represented and legitimated. These processes will be examined in three historical settings:
Frederick Winslow Taylor's schemes of "scientific management" at the turn of the century in the United States; the Leninist project of "scientific socialism" in Eastern Europe; and the International Monetary Fund's current project of "scientific capitalism" in contemporary post-socialist societies. Our century begins and ends with blueprints for making capitalism by design-but whereas Taylor's project was attempted in the microsphere at the level of the firm, current recipes attempt to shape entire national economies by making capitalism according to a plan.

## SOC 245 Inequality in Industrial

 SocietiesFall. 3 credits. E. Bell.

Some degree of inequality among individuals exists in all modern industrial societies, inequality that is related to class, race, gender, and other social characteristics. This class focuses on the social systems that generate this inequality. We will learn how to analyze and interpret the processes that generate social stratification, drawing on aleernative theoretical viewpoints to aid in our understanding. Readings include both sociological classics such as Karl Marx and Max Weber as
well as more recent writings from authors such as William Wilson and Pierre Bourdieu. We will focus primarily on industrial societies such as the United States, Japan, and Western Europe, but will also consider evidence on inequality from some countries currently undergoing industrialization such as China

## SOC 265 Hispanic Americans (also HASP 265)

Spring. 3 credits (4-credit option available) H. Velez.

Exploration and analysis of the Hispanic experience in the United States. An examination of sociohistorical background and economic, psychological, and political factors that converge to shape a Hispanic group identity in the United States. Perspectives are suggested and developed for understanding Hispanic migrations, the plight of Hispanics in urban and rural areas, and the unique problems faced by the diverse Hispanic groups. Groups studied include Mexican Americans, Dominicans, Cubans, and Puerto Ricans.

## [SOC 275 Women at Work (also Women's Studies 275)

Spring. 3 credits. Not offered 1994-95. E. Bell.

Women have always contributed their labor to production and reproduction. With industrial development and the movement of market production out of the home and into the public sphere, however, women's work was relegated to the private sphere of the family. Recently this has changed as women seek employment outside the home. We will examine women's position and the role women play in the labor force, looking at clata from both developed and developing societies. Specific topics will include sex differences in pay and sex segregation in the labor force, theoretical explanations from rational choice to Marxist feminism, the relationship between women's paid and unpaid labor, and the role of the state and government policy.

SOC 283 Groups and Relationships (also Psychology 283)
Spring. 4 credits
S. Kanazawa.

We will tackle the mysteries of human behavior and pursue a single question throughout this course: Why do human beings behave the way they do? We will first discuss several celebrated examples of seemingly unusual and bizarre lehavior and then try to explain these with the help of selected social psychological theories: behaviorism, attribution theory, exchange theory and game theory. The emphasis will be on the application of the theories to explain empirical examples of human behavior.

## [SOC 290 Social Psychology of Interpersonal Relations

Spring. 3 credits. Not offered 1994-95. H. A. Walker.

The focus of this course is on the relationship between the individual and the social group. It will examine the way in which the individual shapes "society," and in turn, how society influences individual behavior. Topics include formation of self, influence and conformity, and the emergence of racial and gender differences in status and power.]

## Methods and Statistics Courses

SOC 301 Evaluating Statistical Evidence Fall. 3 credits.
R. L. Breiger.

A first course in statistical evidence in the social sciences, with emphasis on statistical inference and multiple regression models. Theory is supplemented with numerous applications.
SOC 303 Design and Measurement
Spring. 4 credits. Prerequisite: a course in sociology.
D. P. Hayes

Foundations of sociological analysis; issues arising from using humans as data sources; the quality of our primary data; methods of its collection; research designs in wide use and their limitations; pragmatic considerations in doing research on humans, organizations, communities, and nations

## Intermediate Courses

[SOC 310 Sociology of War and Peace Fall. 4 credits. Not offered 1994-95.
R. M. Williams, Jr

Every human group, community, or society presents many examples of altruism, helping, cooperation, agreement, and social harmony. Each grouping or society also manifests numerous examples of competition, rivalry, opposition, disagreement, conflict, and violence. Both conflict and cooperation are permanent and common aspects of the human condition. Collective conflicts, especially wars and revolutions, are frequent and dramatic events. But "peace" and "war" are equally active social processes, not passive happenings. This course describes various commonly accepted but erroneous notions of the causes and consequences of war and deterrence. It deals with the major theories concerning the sources of war in international and intranational social systems. The last half of the course analyzes the modes, techniques, and outcomes of efforts to restrict, regulate, and resolve international conflicts.)

## SOC 340 Health, Behavior, and Health Policy

Spring. 3 credits
S. B. Caldwell

This course examines the social contexts of physical and mental health, illness and medical care; its purpose is to explore the contributions of social science to health promotion and health policy. Topic areas include: social context of health, disease and illness; social organization of health services; use of health services; effectiveness of health service use; health promotion and disease prevention; and national health care policies
[SOC 345 Gender Inequality
Fall. 3 credits. Not offered 1994-95.
H. A. Walker

Gender inequality in contemporary perspective; emphasis on social origins of gender categories and implications of gender status for collective and individual behavior. Topics include inequalities in interpersonal relations, the family and work organizations, and implications of gender inequality for family violence, sexual harassment, and rape.]

## [SOC 351 Research Seminar on

 Organizations4 credits. Not offered 1994-95. D. Strang.

This course will be structured around a group research project on organizations in the local
area. Students will help to design the research strategy, conduct the research, and interpret their findings. An introduction to sociological theory and research on the role of organizations in modern life.]

## SOC 354 Law and the Social Order

 Spring. 3 creditsR. L. Breiger.

In what ways, if any, do laws and legal institutions make a difference to people who have disputes? How did lawyering come to be a modern profession? How do business organizations deal with legal ambiguity in constructing symbols of compliance with laws? How do networks of interpretive communities structure the authority of law? By exploring selected topics such as these, we seek to understand the distinctive contributions of sociology to the study of law and the social order.
[SOC 366 Transitions From State Socialism
Fall. 4 credits. Not offered 1994-95. D. Stark.

This course examines the rise, stagnation, and eventual fall of state socialism in East Central Europe. It compares the emergence of spheres of social activity autonomous from the state in Poland, Hungary, and Czechoslovakia and analyzes the problems and prospects of democratic consolidation and economic transformation.]

## SOC 393 Introduction to Peace Studies

 (also Government 393)Fall. 4 credits.
R. M. Williams, Jr.

This course serves as an introduction to the study of war, peace, and peacemaking. We will study different theories of peace and war from a variety of disciplinary perspectives. The course will cover definitions of peace and war, causes of conflict, and modes of conflict prevention and resolution. The concepts will be applied to a range of historical and current conflicts. Students will prepare analyses of specific conflicts or instances of peacemaking for class presentation.

## Advanced Courses

The following courses are intended for advanced undergraduates with substantial preparation as well as for graduate students in sociology and related disciplines. The normal prerequisite for all 400 -level courses is one introductory course plus 301 (or an equivalent statistics course). Students who are not sure whether their background is sufficient for a particular course should consult the professor in charge.

## [SOC 420 Mathematics for Social

 ScientistsFall. 2-4 credits. Not offered 1994-95. R. McGinnis.

Elementary matrix algebra, probability theory, and calculus.]

## SOC 426 Social Policy

Fall. 4 credits.
S. B. Caldwell.

The dramatic growth of the policy research sector as an institutional and intellectual force signals a changing relationship of social science to social policy in the United States. With an eye on that relationship, this course examines the development of social policy in selected areas, among them welfare, poverty, housing, crime, and health. The policy research sector itself-people, values, and institutions-is also surveyed.

SOC 434 The Sociology of Reproduction (also Women's Studies 435)
Spring. 4 credits.
E. Bell.

Women's biological potential to bear children and their childbearing experiences are socially constructed. The social context of women's reproductive capacity is one area in which women themselves are socially defined, and therefore within this realm exists the potential to control women through the control of reproduction and childbirth. We will examine the social construction and control of reproduction using both empirical findings and theoretical arguments. Specific topics include: historical trends in fertility; the medicalization and medical control of conception and childbirth; biological versus social definitions of women as mothers; the role of state policy; and theoretical explanations of reproduction and gender stratification
SOC 444 Contemporary Research in Social Stratification
Fall. 4 credits
R. Breiger

Stratification and mobility as paired concepts, requiring mutual articulation. The interplay of structure (occupational groups, labor markets, organizational demographics, social classes) and process (tracking, career trajectories, socioeconomic attainment). Recently formulated log-linear models of mobility and structure provide a central focus of the course.

## SOC 463 Political Sociology

Fall. 4 credits
S. Kanazawa

The entire course will revolve around one question-the Hobbesian problem of order: How can a collection of egoistic human beings manage to cooperate with each other to produce social order? We will survey existing theories of social order and discuss their problems. Over the course of the semester, we will attempt to build a new theory that can satisfactorily explain empirical variations in the levels of order in different societies. Topics will include the problem of cooperation in dyads and small groups, the production of group solidarity, and the role of the state in the production of societal order.

## SOC 470 Different Walks of Life: Sociology of Careers <br> Fall. 4 credits.

S. Han.

By examining various career paths, we will consider the implications of career as a continuous process or as a sequence of positions. We will explore the differences and similarities among different career paths and lay out the patterns and structures of the career fommation from a sociological point of view. We will also discuss the settings in which the career development takes place, giving some comparative attention to the ways of organizing careers in other societies.
soc 491 Independent Study
Fall or spring. 1-4 credits. For undergraduates who wish to ohtain research experience or to do extensive reading on a special topic. Permission to enroll for independent study will be granted only to students who present an acceptable prospectus and secure agreement of a faculty member to serve as supervisor for the project throughout the term. Graduate students should enroll in 891-892.

SOC 495 Honors Research
Fall or spring. 4 credits. Limited to sociology majors in their senior year. Prerequisite:
permission of instructor.
Hours to be arranged. Staff.
SOC 496 Honors Thesis: Senior Year Fall or spring. 4 credits. Prerequisite: Sociology 495.

Hours to be arranged. Staff.
SOC 497 Social Relations Seminar (also Anthropology 495)
Spring. 4 credits. Limited to seniors majoring in social relations.

Hours to be arranged. Staff.

## Graduate Core Courses

These courses are primarily for graduate students in sociology but may be taken by other graduate students with permission of the instructor. Graduate students in sociology will normally take each of the five courses listed below, but with the concurrence of their special committees other arrangements may be made

## SOC 501 Basic Problems in Sociology

 Fall. 4 credits.D. Stark.

Analysis of theory shaping current sociological research. Examination of several central problems in sociological inquiry provides an occasion for understanding tensions and continuities between classical and contemporary approaches, for indicating the prospects for unifying microsociological and macrosociological orientations, and for developing a critical appreciation of efforts to integrate theory and research.

## SOC 502 Basic Problems in Sociology II

 Spring. 4 credits.H. A. Walker.

Continuation of Sociology 501. Emphasis is on the logical analysis of theoretical perspectives, theories, and theoretical research programs shaping current sociological research. The course includes an introduction to basic concepts used in the logical analysis of theories and examines their application to specific theories and theoretical research programs. Strategies include functionalism, social exchange, and interactionism.

## SOC 505 Research Methods I: Logic of

 Social InferenceFall. 4 credits. Prerequisite: a first course in statistics and probability
E. Bell

This course is an introduction to techniques of social inference. We will cover research methods, sources of evidence, model design, and questions of empincal validity.

## SOC 506 Research Methods in Soclology II

Spring. 4 credits. Prerequisite: Sociology 420 or 505 or equivalent.
S. Han.

A survey of methods for analyzing sociological data, including measurement error models, confirmatory factor analysis, panel models, and general structural equation methods. Readings from the sociological research literature will illustrate various methods. Periodic assignments on micro and mainframe computers will integrate theory, method, and data.

## SOC 507 Research Methods in

 Sociology IIIFall. 4 credits. Prerequisite: Sociology 506. S. B. Caldwell.

Models and methods for the analysis of social dynamics. The course presents discrete-time methods for the analysis of time series and longitudinal clata.

## Graduate Seminars

These seminars are primarily for graduate students but may be taken by qualified advanced undergraduates who have permission of the instructor. Which seminars are to be offered any term is determined in part by the interests of the students, but it is unlikely that any seminar will be offered more frequently than every other year. The list below indicates seminars that are likely to be offered in 1991-92, but others may be added and some may be deleted. Students should check with the deparment before each term.
[SOC 510 Comparative Societal Analysis Fall. 4 credits. Not offered 1994-95.
D. Stark.

This course examines contending analytic strategies for comparing institutions (and institutional configurations) across societies and social systems. How, for example, does the institutional analysis of the socialist economy contribute to our understanding of the specificities of modern capitalism? Special emphasis will be given to comparing transitions from state socialism (in Eastern Europe and elsewhere) with transitions from authoritarianism in Latin America and Southern Europe.]

## [SOC 513 Social Networks and Social

 StructureSpring. 4 credits. Not offered 1994-95.
R. L. Breiger.

A critical survey of theories and techniques of structural analysis in sociology, centering on the usefulness of social network analysis in providing integration of studies at different levels of generality. Applications in the areas of the sociology of organizations, community studies, social stratification, and dependence relations among nations. Emphasis on the mutual relevance of theories and operational research procedures.]

## [SOC 515 New Institutional Theory

Spring. 4 credits. Not offered 1994-95. V. Nee.

This seminar examines and assesses arguments about the role of social, political, and economic institutions in the social sciences. A defining feature of new institutional theory is the view that institutions help shape the parameters of choice and thereby guide action. The sources of new institutional theory and recent work in the social sciences are considered, but the primary aim of the seminar is to identify the mechanisms that link informal and formal institutions to ongoing social relationships. The course seeks to outline a new synthesis that unifies three domains of sociological analysis: institutions, networks, and action]

## SOC 524 Rational Choice Theory

## Spring. 4 credits

S. Kanazawa.

Rational choice perspective has gained popularity in all social sciences. The main focus in this course will be sociological rational choice, although we will discuss the work of economists, political scientists, psychologists, and others where relevant. We
will first discuss the foundations of rational choice as a macro-sociological perspective, and emphasize the deductive derivation of various rational choice theories from this perspective. We will discuss the pioneering work of Coleman Hechter and willer as well as the more recent work by Heckathorn, Macy, Jasso, and others. We may have some guest speakers to talk about their current research.

SOC 526 Social Policy (also SOC 426) Fall. 4 credits.
S. Caldwell.
[SOC 540 Organizational Research
Fall. 4 credits. Not offered 1994-95.
D. Strang.

This seminar focuses on contemporary sociological research on organizations. It centers theoretically on the interplay of institutional, ecological, and economic accounts of social structure and social action. Broad subject matter includes organizational birth and mortality, the sources of organizational structure, interorganizational relationships, and stratification and mobility within organizations.]

## SOC 583 Transitions to Market Economies in Eastern Europe (also Management NRE 583)

Spring. 4 credits
D. Stark.

This course examines the problems and prospects of transitions to markets in Eastern Europe. It introduces concepts for understanding the state socialist economy that is being transformed and analyzes important political developments since 1988. Topics include privatization, joint ventures, new capital markets, entrepreneurship, and labor relations in these changing economies.

SOC 591 Special Seminars in Sociology Fall and spring. 2-4 credits. Staff
These graduate seminars will be offered irregularly. Topics, credit, and instructors will vary from semester to semester. Students should look at the sociology department bulletin board at the beginning of each semester for possible offerings.

## SOC 606-607 Sociology Colloquium

Fall and spring. No credit. Required of all sociology graduate students.

Staff.
A series of talks representative of current research interests in sociology, given by distinguished visitors and faculty members

## SOC 608 Proseminar in Sociology

Fall. One credit. Enroliment restricted to first-semester sociology graduate students. Staff.
Discussions on the current state of sociology and on the research interests of the member of the field, given by members of the field.

## SOC 683 Social Interaction (also Psychology 683)

Spring. 4 credits.
D. P. Hayes.

Seminar: topic to be announced.

## soc 891-892 Graduate Research

 891, fall; 892, spring. Up to 4 credits each term, to be arranged. Prerequisite: graduate status and permission of a faculty member willing to supervise the projectSOC 895-896 Thesis Research
895 , fall; 896 , spring. Up to 6 credits each term, to be arranged. Prerequisite: permission of thesis director.

## Summer Session

The following courses are frequently offered in the summer session, though not necessarily by the same instructor as cluring the academic year. Not all of these courses will be offered in a particular summer. Information regarding these courses and additional summer session offerings in sociology is available from the department.

SOC 101 Introduction to Sociology
SOC 103 Introduction to Sociology: Microsociology

SOC 104 Race and Ethnicity
SOC 283 Groups and Relationships

## SPANISH LANGUAGE

See Department of Modern Languages and Linguistics.

## SPANISH LITERATURE

See Department of Romance Studies.

## SWAHILI

See Africana Studies and Research Center.

## SWEDISH

See Department of Modern Languages and Linguistics.

## TAGALOG

See Department of Modern Languages and Linguistics.

## TAMIL

See Department of Modern Languages and Linguistics.

## THAI

See Department of Modern Languages and Linguistics.

## THEATRE ARTS

## Theatre, Film, and Dance

B. Levitt, chaimm; R. Archer, D. Bathrick, S. Brookhouse, J. Chu, J. Devenyi, M. Dewey, D. Feldshuh, A. Fogelsanger, D. Fredericksen, J. E. Gainor, P. Gill, K. Goetz, K. Grant,
D. Hall, C. Hatcher, M. Hays, J. Johnson, P. Lillard, J. Morgenroth, C. Orr Brookhouse, M. Rivchin, J. Self, B. Suber, A. Van Dyke and R. Wilson

Through its courses and production laboratories, the department provides students with a wide range of opportunities in theatre, dance, and film. It offers a theatre arts major with concentration in theatre or film and a major in dance. These majors educate students in accordance with the general liberal arts ethic of the college. The programs in dance and film and the advanced undergraduate theatre program give some measure of professional preparation in those arts as well. The department encourages academic and studio participation by students from all disciplines and also provides the Cornell community with an opportunity to take part in its productions on an extracurricular basis.

## Theatre Arts Major

## Theatre Concentration

The theatre concentration offers studies in the history of theatre, dramatic theory and criticism, playwriting, acting, directing, design technology, and stage management.

## Course requirements for <br> theatre concentration:

Credits

1) THETR 240 and THETR 241 (twosemester introduction to theatre) 8

THETR 250 Introduction to Theatre Design and Technology
THETR 280 Introduction to Acting 3
2) Four laboratory courses
distributed as follows: Credits
THETR 151 Production Lab I 1-3
THETR 153, THETR 253, or
THETR 353 Stage Management Lab I, II, or III 1-3

THETR 155 Rehearsal and Performance or THETR 151 in a different area 1-3
THETR 251 or THETR 351
Production Lab II or III
3) Four courses in the area of Theatre Studies (see Theatre Studies section of theatre courses) chosen in the following manner:
one course must be at 300 level
one course must be at 400 level
two additional courses at the 300 or above level
one of the four courses must be pretwentieth century.
4) Three courses (at least 9 credits) in other Theatre Arts courses chosen in consultation with the faculty advisor. Course taken to qualify for admission to the Advanced Undergraduate Theatre Program (described below) may also be used to fulfill this requirement.
5) Courses in which a student receives a grade below "C" cannot be used to fulfill the requirements for a Theatre Arts major

## The Advanced Undergraduate Theatre Program

The department offers advanced study in acting, directing, playwriting, design/ technology, and stage management to students who qualify on the basis of outstanding achievement in course work. Criteria for admission to the AUTP is by the completion of the appropriate "track" of courses and invitation of the faculty. The program provides students with intensive study in theatre as well as the opportunity to collaborate with professional faculty and guest artists. Department productions will be chosen to offer a unique experience to the individual student selected for the program. (For specific requirements please see listing of courses at end of deparment listings.)

## Film

The study of film began in this department in the 1930s and continues to be based here. In the interim years, however, it has also spread into a significant number of other departments in the college: Africana studies, anthropology, Asian studies, comparative literature, English, German studies, history, psychology, and romance studies. This proliferation of courses has been accompanied by a comparable proliferation of perspectives and faculty concerns, e.g., the relationship of national cinemas to national literatures and specific cultures, film's relationships to myth and ideology, the use of film as historical evidence, film's efficacy as a rhetorical medium, and film's contribution to perennial issues in aesthetics, the history of the arts, and studies in cognition.
This richness of courses and perspectives is matched by the ways in which students may make film the focus of their undergraduate studies. The four ways currently being used are as follows: 1) concentrating on film within a Theatre Arts major; 2) constructing an individually tailored Independent Major in film (including the possibility of placing film in tandem with another medium or discipline); 3) focusing on film as a College Scholar; and 4) concentrating in Visual Studies. Students interested in option 4 should consult Marilyn Rivchin (Theatre Arts) and/or Robert Ascher (Anthropology). Students interested in options 2 or 3 should consult Don Fredericksen (Theatre Arts) and Lynne Abel (director, College Scholar and Independent Major programs). Students interested in the first option should first consult Alison Van Dyke (director, Undergraduate Studies, Theatre Arts) and then one of the department's film faculty.

## Film Concentration Requirements

The department's film concentration requires a total of 50 credits in film and related courses. Students should note that a number of film courses-including two required "core" courses: Theatre Arts 375 and 376-are offered in alternating years. This means that students cannot fulfill the requirements for the major in less than two years, and that they should plan accordingly, in consultation with their major adviser. Within the "core" required courses, Theatre Arts 274 , Introduction to Film Analysis, should be taken during the sophomore year.

Majors wishing to fully utilize the courses in the production sequence must plan carefully. The following sequence is recommended for such students: Theatre Arts 377, Fundamentals of 16 mm Filmmaking, in the fall, junior year; and Theatre Arts 477, Intermediate Film and Video Projects, in fall, senior year. Enroliment in Theatre Arts 477 is competitive and not guaranteed.

1. A core of four film courses:

THETR 274 Introduction to Film Analysis
THETR 375 History and Theory of Commercial Narrative Film
(offered alternate years)
THETR 376 History and Theory of
Documentary and Experimental Film (offered alternate years)
THETR 377 Fundamentals of 16 mm Filmmaking
2. One of the following theatre courses:

THETR 250 Fundamentals of Theatre
Design/Technology
4
THETR 280 Introduction to Acting
THETR 398 Directing I
(prerequisite THETR 280)
3
3. Four courses (15-16 credits) in film offered by Theatre Arts as below, or by other departments (with consent of adviser):
THETR 290 Filming Other Cultures
3
THETR 313 Japanese and Asian Film
4
THETR 378 Soviet Film of 20s
and French Film of 60 s
(offered alternate years)
THETR 379 Documentary Film from
1945 to present
(offered alternate years)
THETR 383 Screenwriting
THETR 389 Luis Bunuel and
the Cinema of Poetry
(offered occasionally)
4
THETR 396 German Film (offered occasionally)
THETR 413 Film and Performance
THETR 475 Seminar in the Cinema I (offered alternate years)

THETR 476 Seminar in the Cinema II (offered alternate years)
THETR 477 Intermediate Film and Video Projects
THETR 493 Advanced Film Production (summer only)
THETR 653 Myth onto Film
4
4) 15 credits of related coursework inside or outside of Theatre Arts (as approved by adviser). The courses chosen to fulfill this requirement should reinforce the student's particular interest in film, and will not necessarily be film courses per se. For example, a student interested in the psychology of film, or in ethnographic film, or in film vis-a-vis intellectual or social history, will be encouraged to choose "related course work" accordingly.
5) With a grade of less than $C$, a course cannot be used toward the concentration.

## Film Study Abroad

The College of Arts and Sciences, through this department and in consort with a number of other colleges and universities, offers up to a full year of study at the Inter-University Center for Film and Critical Studies in Paris, France. The center's program is theoretical, critical, and historical. It is most useful to students pursuing a major in film studies and serves as an intensive supplement to their Cornell film courses. Fluency in French is required, and Theatre Arts 274 and 375 are prerequisites. Inquiries should be addressed to Professor Fredericksen, Comell's liaison with the center.

## The Dance Program

The dance program offers courses in dance technique, improvisation, composition, performance, anatomical analysis of movement, and the history, theory, and criticism of dance. Technique courses include modern dance at four levels and ballet at three levels. Other dance forms, such as tap, historical dances, Japanese Noh, Indian, Javanese, and African dance are offered on a rotating basis. Courses in jazz. and ballroom dance, taken through the Physical Education program, supplement these offerings. Technique classes develop strength, flexibility, coordination, and the ability to perceive and reproduce phrases of dance movement with clarity of rhythm, body design, and expression. The more advanced courses require the ability to perform complex phrases in various styles. Students may earn up to eight academic credits (one each semester) in technique classes. Students may also satisfy the physical education requirement by taking dance technique classes in the dance program. The schedule for all dance technique classes is available in the main office of the Center for Theatre Arts. Registration for technique classes takes place in Teagle Hall. Students taking technique for academic credit must also register through their own colleges.
The faculty offer rehearsal and performance workshops in which they choreograph and rehearse original dances, performed in public concert. Admission to rehearsal and performance classes is by audition. Students may receive one academic credit (S-U grades only) when performing in student-faculty concerts by registering for THETR 155.

## The Dance Major

To be admitted to the major, students must have completed two technique courses in modern dance or ballet at level II or above, Theatre Arts 233 or 305 (Explorations in Movement and P'erformance) and Theatre Arts 210 (Beginning Dance Composition and Music Resources). It is also recommended that Theatre Arts 201 (Dance Improvisation), Theatre Arts 250 (Fundamentals of Theatre Design and Technology) and Music 105 (Introduction to Music Theory) be taken before the junior year. The following requirements are expected of the major.

## Prerequisites for the Major:

THETR 210 Beginning Dance Composition and Music Resources
THETR 233 or 305 Explorations in Movement and Performance
Two technique courses in modern dance or ballet at level II or above

Requirements for the Major:
Credits
Music 105 Introduction to Music
Theory (or substitute at the
appropriate level)
ONE course in historical dance, tap, jazz, a non-western form, folk dance, or ballroom dance

TWO semesters each of ballet and modern dance (in addition to the prerequisite)
THETR 155 Rehearsal and Performance
THETR 201 Dance Improvisation
THETR 250 Fundamentals of Design and Technology
THETR 310-311 Intermediate Dance Composition
THETR 312 Physical Analysis of Movement
THETR 314-315 Western Dance History 8
THETR 410 Advanced Dance
Composition
THETR 418 Seminar in History of
Dance (or other 400-level academic dance course)
THETR 491 Senior Project

Students will be expected to perform in at least two concerts and to present at least two of their own dances, in addition to the senior project.

## Department Courses:

See individual sections for: Freshman Writing Seminars; General Survey Courses; Theatre Studies; Acting; Directing; Playwriting; Design; T'echnology; Stage Management; Independent Study, Internships and Honors; Film; Dance.

## FRESHMAN WRITING SEMINARS

THETR 108 Writing about Film
Summer. 3 credits. Offered occasionally. Staff.

## THETR 110 Topics in the Cinema

Fall and spring. 3 credits.
M W F 10:10-11:00. V. Begley. Topic for 1994-95: Broadway and Hollywood: Theatre and Film in America. Hollywood occasionally turns to "proven," commercially successful plays as raw material for marketable films. This course will examine the politics and process of film adaptation, the ambivalent relation of Hollywood to Broadway, and the larger question of how mass culture makes use of marginal cultural forms. In addition, we will focus on different ways of thinking and writing about performance, text, and film. Materials will probably include: Norman's Night Mother, Hare's Plenty, Lucas' Prelude to a Kiss, and Mamet's Glengarry Glen Ross.

## THETR 120 Enfants Terribles:

Rebellious Youth on Stage
Spring. 3 credits.
M W F 12:20-1:10. R. Bechtel
Throughout history, in many of the world's most controversial dramatic texts, playwrights have thrust young heroes and antiheroes center stage. By focusing on such plays as The Orestia, Hamlet, Spring Awakening, Mrs Warren's Profession, and Oleanna, among others, this course will explore such themes as innocence, rebellion, and rebirth, and how
these themes are achieved through representations of youth. The plays will be treated in their historical context in order to understand the social and cultural forces that prompted the playwrights to address such themes and informed their creation of juvenile characters. In turn, the theatrical presentation of these plays in their historical moment will also be examined to determine their effect on the cultural and social climate of the period.

## [THETR 130 American Myth in Drama

 Fall. Not offered 1994-95.Staff.]
[THETR 140 From Script to Stage
Fall and spring. 3 credits. Not offered 1994-95.]

## [THETR 150 Other Voices in American

 DramaFall and spring. 3 credits. Not offered 1994-95.]

THETR 160 Writing in the Theatre
Fall and spring. 3 credits.
M W F 9:05-9:55. M. Leon
Topic for 1994-95: Producing Culture: Theatre in America Today. This course will explore key material features of producing professional theatre in America today. Organized along axes of venue (Broadway, regional, university) and financial structure (commercial, not-for-profit), this course will examine a select group of American theaters with the explicit aim of exploring a larger concern, namely, the relationship between material forces and cultural product. Issues to be addressed include the nurturing of playwrights and development of new plays, National Endowment for the Arts and related funding controversies, and non-traditional casting policies. We will read a number of recent plays-not only for the content of the dramas themselves, but with a critical eye toward the life of their production of the American (and sometimes British) stage. In addition to writing assignments during the course of the semester covering the topics outlined above, students will be asked to write a final research paper involving the case study of a theatre or production of their choice.

## THETR 170 Writing about the Theatre

## Fall. 3 credits

T R 10:10-11:25. J. E. Gainor.
Writing about the theatre entails much more than composing the scathing reviews for which drama critics are notorious. We will consider theatre from many angles: its place in cultural history, literary elements of dramatic texts, the theatrical production and its components. Focusing on the three main productions in the Theatre Arts department during the semester, we will explore numerous perspectives on performance, and by seeing the dramas and meeting with artistic personnel, we will develop a fuller understanding of the multiple positions from which we can critique and discuss the theatrical event.

## THETR 180 Asian-American Drama

Fall and spring. 3 credits.
T R 11:40-12:55. C. Conceison.
What does it mean to be Asian American? We will explore this question through examination of selected plays written by Asian American playwrights. Topics will range from the history and status of Asians and Asian Americans in the U.S. to issues of current concern in the Asian American community
both nationally and at Cornell. We will read works by Frank Chin, Velina Hasu Houston, David Henry Hwang, and Genny Lim among others. Writing assignments will include analytical papers, theatre reviews, short scenes, and journal entries. Attendance at selected Asian American Playhouse productions will be required.
[THETR 190 Theatre and Society
Fall and spring. 3 credits. Not offered 1994-95.

Staff.]

## general survey courses

## THETR 230 Creating Theatre

Spring. 3 credits.
T R 8:40-9:55. K. Goetz and faculty. An overview course introducing students to the collaborative art of theatrical production. Students will explore theatre backstage and onstage and learn about the perspective of the audience. Through lectures, demonstrations, discussion with faculty and staff, and attendance at departmental productions, the class will be exposed to a number of theatrical and dance forms.

## THETR 430 Introduction to Theatre

 ManagementSpring. 4 credits. Limited to 15 students. J. E. Gainor.

This class is designed to introduce students to the profession of theatre management. The class will be a project-oriented study of components of the field, such as markering, fundraising, contracts, organizational structures, personnel management, accounting, and box office. The class will use the work of the Center for Theatre Arts as a case study, and faculty and staff of the Department of Theatre Arts will lead sessions on the various topic areas.

## THEATRE STUDIES COURSES

THETR 223 The Comic Theatre (also Comparative Literature 223 and Classics 223) \#
Spring. 3 credits. J. Rusten.

See Classics 223 for course description.
THETR 240 Introduction to Western Theatre 1 \#

## Fall. 4 credits.

T R 10:10-11:25. J. Devenyi.
A survey of the major developments in the theatre-playwriting, acting, staging,
architecture, and dramaturgy - in classical Greece and Rome, medieval and Renaissance Europe. Representative plays will be read and discussed in their theatrical context.

## THETR 241 Introduction to Western

 Theatre II "Spring. 4 credits.
T R 10:10-11:25. J. Devenyi.
A survey of the major developments in the theatre-playwriting, acting, staging, architecture, and dramaturgy-since 1642. Among the areas considered will be French Neoclassicism, the English Restoration, the eighteenth and nineteenth centuries in England, France, and Germany and the modern international stage. Representative plays will be read and discussed in their theatrical context.
[THETR 322 Russian Drama and Theatre (also Theatre Arts 622 and Russian 332/632)
Fall. 4 credits. Not offered 1994-95.
See Russian 332 for description.
[THETR 331 The Classical Theatre (also Comparative Literature 331] *
Fall. 4 credits. Prerequisite: THETR 240 or permission of instructor. Not offered 1994-95 Staff.
This course will look at the major developments in Classical Greek and Roman theatre as well as possible assessments in the light of contemporary theory. Topics may include one or more of the following: the relation of the dramatic festivals to questions of
democracy, the links between the Poetics and subsequent criticism, and more recent critical approaches to the dramatic texts.]

## [THETR 332 Medieval and Renaissance Theatre falso Comparative

 Literature 332) *Fall. 4 credits. Prerequisites: THETR 240 or permission of instructor. Not offered 1994-95. Staff.
Besides the discussion of representative plays from these periods, this class may focus on questions such as the staging of medieval drama, the relation between the church and the community, and the ways in which historians and critics have interpreted the Renaissance, especially in light of Shakespeare's work. Representations of class, race, and gender on stage as well as in the audience will also be examined.]

## [THETR 333 European Drama from the Neo-Classical to the Bourgeois (also

 Comparative Literature 333)Spring. 4 credits. Prerequisite: THETR 240 or 241. Not offered 1994-95.

The course will examine the explosion of dramatic forms and theories in pre- and postrevolutionary Europe. The class will also discuss the ways in which changes in theatre architecture and dramatic structure participate in the dynamics of change in European society that operates between the early seventeenth and the mid-nineteenth centuries.]

## [THETR 335 The Modern and

 Contemporary Theatre (also Comparative Literature 337)Spring. 4 credits. Prerequisites: THETR 240 or permission of instructor. Not offered 1994-95.

Staff.
A study of the drama and its cultural contexts from the late nineteenth century to the present. This course will raise questions about modern as well as postmodern theories of performance and the role of theatre in society. It may also examine western style theatre in non-western settings.]
[THETR 336 American Drama and Theatre (also English 336)
Fall. 4 credits. Limited to 25 students. Prerequisite: permission of instructor. Not offered 1994-95.

Staff.
A survey of twentieth-century American theatre and representative American plays.]

## THETR 337 Contemporary American

 Theatre (also English 337)Fall. 4 credits. Limited to 20 students. T R 1:25-2:40. J. E. Gainor. A survey of American drama and theatre post1960. Particular emphasis will be placed on plays by women and dramatists of color to explore questions of identity and theatrical responses to contemporary American culture.

THETR 372 English Drama to 1700 (also English 372)
Fall. 4 credits.
T R 2:55-4:10. S. McMillin.
See English 372 for description.
THETR 373 English Drama from 1700 to the Present (also English 373)
Spring. 4 credits
T R 2:55-4:10. S. McMillin.
See English 373 for description.
[THETR 431 Theory of the Theatre and Drama (also Comparative Literature 433) \#

Fall. 4 credits. Prerequisite: some theatre history and dramatic literature work at the 300 level or permission of instructor. Not offered 1994-95

Staff.
A survey of dramatic theory and theories of theatrical representation from Aristotle to the present.]
THETR 433 Dramaturgy: Play and Period (also Comparative Literature 443)
Spring. 4 credits. M. Hays.

Inventing the Modern Drama. European theatre between 1870 and 1900 .

## THETR 434 Theatre and Society (also

 English 454)Fall. 4 credits. Prerequisite: permission of instructor or some work in theatre history or dramatic literature at the 300 level.

W 10:10-12:05. M. Hays.
Staging the End of the Century: reflections on American life in the works of Tony Kushner, Anna Smith, Jose Rivera, Paula Vogel, Richard Greenberg, and others.
THETR 435 Special Topics: Theories of Contemporary Performance (also Comparative Literature 436)
Fall. 4 credits. Limited to 15 students Prerequisite: permission of instructor.

T R 2:55-4:10. J. Devenyi.
This course will provide an introduction to performance studies. After a review of the major performance traditions of the late twentieth century, the class will examine the theoretical and practical work of contemporary intemational and American directors, performance groups and artists who, in their mise-en-scene, combine various media

## [THETR 436 The Female Dramatic

 Tradition (also Women's Studies 433)Spring. 4 credits. Not offered 1994-95. J. E. Gainor.

Is there a "female dramaturgy"? What is the female tradition in the theatre? The course will explore these questions through an investigation of texts by women dramatists, including Hrotsvitha, Aphra Behn, and Caryl Churchill, as well as theory by such critics as Sue Ellen Case and Jill Dolan.]

## THETR 437 Seminar in Dramatic

 Criticism (also Theatre Arts 636)Spring. 4 credits. Prerequisite: open to qualified junior and senior departmental majors with permission of the instructor.

## J. Ellen Gainor.

Topic for 1995: Close Reading. Reading as: critic, dramaturg, actor, director. How do we distinguish among these perspectives? Where might they be mutually informing or exclusive? A limited number of texts will be selected for intensive scrutiny.

## [THETR 438 East and West German Drama

Fall. 4 credits. Not offered 1994-95
D. Bathrick.

This course will cover the major historical and textual developments in German theatre from the end of World War II to the present. Leading dramatists from West and East Germany, Switzerland, and Austria (Brecht, Frisch, Durrenmatt, Weiss, Hochhuth, Muller, Braun, Kroetz. Handke, and others) will be treated in the light of the political events and aesthetic-dramaturgical traditions from which they emerge and with which they are taking issue.]

## [THETR 470 The Japanese Noh Theater and Modern Dramatists (also Asian Studies 470 and Comparative Literature 470)

Fall. 4 credits. Alternates with THETR 471 Not offered 1994-95.
K. Brazell.

See Asian Studies 470 for course description.]
THETR 471 Japanese Theatre (also Asian Studies 471) © \#
Fall. 4 credits
T R 2:30-4:25. K. Brazell.
See Asian Studies 471 for course description.

## THETR 600 Proseminar in Theatre

 StudiesSpring. 4 credits. Limited to Theatre Arts graduate students.

TBA. Staff.
An introduction to the theory and methods involved in the study of the theatre as cultural and aesthetic practice.
[THETR 622 Russian Drama and Theatre (also Theatre Arts 322 and Russian 332/632)
Not offered 1994-95
See Russian 322 for description.]
THETR 630 Special Topics: Los Angeles as Cultural Performance [also Comparative Literature 632) Spring. 4 credits
J. Devenyi.

This course will attempt to establish connections between various aspects of contemporary culture in Los Angeles (urbanization, freeway psychology, pop culture, Southern California interculturalism in the theatre, body building, the film industry, etc.), from the point of view of performance. It will also investigate interpretations and representations of Los Angeles with an emphasis on those originating from the East Coast United States and France.

THETA 633 Seminar in Theatre History: The Director's Theatre (also Comparative Literature 634)

## Fall. 4 credits

w 2:00-4:00. M. Hays.
Modern dramaturgy and the rise of the
director, with special emphasis on Pirandello, IBrecht, and Artaud.

## THETR 636 Seminar in Dramatic

Criticism (also Theatre Arts 437)
Spring. 4 credits. Prerequisite: Permission of instructor.
J. E. Gainor.

Topic for 1995: Close Reading. Readings as: critic, dramaturg, actor, director. How do we distinguish among these perspectives? Where might they be mutually informing or exclusive? A limited number of texts will be selected for intensive scrutiny.

THETR 637 Seminar in Dramatic Theory (also Comparative Literature 638)
Spring. 4 credits. Prerequisite: Permission of instructor.
M. Hays.

Disciplining the Spectator. The transformation of Republic world and the rise of the literary eighteenth- and nineteenth-century E゙urope.

## [THETR 641 Dark Employments: The Revolutionary Practice of Romantic Drama (also English 641)

4 credits. Not offered 1994-95.
R. Parker.

See English 641 for description.]

## [THETR 648 East and West German

 Drama: Post-1945 (also German Studies 438)Fall. 3 credits. Not offered 1994-95 D. Bathrick.

This course will cover the major historical and textual developments in German theatre from the end of World War II to the present. Leading dramatists from West and East Germany, Switzerland, and Austria (Brecht, Frisch, Durrenmatt, Weiss, Hochhuth, Muller, Braun, Kroetz, Handke, and others) will be treated in the light of the political events and aesthetic-dramaturgical traditions from which they emerge and with which they are taking issue.]

## THETR 656 Race and Theatre in America

 (also English 656)Spring. 4 credits.
B. Jeyifo.

See English 656 for course description.
[THETR 660 Visual Ideology Ialso Comparative Literature 660 and German Studies 660)
Spring. 4 credits. Not offered 1994-95 G. Waite.

See German Studies 660 for description.I

## [THETR 678 Post-Structuralist Dramatic

 Theory (also Comparative Literature 678)Fall. 4 credits. Not offered 1994-95 J. Devenyi.

This course will investigate trends in dramatic theory since structuralism and discuss their application to dramatic texts and performance from various periods.]

## [THETR 679 Bertolt Brecht in Context

 (also German Studies 679 and Comparative Literature 679)Spring. 4 credits. Requirements: seminar paper that will form the basis for an oral presentation for class discussion. Not offered 1994-95.

## D. Bathrick.

Brecht's theory and dramatic praxis will be examined in the light of a two-fold contexts: (1) the relation of selected plays and writings to the historical contingencies of the Weimar and exile periods in which they emerged; (2) in later periods: an analysis of the reception and various readings (postmodern, feminism, post-structuralism) of these same works by later writers and critical publics in Germany and the United States as a way of understanding the changing nature of aesthetic values in the postwar period. Special attention will be given to the importance of Marxism for Brecht's art, as well as to the author's role as a representative of the cultural avant-garde.]
[THETR 692 The Politics of Criticism (also Comparative Literature 692 and German Studies 692)
Fall. 4 credits. Not offered 1994-95.
D. Bathrick.

See German Studies for description.]

## ACTING

THETR 155 Rehearsal and Performance
Fall or spring. $1-2$ credits. 1 credit per production experience per term up to 2 credits per term. Students must register for the course in the term in which credit is earned; requests for retroactive credit will not be honored. Limited to students who are assigned roles after tryouts at the department's scheduled auditions. Students should add this course only after they have been assigned roles. S-U grades only.

Staff
The study, development, and performance of roles in departmental theatre or dance productions or the study and practice of directing as experienced in assisting faculty and guest directors.

## THETR 205 Rehearsal Workshop

Fall or spring. 2 credits. Limited to 30 students. Prerequisites: participation in a particular department production; and by permission.
$2-4$ hours per week, TBA. Staff. This course will enable students participating in a particular production to gain expertise and/or knowledge to contribute to that production. The focus of the class will depend on the needs of a particular production (history, choreography, textwork, dramaturgy, etc). This class will leverage the experience of participating in a production by allowing students to focus intensely on a particular aspect of that production in a nonpressurized learning environment.

## THETR 280 Introduction to Acting

Fall or spring. 3 credits. Each section is limited to 16 students. Registration only through roster in the department office, Center for Theatre Arts.

01 T R 2:30-4:25 (primarily for prospective majors and those interested in extended study of acting), A. Van Dyke. 02 T R $12: 20-2: 15$, staff. 03 M W 12:20-2:15, staff. 04 M W 2:30-4:25, staff. 05 T R 2:30-4:25, staff. 06 T R 10:10-12:05, staff. 07 M W 2:30-4:25, staff.
An introduction to the actor's technique and performance skills, exploring the elements necessary to begin training as an actor, i.e., observation, concentration, and imagination. Focus will be on physical and vocal exercises, improvisation, and text and character. There is required play reading, play attendance, and some scene study.

## THETR 281 Acting I

Fall or spring. 3 credits. Each section limited to 14 students. Prerequisites: THETR 280 and audition. Registration only through roster in department office, the Center for Theatre Arts. 281 is restricted to sophmores and above.

01 T R 10:10-12:05, A. Van Dyke. 02 M W $12: 20-2: 15$, staff.
Practical exploration of the actor's craft through improvisation and exercises in physical and psychological action. Scene study utilizing the plays of Williams, Inge, and Miller.

## [THETR 282 Introduction to Voice and Speech for Performance

Fall or spring. 2 credits. Not offered 1994-95 Staff.
Study and practice in the development of the speaking voice with emphasis on tone quality, breathing, articulation, and practice of standard American English pronunciation. Some oral interpretation of poetic, narrative, and dramatic text.]

## [THETR 283 Voice and Speech for

 PerformanceSpring. 2 credits. Limited to 12 students. Primarily for department majors. Prerequisites: THETR 282. Not offered 1994-95. Registration only through department roster in the main office of the Center for Theatre Arts. Development of the speaking voice with additional emphasis on dramatic interpretation.]

## THETR 284 Speech and Dialects for

 PerformanceSpring. 3 credits. Limited to 12 students. Primarily for department majors or advance undergraduate training program candidates. Prerequisites: THETR 280,281, and permission of instructor. Registration only through department roster in the main office of the Center for Theatre Arts.

T R 10:10-12:05. A. Van Dyke. Development of speech and dialects in dramatic text.

## THETR 285 Creativity and the Actor

Summer. 3 credits. Limited to 16 students.
M-F. 9-11:30. D. Feldshuh.
Using mime, physical and vocal exercises, karate, Gestalt therapy, theatre games, and Zen meditation, this course will attempt to make the student more aware of how he or she participates in and can influence the creative process of acting and to assist the student toward a greater capacity for stage presence. The course will deal with hindrances to the creative response (stage fright, self-consciousness, mannerisms, physical and vocal tension, emotional blocks), introduce the concepts of energy, stillness, and release, and explore the relationship berween emotion, mind and body structure. It will attempt to give the individual tools with which the student may continue to expand his or her capacity for spontaneous, flexible, and believable acting.

## THETR 287 Summer Acting Workshop

Summer. 3 credits. Limited to 16 students in a section.
An introduction to the processes of acting. Practice in training techniques, rehearsal procedures, and methodology.

## THETR 380 Acting II

Fall. 3 credits. Prerequisite: THETR 281 and audition. Limited to 12 students.

T R 10:10-12:05. R. Wilson. A continuation of Acting 1. Special consideration will be given to a physical approach to characterization utilizing the plays of Chekhov and Ibsen.

## THETR 381 Acting III: Advanced Scene Study

Spring. 3 credits. Prerequisite: THETR 280, 281, 380, and audition. Limited to 10 students.

M W 12:20-2:15. K. Grant.
This course focuses on advanced problems in language and period style (movement, bows, curtsies, and period dances). Monologues and scenes will be drawn from these playwrights: Shakespeare and Moliere.

## THETR 385 Skills, Techniques, and

Physical Approaches to Performance
Spring. 3 credits. Prerequisites: THETR 281 and permission of instructor. Limited to 10 students.

M W 2:30-4:25. R. Wilson.
Physical skills for the actor will be developed through work with LeCoq-based Neutral Mask technique, Commedia Dell-Arte half-mask technique, and basic unarmed stage combat technique

## [THETR 400 Modern Performance Problems

Fall. 4 credits. Prerequisites: THETR 240. 280, 281 and permission of instructor. Limited to 14 students. Not offered 1994-95.
J. E. Gainor and R. Wilson.

This class is a combination of play analysis and performance focused on the special problems of gender issues in modern dramatic material. Playwrights to be studied are Caryl Churchill, Sam Shepard, and Marsha Norman The class will not only deal with some of the plays by these authors, but also critical writing based on their work. Requirements will include the performance of monologues and scenes and the writing of three papers.]

## DIRECTING

THETR 155 Rehearsal and Performance Fall or spring. $1-2$ credits. 1 credit per production experience per term up to 2 credits per term. Students must register for the course in the term in which credit is earned; requests for retroactive credit will not be honored. Limited to students who are assigned assistant director positions after obtaining director's approval. Students should add this course only after they have been given approval. S-U grades only.

Staff.
The study, development, and performance of roles in departmental theatre or dance productions or the study and practice of directing as experienced in assisting faculty and guest directors.

## THETR 398 Fundamentals of Directing I

Fall. 3 credits. Limited to 10 students. Prerequisite: THETR 280 and permission of instructor

M W 12:20-2:15, plus lab W 4:30-6:00. D. Feldshuh.

Focused, practical exercises to teach the student fundamental staging techniques that bring a written text to theatrical life. A core objective of the course is to increase the student's awareness of why and how certain stage events communicate effectively to an audience. Each student will direct a number of exercises as well as a short scene.
THETR 498 Fundamentals of Directing II Spring. 4 credits. Enrollment strictly limited. Prerequisite: THETR 280 and 398 , and permission of instructor. Recommended: THETR 250 and 281.

M W 12:20-2:15 plus lab R 4:30-6:00.
I). Feldshuh.

This course builds on the staging techniques learned in Fundamentals of Directing I. In this course each student will direct a series of projects and public presentations focusing on specific directoral challenges. The student will develop an increased ability to articulate and defend directoral choices and learn to work with actors on a diverse range of material. Directors will cast from a company of actors to be auditioned early in the semester. Each actor in the company will earn one or two credits as part of Theatre Arts 155.02.

THETR 499 Seminar in Directing
Fall or spring. $1-4$ credits. Prerequisites: THETR $240,250,280,398,498$, and permission of instructor.

Hours to be arranged. D. Feldshuh. This seminar will give the student the opportunity to direct a full evening of theatre. It inay also involve an internship with a prominent director on campus and a final paper focusing on a specific aspect of directing.

## PLAYWRITING

[THETR 348 Playwriting
Spring. 4 credits. Limited to 12 students. Registration only through department roster in CTA 225. Not offered 1994-95.

T R 2:55-4:10. R. Wilson.
A laboratory for the discussion of student plays. Following exercises in dramatic structure and technique, students will be expected to complete a one-act play.]

## THETR 349 Advanced Playwriting

Fall. 4 credits. Prerequisite: THETR 348 and permission of instructor.

T R 12:20-2:15. R. Wilson. A continuation of Theatre Arts 348, emphasizing advanced techniques and culminating in the composition of a full-length play.
[THETR 497 Seminar in Playwriting
Fall. 1-4 credits. Prerequisite: THETR 348 and 349 or permission of instructor. Not offered 1994-95.]

## design, technology, and stage MANAGEMENT

## Design

## THETR 250 Fundamentals of Theatre

 Design and TechnologyFall and spring. 4 credits. Not open to first term freshman. Limited to 12 students. Registration only through department roster in CTA 225. A minimum of one credit of Production Lab (THETR 151 or 251) is strongly recommended concurrently.

M W F 12:20-2:15. R. Archer, J. Johnson,
P. Gill, K. Goetz, D. Hall,
C. Orr Brookhouse.

An introduction to design and technology in the theatre. Lectures, discussion, and project work introduce the principles of designing scenery, costumes, lighting and sound, and the technical process of realizing designs on stage. Students are required to purchase materials, which the instructors will specify (approximate cost, $\$ 35$ ).

## THETR 262 Interactive Multimedia and

 Theatre in Social EducationFall and summer. 3 credits. Limited to 10 students.

T R 10:10-12:05. P. Gill.
This course explores digital multimedia as an educational tool. Students create interactive applications that encourage users to develop an awareness of and sensitivity to social issues. An interest in cligital video and computer animation and art and some familiarity with the Macintosh computer are desirable. Equipment maintenance fee (collected in class): $\$ 25$.

## THETR 263 Computer-Aided Design for

 the TheatreSpring and summer. 3 credits. Limited to 6 students.

T R 10:10-12:05. P. Gill and selected
Theatre Arts production faculty and staff.

Through lectures, discussion, and project work, this course will introduce both the application of existing software and the development of new computer-aided techniques to the design process for scenery, costumes, lighting, and sound for theatre. In addition to the use of digital multimedia and three-dimensional photorealistic rendering as design tools, the course will also investigate current performing arts specific software Familiarity with the Macintosh computer is essential

## THETR 343 Costume History: From Fig Leaf to Vanity

Fall. 3 credits. Limited to 20 students
T R 8:40-9:55. C. Orr Brookhouse. Costume History will offer an overview of the history of clothing from the first signs of clothing to the early 20th century. It will investigate personal, social, religious, political, and regional reasons for why and how clothing evolved

## THETR 360 Costume Crafts Studio

Spring. 3 credits. Limited to 10 students.
M W 10:10-12:05. J. Johnson.
This course will provide hands-on experiences for students in the form of a series of workshops conducted by faculty members, visiting artists (from the community, primarily), and class members themselves. Workshops may include mask-making, fabric manipulation, hair and wig care and construction, and millinery. Students will conclude the course by creating a costume utilizing three different techniques from the workshops and/ or one discovered through individual research.

## THETR 362 Lighting Design Studio I: Lighting in the Performing Arts

 Fall and summer. 4 credits. Students are required to purchase lighting software and materials which the instructor will specify (approximate cost $\$ 175.00$ ). Prerequisite: THETR 252 and 340 or permission of instructor. Limited to 6 students.M W 10:10-12:05. I'. Gill. An exploration of the process of seeing, basic theories of color, and the psychological and physical characteristics of light. Through discussion, design projects based on current Cornell productions, a series of projects in the light lah, and an actual dance-lighting design as a final project, this course considers the role of light as a flexible, expressive art medium, its visual elements and dramatic impact, and the intuitive nature of a successful approach to stage lighting.

## THETR 364 Scenic Design Studio

Fall and spring. 3 credits. Students are required to purchase materials which the instructor will specify (approximate cost: $\$ 50.00$ ). Limited to 10 students. Prerequisite: THETR 250 and 340 or permission of instructor.

M W 10:10-12:05. K. Goetz. An exploration of the process of designing scenery for the live theatre. Emphasis on the analysis of the dramatic text, research, and the use of imagery to support dramatic intent of playwright. Class projects will engage students in using a variety of mediums to explore how architecture, the arrangement of space, and elements of interior design are used dramatically. Class activities and projects are designed to encourage the development of stuclent's innate expressive abilities. Experience in theatre production and graphic skills is helpful but not essential. May be repeated for credit.

## THETR 366 Costume Design Studio

Spring. 3 credits. Students are required to purchase materials which the instructor will specify (approximate cost: $\$ 50.00$ ). Prerequisite: Permission of instructor. Limited to 10 students.

T R 10:10-12:05. J. Johnson.
Design of costumes for the theatre, concentrating on script and character analysis, period research, design elements, figure drawing and rendering skills, and understanding production style. May be repeated for credit.
THETR 368 Sound Design Studio
Spring. 4 credits. Limited enrollment to 6 students. Prerequisite: THETR 250 and 252 or permission of instructor. Students are required to purchase supplies (approximate cost $\$ 30.00$ ).

T R 12:20-2:15. C. Hatcher.
The use of sound as a medium of design for the theatre; research and creation of sound score, recording and engineering techniques, live effects and projects in live and studio sound production.

## THETR 462 Lighting Design Studio II:

 Lighting in the EnvironmentSpring. 4 credits. Prerequisite: THETR 362 or permission of instructor. Limited to 6 students.

M W 10:10-12:05. P. Gill.
This course concentrates on the individual development of the lighting designer as a versatile artist. Discussion and guest artist lectures are combined with individual tutorial sessions and various environmental lighting design competition entries tailored to each student. This structure provides students with an opportunity to originate an independent contemporary style of lighting design.
[THETR 464 Scene Design Studio II Fall and spring. 4 credits. Students are required to purchase materials which instructor will specify (approximate cost $\$ 50$ ). Prerequisite: THETR 363 or permission of instructor. Not offered 1994-95.

TBA. K. Goetz.
A continuation of THETR 364. Projects and activities will be tailored to the creative and developmental needs of the individual student with emphasis on maintaining professional standards.

## Technology

## THETR 252 Technical Production

## Studio I

Fall. 3 credits. Limited to 6 students.
T R 2:30-4:25. C. Hatcher.
Stage Lighting and Sound Technology: The practical aspects of lighting and sound technology including equipment setup, engineering, electrics, organization, recording techniques, and production paperwork will be explored through projects, lectures, and class discussions. In addition to twice-weekly class meetings the course requires a laboratory commitment of fifty hours for the semester

## THETR 254 Theatrical Make-up Studio

Fall. 3 credits. Students are required to purchase make-up kits which the instructor will provide (approximate cost $\$ 40.00$ ). Prerequisite: permission of instructor, Limited to 12 students.

T R 2:30-4:25. J. Johnson. Basic techniques of make-up for the stage including corrective, old age, and fantasy; use of prosthetics, wigs, hair and hairpieces.

## THETR 340 Theatrical Drafting and

 Technical Drawing StudioFall. 3 credits. Limited to 6 students. Prerequisite: THETR 250 or permission of instructor.

M W F 9:05-9:55. S. Brookhouse.
Implementation of the fundamentals of drafting and technical drawing. Introduction of the concept of an individual style in the approach to drafting for the theatre. A series of projects to familiarize students with the convention and process of visualization and drafting.

## THETR 354 Stagecraft Studio

Fall. 3 credits. A minimum of one credit of production laboratory (THETR 151 or 251) is strongly recommended concurrently. Prerequisite: THETR 250 or permission of instructor.

T R 10:10-12:05. R. Archer.
An exploration of the techniques and practice of theatre operation, scenic construction, stage mechanics, rigging, painting, and model building.
[THETR 355 Theatrical Make-up Studio II Offered occasionally. 3 credits. Prerequisite: THETR 254 and permission of instructor. Not offered $1994-95$.
This course is designed for the student interested in pursuing the field of makeup as a career. This course is geared toward students who have already displayed a talent for makeup design and application and wish to gain more experience in the related specialty areas of prosthetics, hair, and hairpieces.]

## THETR 356 Costume Construction

 StudioSpring, 3 credits. A minimum of one credit of production laboratory (THETR 151 or 251) is strongly recommended concurrently.
Prerequisite: THETR 250 or permission of instructor. Lab fee of $\$ 25$ to be paid in class.

M W 2:30-4:25. C. Orr Brookhouse. A project/lecture/discussion class in costume research, patterning, cutting, construction, and fitting.

## Stage Management

## THETR 153 Stage Management

 Production Laboratory IFall and spring. $1-2$ credits. May be repeated for credit. Before registering, students must attend orientation meeting in the Proscenium theatre at the Center for Theatre Arts at 7:30 p.m. on the first Tuesday of classes. Prerequisite: permission of instructor.
p. Lillard.

Practical experience in theatrical production as Assistant Stage Manager for a Dance Theatre Concert or as a Stage Manager for readings or S.L.T.C. under the supervision of the faculty Production Stage Manager. THETR 370 complements this course.

## THETR 253 Stage Management Laboratory II

Fall and spring. $1-4$ credits. May be repeated for credit. Before registering, students must attend orientation meeting in the Proscenium theatre at the Center for Theatre Arts at 7:30 $\mathrm{p} . \mathrm{m}$. On the first Tuesday of classes. Prerequisite: permission of instructor.
P. Lillard.

Practical experience in theatrical production as Assistant Stage Manager for a season production under the supervision of the faculty Production Stage Manager. THETR 370 complements this course.

## THETR 353 Stage Management

 Laboratory IIIFall and spring. $1-3$ credits. May be repeated for credit. Before registering, students must attend orientation meeting in the Proscenium theatre at the Center for Theatre Arts at 7:30 p.m. on the first Tuesday of classes. Prerequisite: permission of the instructor.
P. Lillard.

Practical experience in theatrical production as Stage Manager for a Dance Theatre Concert or as Production Stage Manager for the Black Box lab session under the supervision of the faculty Production Stage Manager. THETR 370 complements this course.

## THETR 370 Stage Management Studio

Fall and spring. 1 credit. Prerequisite: THETR 250 or 280.

T 2:30-4:25. P. Lillard.
Introduction to the concepts and techniques of stage management as they relate to specific areas of production. Development of relevant communication skills and an understanding of the production process as experienced by a working stage manager or assistant stage manager. THETR 153,253 , and 353 complement this course.

## THETR 453 Stage Management

Laboratory IV
Fall and spring. 1-5 credits. May be repeated for credit. Before registering, students must attend orientation meeting in the Proscenium theatre at the Center for Theatre Arts at 7:30 p.m. on the first Tuesday of classes. Prerequisite: admission to Advanced Undergraduate Theatre Program.
P. Lillard.

Practical experience in theatrical production as Stage Manager for a season production under the supervision of the faculty Production Stage Manager.

## Production Laboratories

THETR 151 Production Laboratory I
Fall and spring. 1-3 credits. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the Proscenium Theatre.
S. Brookhouse, N. Cross, D. Hall,
C. Hatcher, K. Krump, C. Orr Brookhouse. Students register for sections by areas of interest. 01 Scenery, 02 Costumes, 03 Properties, 04 Lighting, 05 Sound, 06 Stage crew. No prerequisites or experience required. This course provides practical experiences in theatrical production, as a member of the production crew.

## THETR 251 Production Laboratory II

Fall and spring. $1-3$ credits. Prerequisite: THETR 151 or permission of instructor. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the CTA Proscenium theatre.
S. Brookhouse, N. Cross, D. Hall,
C. Hatcher, K. Krump, C. Orr Brookhouse. Practical experience in theatrical production, in a position of major responsibility on the production staff. Students register for sections by areas of interest: 01 Scenery, 02 Costumes, 03 Properties, 04 Lighting, 05 Sound.

## THETR 351 Production Laboratory III

 Fall and spring. $1-3$ credits. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the CTA Proscenium Theatre. Prerequisite: THETR 251 or permission of instructor.R. Archer, C. Hatcher, P. Gill, K. Goetz,
J. Johnson, C. Orr Brookhouse.

This course provides practical experience in theatrical production, in a position of major responsibility on the production staff or as assistant to a faculty or guest designer.

THETR 451 Production Laboratory IV Fall and spring. $1-3$ credits. May be repeated for credit. Prerequisite: admission to Advanced Undergraduate Theatre Program.
R. Archer, P. Gill, K. Goetz, C. Hatcher,
J. Johnson, C. Orr Brookhouse.

Practical experience in theatrical production, in the position of designer or in another position of major responsibility on the production staff.

## INDEPENDENT STUDY, INTERNSHIPS AND HONORS

THETR 300 Independent Study
Summer, fall, or spring. 1-4 credits.
TBA. Staff.
Independent Study in the Theatre allows students the opportunity to pursue special interests not treated in regularly scheduled courses. A faculty member, who becomes the student's instructor for the course, must approve the student's program of study and agree to provide continuing supervision of the work. Students must prepare a proposal for independent study.

## THETR 485 Undergraduate Internship

Fall, spring, or summer. $1-6$ credits.
TBA. Staff.
To be eligible to enroll and receive credit for an internship, Theatre Arts students must either be majors or be admitted to the Advanced Undergraduate Theatre Program (AUTP). Students are responsible for arranging their own internships in consultation with the AUTP faculty in their area of choice prior to preregistration of the semester in which the internship is planned to take place. To receive credit for this course, it must be an unpaid internship; if it is a paid internship, it is possible to receive independent study (see TA 300) credit for it.

## THETR 495 Honors Research Tutorial

 Fall or spring. 2-8 credits. Limited to Theatre Arts seniors only.TBA. Staff.
This course is the first of a two-semester sequence (the second is THETR 496). Up to eight credit hours and one grade will be given upon completion of second semester. The Theatre Arts honors program is for majors who have demonstrated exceptional ability in the major and who seek an opportunity to explore branches of their subject not represented in the regular curriculum or to gain experience in original research. To be a part of the honors program the student must maintain an average of 3.5 in departmental courses and an average of 30 in all courses. Students should consult with their advisers in their junior year if deciding to do honors. Admissions to honors is at the discretion of the departmental committee.

## THETR 496 Honors Thesis Project

Fall or spring. $2-8$ credits. Limited to Theatre seniors only.

TBA. Staff.
This course is the second of a two-semester sequence (the first is THETR 495). Up to eight credit hours and one grade will be given upon completion of second semester. See THETR 495 for further information.

## FILM

THETR 274 Introduction to Film Analysis: Meaning and Value
Fall, 4 credits. Limited to thirty-five students. T R 10:10-12:35. D. Fredericksen. An intensive consideration of the ways films generate meaning and of the ways we attribute meaning and value to films. Discussion ranges over commercial narrative, documentary, and personal film modes. Prospective film majors should enroll in their sophomore year.

## THETR 277 Video Production I

Summer. 3 or 4 credits. Limited to 10 students. Offered occasionally. M. Rivchin.

An intensive, hands-on video production course using Super-VHS cameras and editing equipment. Students will learn camera, lighting, sound recording, and editing techniques through a series of exercises. Directing for both single-camera and multiplecamera shoots will be practiced. Strategies and ideas for documentary, dramatic and experimental work, music videos, etc., will be discussed before students plan, write, shoot, and edit one short, individual project and one project of their choice. A $\$ 25$ equipment maintenance fee per student will be collected in class. Students will spend approximately $\$ 50-60$ for S-VHS and regular VHS videotapes. which they will own.

## [THETR 290 Filming Other Cultures (also

 Anthropology 290)Spring. 3 credits. Limited to 20 students, with preference given to those who have taken either Anthropology 102 or Theatre Arts 274.
Not offered 1994-95.
R. Ascher.

See Anthropology 290 for course description.]
THETR 313 Japanese and Asian Film (also Asian Studies 313 and Comparative Literature 313) ©
Spring. 4 credits.
M W 11:15-12:20. Students are encouraged to screen each week's films twice, if at all possible, to prepare for Wednesday's formal analysis and discussion. Group screenings will be held in Uris Library on Monday and Tuesday evenings at $7: 30$ p.m. Students who cannot attend these screenings, however, may view films at their convenience in the Uris Media Room, where they will be held on reserve.
See Asian Studies 313 for course description.

## THETR 330 Political Theory and Cinema

 \{also German Studies 330, Comparative Literature 330, and Government 370)
## Fall. 4 credits.

T R 11:40-12:55. G. Waite.
See German Studies 330 for course description.

## THETR 375 History and Theory of the Commercial Narrative Film

Fall. 4 credits. Fee for screening expenses, $\$ 10$ (paid in class). Offered alternate years. T R 1:25-4:25. D. Fredericksen. Consideration of the broad patterns of narration in the history of the commercial
narrative film, viewed as an artistic medium and as a system requiring the massive consumption of artifacts. Emphases placed upon the early articulation of a cinematic means of narration, realism as an artistic style, the nature and functions of popular film, and the modes of modernist and post-modernist "art cinema" narration. Major figures discussed include Griffith, Eisenstein, Murnau, Von Stroheim, Dreyer, Chaplin, Renoir, Ford, Hitchcock, Welles, Antonioni, Fellini, Bergman, Bunuel, Resnais, Godard, Jansco and Herzog. Students majoring in film should have previously taken Theatre Arts 274.

## [THETR 376 History and Theory of

Documentary and Experimental Film
Fall. 4 credits. Fee for screening expenses, $\$ 10$ (paid in class). Prerequisite: THETR 274 is strongly recommended, but not required. Offered alternate years; not offered 1994-95. Next offered 1995-96.

T R 1:25-4:25. D. Fredericksen.
First, the history and theory of documentary film up to the end of World War II. Major figures covered include Vertov, Flaherty, Ivens, Grierson, Lorentz, Riefenstahl, Capra, Hurwitz, and Jennings. Second, within the history and theory of the experimental and personal film forms, emphases are: the avantgarde film of the twenties in Germany, France, U.S.S.R., and the U.S., the movement toward documentary practice in the thirties, and American experimental and personal film from the forties to the present. Major figures covered in this latter period include Deren, Brakhage, Baillie, Belson, the Whitneys, Hill, Snow, Pitt, L. Jordan, H. Smith, G. Nelson and Mekas.]

## THETR 377 Fundamentals of 16 mm Filmmaking

Fall and spring. 4 credits. Limited to 10 students. Intended for juniors and seniors (who may need to sign up a year or more in advance). Prerequisite: THETR 274 (or higher-level film studies course) and permission of instructor. Fee for maintenance costs, $\$ 100$ (paid in class). The average cost to each student for materials and processing is $\$ 400$.

M W F 2:15-4:25. M. Rivchin.
A hands-on course in the basics of 16 mm filmmaking techniques, requiring no prior production experience, emphasizing the creative development of filmic ideas through critical discussion. Each student will complete a number of short film projects to explore narrative, experimental, documentary, animation, and abstract genres. A longer, final sound film project will be screened publicly.
[THETR 378 Soviet Film of the 1920s and French Film of the 1960s
Spring. 4 credits. Fee for screening expenses, \$10 (paid in class). Prerequisite: THETR 375 is strongly recommended, but not required. Offered alternate years. Not offered 1994-95. Next offered spring 1997.

T R 1:25-4:25. D. Fredericksen. An intensive treatment of two distinct periods of innovation in film theory and history. Emphasis on the vital relationship between theory and practice in these two periods. Major figures include Eisenstein, Pudovkin, Vertov, Dovzhenko, Room, Godard, Truffaut, Resnais, Rohmer, Tati, Rouch and Bresson.]

## [THETR 379 Documentary Film from

 1945 to presentSpring. 4 credits. Prerequisite: THETR 376 or permission of the instructor. Fee for screening expenses, $\$ 10$ (this fee is paid in class).

Offered alternate years; offered 1994-95. Next offered 1995-96.

T R 1:25-4:25. D. Fredericksen.
Emphases on the contemporary documentary film as a sociopolitical force, as an ethnographic tool within and without a filmmaker's own culture, and as an artistic form with a distinct history and set of theoretical questions. Major figures, structures, and movements covered include Jennings, Rouquier, Leacock, Malle, Rouch. Solanas, national film boards, Challenge for Change, direct cinema, cinema verite, revolutionary documentary of the Third World and feminist documentary The scope is intemational.]

## THETR $\mathbf{3 8 3}$ Screenwriting

Spring. 3 credits. Prerequisites: THETR 274 and 377 , and permission of instructor. Limited to 12 students.

M W 12:20-2:15. R. Wilson.
Exercises in various genres of screenwriting will be explored: the commercial narrative, documentary, experimental, and abstract. This class will culminate in the writing of a finished script for a ten to fifteen-minute film. Note: This class is an intensive writing experience that will demand a great deal of outside work.

## [THETR 389 Luis Buñuel and the Cinema of Poetry (also Spanish Literature 3791

Spring. 4 credits. Taught in English. Films with subtitles. Not offered 1994-95.

Screenings to be arranged. A. Monegal.
See Spanish Literature 379 for course description.]

## THETR 395 Video: Art, Theory, Politics

 (also English 395)Fall. 4 credits.
T R 11:40-12:55. T. Murray.
See English 395 for course description.

## [THETR 396 German Film (also

 Comparative Literature 396 and German Studies 396)Spring. 4 credits. Requirements: participation in class discussion, one paper, midterm, and final. Not offered 1994-95.

Screenings to be announced. D. Bathrick. The goal of the course is to explore the form and context of German film in relation to the cultural and sociopolitical context of which it is a part. Accordingly, the material discussed will be divided into three major periods: Weimar film, 1918-1933; Nazi film, 1933-45; postwar film, 1945-present. Readings and lectures will be devoted to formal and cultural developments in the history of German film as well as interpretive analysis of selected individual films. In both lectures and discussions, particular emphasis will be placed on helping students develop an appropriate method of viewing and analyzing films.]

## THETR 399 Spanish Film (also Romance

 Studies 399)Spring, 4 credits.
M W F 2:30. A. Monegal.
See Romance Studies for description.
[THETR 402 Latin American and Latino Video (also Romance Studies 402 and Hispanic American Studies 402)
Spring. 4 credits. No knowledge of Spanish required. Not offered 1994-95. C. Noriega

See Romance Studies 402 for complete description.]

THETR 413 Film and Performance
Spring. 4 credits. Prerequisite: At least one production course in 16 mm film or video, and/or at least one 300 -level course in acting, directing, dance or dance composition.
Permission of the instructors. Limited to 10-12 students. $\$ 50$ maintenance fee to be paid in class.

T R 2:30-4:30. M. Rivchin and J. Self. Special Topic for 1995: Experimental Film, Video, and Performance. This course is a creative, production workshop intended for advanced students in filmmaking, videomaking, dance, and theatre performance who want to collaborate in making experimental film and/or mixed-media performance art. It is an opportunity for an interdisciplinary, exploratory approach to studying historical contemporary multi-media work, considering its roles in visual culture, and practicing it. [It is not a course in sync-sound, dramatic narrative work: see THETR 477].
Classes will include discussions of texts about screenings of films and videos illustrating particular styles and phases of avant-garde film and such performance work as: Happenings; Fluxus; Robert Wilson's Einstein on the Beach; work by Robert Rauschenberg, Merce Cunningham, and John Cage; Laurie Anderson, Tricia Brown, and Nam June Paik; Spaulding Grey's Suimming to Cambodia; Robbie McCauley's Indian Blood; music videos, etc.

To develop skills there will be exercises in and demonstrations of experimental techniques for color film, unusual film stocks and printing methods, and video in-camera manipulations and digital video editing effects. There will also be movement, improvisation and choreographic exercises and practice in designing performance spaces with projections. The production of collaborative group projects may combine projection with live performance, experimental performance work within a film or video piece, or multi-media events. A public presentation of the final project(s) will take place at the end of the semester.
[THETR 475 Seminar in the Cinemal (also College Scholar Seminar) Spring. 4 credits. Limited to twenty students. Offered alternate years; not offered 1994-95. Next offered 1995-96.

T R 10:10-12:05. D. Fredericksen. Topic for 1996: Jung, film, and the process of self-knowledge. "Know thyself": this has been called our culture's most enduring psychological need, and it has been frequently offered as the raison d'etre for liberal studies. C. G. Jung's answer to how one might "know oneself" is based on his claim that "image is psyche"; his informing metaphor is depth. The seminar will trace the elaborations of this position in Jung, James Hillman, Russell Lockhart, Murray Stein, and Sylvia Perera. It will also test the critical capacities of this position with respect to film images given us by Bergman, Fellini, Stan Brakhage, Gunvor Nelson, Suzan Pitt, Larry Jordan, Bruce Baillie, and others. The manner in which Jung's claim might provide an archetypal and imaginal alternative to current approaches to liberal studies will be asked throughout the seminar; the nature of education will thereby become a central theme of the semester's work.]
[THETR 476 Seminar in the Cinema II
Spring. 4 credits. Prerequisite: THETR 274 or 375 or comparable experience in film analysis. Limited to twenty students. Offered alternate years. Not offered 1994-95
The spring 1997 topic will be announced in the 1995-96 catalog.]

## THETR 477 Intermediate Film and Video Projects

Fall. 4 credits. Limited to 6 students. Prerequisites: THETR 377 and permission of instructor. Fee: $\$ 100$ cinema maintenance fee. Film projects costs: $\$ 1000-3000$; video \$200-500.

T R 10:10-12:05. M. Rivchin.
This is a second-level 16 mm filmmaking course for students who have already drafted and/or completed a short screenplay (5-10 minutes) for sync-sound production and postproduction. After script revisions, budgeting, production scheduling, casting and rehearsals, students will learn the basic techniques of sync-sound filming, directing, and editing dramatic narrative documentary work. [N.B. Students interested in more experimental film genres should consider THETR 413].
The class will form two filming crews rotating as directors, cinematographers, and sound recordists for each others' projects. Students may also opt for shooting in film, transferring to and editing on videotape, or working entirely on videotape. Students will edit the films they write and direct, and will be individually responsible for all film flatbed editing, sound track mixing. A \& B rolling options, and lab work; or for video editing and mixing techniques. A public screening for completed films and videos will be held at the end of the semester.

## THETR 493 Advanced Film Projects

Summer. 4 credits. Limited to 12 students. Prerequisite: THETR 280, 281, or 377 or equivalent and permission of instructor. Maintenance fee, $\$ 50$.
M. Rivchin.

Students work in small crews to produce a short dramatic film and/or short documentary film, using synchronous sound filming and editing equipment and/or super-VHS video. Equipment is provided, but students must pay for film and processing (average cost, $\$ 400$ ) or videotape (average cost $\$ 100$ ).

## THETR 653 Myth onto Film (also Anthropology 653)

Fall. 4 credits. Open to undergraduate and graduate students with permission of instructor. Enrollment limited by available studio space and equipment. Prerequisite: some knowledge of any one of the following: anthropology, filmmaking, mythology, graphics, drawing, and painting.

W 2-4:25. R. Ascher.
See Anthropology 653 for course description.

## [THETR 699 German Film Theory (also German Studies 699 and Comparative Literature 699)

Spring. 4 credits. Not offered 1994-95. offered occasionally.
D. Bathrick.

This course will examine critically the writings of major German film theories from the Weimar period to the present. Works by Bela Balazs, Rudolf Arnhelm, Siegfried Kracauer, Walter Benjamin, Theodor Adorno, Max Horkheimer, Alexander Kluge,
H. J. Syberberg, Gertrud Koch, Thomas

Elsaesser, and others will be read and
discussed in light of the following considerations: What are the cultural and political contexts out of which these ideas emerge and how are these theories addressing these contexts? How do these theories relate to the work coming out of other national traditions at the same time or to current debates in feminist, formalist, postmodern, or poststructuralist film theory. There will be film showings.]

## DANCE

THETR 123 Ballet I (also Physical Education 423)
Fall and spring. 0 or 1 credit. Satisfies the PE requirement. Attendance at dance concerts is required. Theatre Arts and Physical Education registration at Teagle Hall only.

Fall T R 3:10-4:40. Spring T R 11:20-12:50. B. Suber.

The fundamentals of classical ballet technique Material covered includes all of the exercises at the barre, and elementary work in the areas of port de bras, adage and petite and grande allegro. The acceleration of the class is determined by the ability of the majority of the class.

## THETR 124 Modern Dance I (also Physical Education 424)

Fall and spring. 0 or 1 credit. Theatre Arts and Physical Education registration at Teagle Hall only. Satisfies the PE requirement.
Atrendance at dance concerts is required.
Fall. Sec. 01 M W 1:30-3:00. J. Chu. Sec. 02 T R 11:20-12:50. J. Chu. Spring. Sec. 01 MW 1:30-3:00. J. Kovar. Sec. 02 T R 11:20-12:50. J. Chu.
The fundamentals of modern dance technique. Elementary dance movement phrases, with attention to rhythm, placement, and vitality of performance.

## [THETR 125 Tap Dance I (also Physical

 Education 425)Fall. 0 credit. Theatre Arts and Physical Education registration at Teagle Hall only. Satisfies the PE requirement. Not offered 1994-95.

TBA. L. Strassberg.
Understanding of rhythm, coordination, sound emphasis, through basic tap steps.]

THETR 155 Rehearsal and Performance Fall and/or spring. $1-2$ credits. 1 credit per production experience per term up to 2 credits per term. Students must register for the course in the term in which credit is eamed; requests for retroactive credit will not be honored. Limited to students who are assigned roles after tryouts at the dance program's auditions. Students should add this course only after they have been assigned roles. S-U grades only.

Staff.
The study, development, and performance of roles in departmental theatre or dance productions or the study and practice of directing as experienced in assisting faculty and guest directors.

## [THETR 200 Introduction to Dance

Fall. 3 credits. Attendance at dance concerts is required. Not offered 1994-95. Staff.]

## THETR 201 Dance Improvisation

Fall. 3 credits. Limited to 12 students. Concurrent enrollment in a dance technique class at the appropriate level is required. Registration only through department roster in
the main office of the Center for Theatre Arts. Attendance at dance concerts is required. T R 4:50-6:20. J. Morgenroth. When the body knows when, where, and how to move without prior direction, we call that improvisation. This course offers the possibility of "training" one's movement instincts to respond with lightness, humor, grace, and spontaneity. Solo and group forms are covered. Includes some dance history.

## [THETR 209 Introduction to African

 Dance (also AS\&RC 209) 붕 Fall. 3 credits. Not offered 1994-95. Staff.An introduction to ancient African dance forms, origins, socio-economic and politica! significance; the state of the dances, changes and continuing relevance in contemporary times. This course will look at the evolution and significance of contemporary dance forms.]

## THETR 210 Beginning Dance

Composition and Music Resources
Spring. 3 credits. Concurrent enrollment in a dance technique class at the appropriate level is required. Registration only through the department roster in the main office of the Center for Theatre Arts. Attendance at dance concerts is required.

M W 4:50-6:50. J. Self and A. Fogelsanger. Weekly assignments are designed to introduce students to basic elements of dance traditionally and currently used in the choreographic process. Problems are defined and explored through class improvisation as a way to encourage fresh, individual solutions. Students compose and present a series of short studies that are discussed and reworked before being performed at informal studio showings. The music resource faculty will introduce the class to contemporary music for modern dance and orient the class regarding problems and possibilities with sound collaborations. Students are required to attend campus dance activities for class discussion.
THETR 211 Dance Movement Workshop Summer. 3 credits. Limited to 15 students. For students with varied levels of training, including those with no experience.

## Staff.

Students explore new ways of moving and creating dances and prepare short studies each week based on material covered in class. Modem dance technique, improvisation, and composition are covered. Students observe and discuss the main concems of contemporary performance from the artist's/performer's perspective. Viewings of films, videotapes, and live performances.

## [THETR 225 Tap Dance II (also Physical Education 425)

Fall. 0 credit. Theatre Arts and Physical Education registration at Teagle Hall. Satisfies PE requirement. Prerequisite: permission of instructor. Attendance at dance concerts required. Not offered 1994-95.

M W 3:10-4:10. L. Strassberg. Applying tap steps to a more intricate expression of technique, while developing musicality and improvisational skills.]

## THETR 231 Ballet II (also Physical

 Education 431)Fall and spring. 0 or 1 credit. Theatre Arts and Physical Education registration at Teagle Hall only. Prerequisite: permission of instructor. Satisfies the PE requirement. Attendance at dance concerts is required.

M W 3:10-4:40. B. Suber.
An intermediate ballet class that is a continuation of Ballet I with intermediate work in the areas of port de bras, adage and petite and grande allegro. There is an emphasis on placement through muscular harmony.

## THETR 232 Modern Dance II (also

 Physical Education 432)Fall and spring. 0 or 1 credit. Theatre Arts and Physical Education registration at Teagle Hall only. Prerequisite: Modern Dance I or permission of instructor. Satisfies the PE requirement. Attendance at dance concerts is required.

Fall. Sec. 01 M W 3:10-4:40.
J. Morgenroth. Sec. 02 T R 1:30-3:00.
J. Kovar. Spring. Sec. 01 M W 3:10-4:40.
J. Chu. Sec. 02 T R 1:30-3:00. J. Chu. A continuation of Modern Dance I, for students with at least a year of dance training. Practice of longer dance phrases, with attention to clarity of design, rhythm, and expression.

THETR 233 Explorations in Movement and Performance A (also Physical Education 440)
Fall. 0 or 1 credit. Limited to 16 students. Theatre Arts and physical education registration at Teagle Hall only. Satisfies PE requirement. Attendance at dance concerts is required.

M W 11:20-12:50. J. Self.
This course is a physically demanding exploration into a wide range of movement realms. Specific subjects covered are genderized movement, erotic power, spiritual power, music and movement, and ritual and performance. Techniques include extensive use of breath, animal movement, improvisation, and group games. This course requires an eagerness to investigate the nature of performance and explore unfamiliar territory in movement.

## [THETR 304 Ballet III (also Physical Education 434)

Fall and spring. 0 or 1 credit. May be repeated for credit. Prerequisite: permission of instructor. Theatre Arts and physical education registration at Teagle Hall only Satisfies the PE requirement. Attendance at dance concerts is required. Not offered 1994-95.

## B. Suber.

Study and practice of classical ballet at an advanced level. Work is done on strengthening the body through harmonic muscular control combining Russian, Danish and American techniques.]
THETR 305 Explorations in Movement and Performance B (also Physical Education 440)
Spring. 0 or 1 credit. Explorations A, dance improvisation or permission. May be repeated for credit. Limited to 16 students. Theatre Arts and physical education registration at Teagle Hall only. Satisfies the PE requirement. Attendance to dance concerts is required.

M W 1:30-3:00. J. Self.
This course continues the investigations of Explorations A with special emphasis on performance and ritual. The class will create performance opportunities throughout the semester.

## THETR 306 Modern Dance III (also Physical Education 436)

Fall and spring. 0 or 1 credit. May be repeated for credit. Prerequisite: Modern Dance II or permission of instructor. Theatre Arts and physical education registration at Teagle Hall only. Satisfies PE requirement. Attendance at dance concerts is required Fall M W F 4:50-6:20. J. Self. Spring M W F 4:50-6:20. J. Morgenroth.
Advanced work with rhythm, placement, and phrasing for students who are prepared to refine technical skills of dancing. Students will be physically and mentally challenged by lengthy, complex phrases and will be expected to bring the instructor's material to life.

## [THETR 307 Asian Dance and Dance

 Drama (also Asian Studies 307) © Fall. 3 credits. May be repeated for credit. Section 1: Indian Dance, Section 2: Japanese Noh Theatre, Section 3: Indonesian Dance Theatre. Not offered 1994-95.
## Staff.

Readings, lectures, and practice sessions. On Fridays there will be lectures, demonstrations, and discussions. Videotapes and films will be shown. The Monday and Wednesday classes will consist of learning basic movement vocabulary and dances. No previous experience in dance is necessary.]

## THETR 308 Modern Dance IV (also Physical Education 438)

Fall and spring. 0 or 1 credit. May be repeated for credit. Prerequisite: Modern Dance III or permission of instructor. Theatre Arts and physical education registration at Teagle Hall only. Satisfies PE requirement. Attendance at dance concerts is required.

Fall. TRF4:50-6:20. J. Chu. Spring. T R F 4:50-6:20. B. Suber.
A continuation of, and supplement to, Theatre Arts 306/Physical Education 436.

## [THETR 309 African Dance Aesthefics

 (also AS\&RC 309) (옹Spring. 3 credits. Prerequisite: THETR and AS\&RC 209 or permission of instructor. Attendance at dance concerts is required. Not offered 1994-95.

Staff.
An examination of African dance styles and forms within the cultural perspective of African peoples. Practical classes will consist of learning basic movement vocabulary, techniques, and dances, with lectures on the cultural world view of the people. Practical sessions will explore the dynamics of African dances as nonverbal artistic forms communicating a world view, with an end of semester studio showing.]

## THETR 310 Intermediate Dance

 Composition and Music ResourcesFall and spring. 3-4 credits. Prerequisite THETR 210. Attendance at dance concerts is required.

Fall, F 3:10-4:40 and hours to be arranged. J. Self and A. Fogelsanger. Spring, TBA. J. Chu.

The scheduled weekly meetings will be devoted to expanding the music vocabulary and skills of students through a survey of contemporary music for modern dance, discussion of the needs of musicians and choreographers in collaborations, and rhythmic studies. Students working on intermediate choreographic studies and projects to be presented in various performance situations. Work in progress will be
critiqued by faculty and peers. Design problems in costuming and lighting will be approached, and students with particular interests in collaboration will have a forum in which to develop their ideas.

## THETR 311 Intermediate Projects in Dance Composition

Fall and spring. 3-4 credits. Prerequisite:
THETR 310. Attendance at dance concerts is required.

Fall. TBA. J. Self and A. Fogelsanger Spring. TBA. J. Chu
A continuation of THETR 310.

## [THETR 312 Physical Analysis of

 MovementSpring. 3 credits. Not offered 1994-95. T R 1:25-2:40. J. Morgenroth.
This course is an examination of human movement with particular attention to dance movement. Readings in texts on human anatomy, physiology, and kinesiology and in Sweigard's Human Movement Potential. Guest lectures by experts in anatomy and health areas. Practical and laboratory work. Demonstration of dissection.]
[THETR 314 Western Dance History I
Fall. 4 credits. Attendance at dance concerts is required. Not offered 1994-95. Staff.]
[THETR 315 Western Dance Mistory II Spring. 4 credits. Attendance at dance concerts is required. Not offered 1994-95. Staff.]
[THETR 318 Historical Dances \# Spring. 2 credits. Prerequisite: Ballet II or Modern Dance II. Attendance at dance concerts is required. Not offered 1994-95. Staff.
A sampling of the social dances from the Renaissance to the present, with emphasis on pinpointing basic differences in movement styles and customs in the various periods. A major part of class time will be spent learning and performing the dances.\}

## THETR 410 Advanced Dance

## Composition I

Fall and spring. 3-4 credits. Prerequisite: THETR 310 and 311. Attendance at dance concerts is required.

Fall: TBA. J. Self and A. Fogelsanger.
Spring TBA. J. Chu.
Students work on advanced choreographic problems, to be presented in performance.
Work in progress will be critiqued by faculty on a regular basis.

## THETR 411 Advanced Dance Composition II

Fall and spring. 3-4 credits. Attendance at dance concerts is required.

Fall: TBA. J. Self and A. Fogelsanger. Spring TBA. J. Chu.
A continuation of THETR 410.

## THETR 413 Film and Performance

Spring. 4 credits. Prerequisite: at least one production course in 16 mm film or video, and/or at least one 300 -level course in acting, directing, dance or dance composition. Permission of the instructors is required. Limited to $10-12$ students. Equipment fee: $\$ 50$ to be collected in class.

T R 2:30-4:30. M. Rivchin and J. Self. Topic for 1995: Experimental Film, Video, and Performance. For course description, see THETR 413 under Film heading.

THETR 418 Seminar in History of Dance
Fall. 4 credits. Prerequisite: General knowledge of dance history recommended. Attendance at dance performances required.

M W 1:25-2:40. B. Suber.
Topic for 1994: Identity, Voice, and Vision in Dance. Considering dance as a presentational art form, this seminar explores the idea of self in the context of performer, choreographer and audience. How is gender defined or exploited? What voice is represented onstage and for what viewing audience? Utilizing video and assigned readings, we will examine the contributions of such pivotal agents as the romantic ballerina, Martha Graham, George Balanchine, and Pina Bausch.

## THETR 490 Senior Paper in Dance

Spring. 4 credits. Prerequisite: THETR 418, senior standing. Attendance at dance concerts is required.
Under faculty direction, the student will write a senior paper in dance history, criticism, or theory.

## THETR 491 Senior Project in Dance

Fall or spring. 4 credits. Prerequisite: THETR 410 or permission. This course is limited to senior dance majors only

TBA. Staff.
Students who take this course will create a project in choreography and performance, dance film or video, dance pedagogy, or other appropriate area agreed upon with a member of the dance faculty. Senior projects that are to be performed, must be presented within one of the three regularly scheduled department concerts.

## Tracks toward admission into the advanced undergraduate theatre program

## Design, Technology, and Stage Management

Required for ALL individuals interested in a Design. Technology, or Stage Management track:
THETR 250 Fundamentals of Theatre Design and Technology
THETR 151 and 251 Production Lab I and II (at least one credit of each)
Required for Scenic Design emphasis:
THETR 340 Theatrical Drafting and Technical Drawing Studio
THETR 351 Production Lab III (as Design Assistant)
THETR 354 Stagecraft Studio
THETR 364 Scene Design Studio
Upon admission to the program: THETR 451 Production Lab IV (at least 1 credit)

Required for Costume Design emphasis:
THETR 254 Theatrical Make-up Studio
THETR 351 Production Lab III (as Design Assistant)
THETR 356 Costume Construction Studio
THETR 366 Costume Design Studio I Upon admission to the program: THETR 451 Production Lab IV (at least 1 credit)
Required for Lighting Design emphasis:
THETR 252 Technical Production Studio I
THETR 263 Computer-Aided Design for the Theatre
THETR 351 Production Lab III (as Student Electrician)
THETR 351 Production Lab III (as Design Assistant)

THETR 362 Lighting Design Studio I
Upon admission to the program: THETR 451 Production Lab IV (at least 1 credit)

Required for Sound Design emphasis:
THETR 252 Technical Production Studio I
THETR 351 Production Lab III (as Student Sound Technician)
THETR 351 Production Lab III (as Design Assistant)
THETR 368 Sound Design Studio
Upon admission to the program: THETR 451 Production Lab IV (at least 1 credit)

Required for Technical Direction emphasis
THETR 252 Technical Production Studio I
THETR 256 Technical Production Studio II
THETR 340 Theatrical Drafting and Technica Drawing Studio
THETR 351 Production Lab III (as Assistant Technical Director)
THETR 354 Stagecraft Studio
Upon admission to the program: THETR 451
Production Lab IV (at least 1 credit)
Required for Stage Management emphasis:
THETR 253 and THETR 353 Stage Manage-
ment Lah II and III
THETR 280 Introduction to Acting
THETR 370 Stage Management Studio
THETR 398 Fundamentals of Directing I
Upon admission to the program: THETR 453
Stage Management Lab IV (at least 1 credit)

## Acting

Required for ALL individuals interested in an acting track
THETR 151 and THETR 251 Production Lab I and II (at least 2 combined credits)
THETR 240/241 Introduction to Western
Theatre (1 Semester ONLY)
THETR 250 Fundamentals of Design and Technology
THETR 280 Introduction to Acting
Required for Acting emphasis:
THETR 281 Acting I
THETR 282 Introduction to Voice and Speech for Performance
or
THETR 284 Speech and Dialects for
Performance
THETR 380 Acting II
Be accepted into THETR 381 Acting III

## Directing

Required for ALL individuals interested in a directing track:
THETR 151 and THETR 251 Production Lab I and II (at least 2 combined credits)
THETR 240/THETR 241 Introduction to
Westem Theatre ( 1 Semester ONLY)
THETR 250 Fundamentals of Design and
Technology
THETR 280 Introduction to Acting
THETR 398 Directing I
THETR 498 Directing II

## Playwriting

Required for ALL individuals interested in a playwriting track:
THETR 240/THETR 241 Introduction to Westem Theatre ( 1 Semester ONLY)
THETR 250 Fundamentals of Design and Technology
THETR 280 Introduction to Acting
Required for Playwriting emphasis:
THETR 348 Playwriting
THETR 349 Advanced Playwriting Students in the advanced undergraduate theatre program may also elect to take THETR

485 (Undergraduate Internship) in addition to or in place of one production assignment.

## TURKISH

See Department of Near Eastern Studies.

## UKRAINIAN

See Department of Modem Languages and Linguistics.

## URDU

See Department of Modern Languages and Linguistics, under "Hindi."

## VIETNAMESE

See Department of Modern Languages and Linguistics.

## WOMEN'S STUDIES MAJOR

See "Special Programs and Interdisciplinary Studies."

## WRITING PROGRAM

See John S. Knight Writing Program, p. 527.

## YIDDISH

See Department of Near Eastern Studies.

## YORUBA

See Department of Modern Languages and Linguistics.

## SPECIAL PROGRAMS AND INTERDISCIPLINARY STUDIES

## Africana Studies and Research Center

L. Edmondson, director (255-5218); A. Adams N. Assié-Lumumba, V. Carstens, W. Cross (on leave, fall 1994-spring 1996), S. Greene, V. Gordon, R. Harris, S. Hassan, A. Mazrui, M. Muhammad, A. Nanji, D. Ohadike, J. Turner. Offices: 310 Triphammer Road, 255-4625 or 255-4626.
The Africana Studies and Research Center is concerned with the examination of the history, culture, intellectual development, and social organization of Black people and cultures in the Americas, Africa, and the Caribbean. Its program is structured from an interdisciplinary and comparative perspective and presents a variety of subjects in focal areas of history, literature, social sciences, and African languages including Mandinka,
Swahili, and Yoruba.

The center offers a unique and specialized program of study that leads to an undergraduate degree through the College of Arts and Sciences and a graduate degree, the Master of Professional Studies (African and AfroAmerican), through the university's Graduate School.

A student may major in Africana studies; however, another attractive altemative is the center's joint major program. This program enables the student to complete a major in any of the other disciplines represented in the college while at the same time fulfilling requirements for a major in Africana Studies. This requires only a few more credits than is usually the case when one completes a single major course of study. Courses offered by the center are open to both majors and nonmajors and may be used to meet a number of college distribution requirements, including historical/ temporal breadth (\#) and geographical breadth (©) requirements, such as freshman writing seminars, language (Mandinka, Swahili, Yoruba), expressive arts, humanities, social sciences, and history.
The center also brings distinguished visitors to the campus, sponsors a lecture series, and houses its own library.

## The Africana Major

The undergraduate major offers interdisciplinary study of the fundamental dimensions of the Afro-American and African experiences. Because of the comprehensive nature of the program, it is to the students' advantage to declare themselves Africana majors as early as possible. The following are prerequisites for admission to the major.
Students should submit:

1) a statement of why they want to be an Africana studies major;
2) a tentative outline of the area of study they are considering (African or AfroAmerican) for the undergraduate concentration; and
3) a full transcript of courses taken and grades received.
The center's undergraduate faculty representative will review the applications and notify students within two weeks of the status of their request.
After acceptance as a major in the Africana Center, a student must maintain a C+
cumulative average in the center's courses while completing the major program. The Africana major must complete 36 credits in courses offered by the center, to include the following four core courses: AS\&RC 231, 290, 360 , and 431. Beyond the core courses, the student must take 8 credits of center courses numbered 200 or above and 15 credits numbered 300 or above. Within this selection the student must take at least one of the following AS\&RC courses: 203, 204, 283, or 301. The program of an undergraduate major may have a specifically Afro-American focus or a specifically African focus.

## Joint Majors

The center encourages joint majors in the College of Arts and Sciences and in other colleges. Joint majors are individualized programs that must be worked out between the departments concerned. The center's undergraduate faculty representative,

Professor Adams, will assist students in the design and coordination of joint major programs. However, in any joint major program, the center will require at least 16 credits be taken in Africana studies courses, including AS\&RC 290.

## Double Majors

In the case of double majors (as distinct from joint majors) students undertake to carry the full load of stipulated requirements for a major in each of the two departments they have selected.

## Certificate in African Studies

In conjunction with the Institute for African Development, the Africana Studies and Research Center administers an undergraduate Certificate in African Studies program. The certificate is offered as a minor concentration available to students in all of the undergraduate colleges at Cornell. Many of the courses in the program might be used to fulfill other course distribution requirements. By pursuing this certificate, students acquire an interdisciplinary understanding of Africa. After developing a foundation of knowledge on the culture, society, and development of Africa in the core course "Africa: The Continent and Its People," students pursue 15 credit hours in a humanities or development studies track or a combination of the two, including an additional core course, either "African Civilizations and Cultures" or "Contemporary African Development Issues." The requirements for the cetificate are a minimum of 18 credit hours, including the core courses. Students interested in the certificate program must contact Professor Adams (the center's undergraduate faculty representative) who will register them in the program and assign them a faculty adviser from their own college. The faculty adviser will be responsible for determining completion of the certificate requirements.
Honors. The honors program offers students the opportunity to complete a library research thesis, a field project in conjunction with a report on the field experience, or a project or experiment designed by the student. The requirements for admission to the honors program for all students-regular majors, joint majors, and double majors-are a Bcumulative average in all courses and a B+ cumulative average in the center's courses. Each student accepted into the honors program will have an honors faculty committee consisting of the student's adviser and one additional faculty member, which is responsible for final evaluation of the student's work. The honors committee must approve the thesis or project before May 1 of the student's junior year. The completed thesis or project should be filed with the student's faculty committee by May 10 of the senior year.

## Distribution Requirement

Two Africana Studies and Research Center courses from the appropriate group may be used in fulfillment of the following distribution requirements:
Social sciences: AS\&RC 171, 172, 190, 191, 208, 231, 280, 290, 301, 302, 344, 345, 346, $351,352,400,410,420,451,460,481,484$, $485,495,550,551,571$.
History: AS\&RC 203, 204, 205, 283, 344, 350, $360,361,370,381,405,460,471,475,482$, $483,490,510$.

Humanities: AS\&RC 202, 211, 219, 422, 425 , 431, 432, 450, 455, 525.
Expressive arts: AS\&RC 209, 285, 303, 425, 430.

Freshman writing seminars: AS\&RC 100 .

## Language Requirement

Courses in Mandinka, Swahili, and Yoruba may be used to satisfy the College of Arts and Sciences language requirement. Successful completion of the Mandinka or Yoruba series AS\&RC/DMLL 121, 122, 123 provides qualification, and study through 203 in either language provides proficiency. In Swahili, successful completion of AS\&RC 131, 132, 133, and 134 provides qualification, and the addition of 203 provides proficiency. AS\&RC majors are not required to take an African language, but the center recommends the study of one to complete the language requirement.

## Courses

AS\&RC 121 Sec 01 Elementary Yoruba (also YORUB 121)
Fall. 4 credits
V. Carstens and staff.

Foundation provided in all basic language skills, with an emphasis on speech and aural comprehension. Classes provide speaking and listening practice.

## [AS\&RC 121 Sec 02 Elementary

 Mandinka (also MANDI 121)4 credits. Not offered 1994-95.
V. Carstens and staff.]

## [AS8RC 121 Sec 03 Elementary Zulu

 (also ZULU 121)Fall. 4 credits. Not offered 1994-95.
V. Carstens and staff.]

## AS\&RC 122 Sec 01 Elementary Yoruba (also YORUB 122)

Spring. 4 credits. Prerequisite: AS\&RC 121, Sec. 01.
V. Carstens and staff.

Foundation provided in all basic language skills, with an emphasis on speech and aural comprehension. Classes provide speaking and listening practice
AS\&RC 122 Sec 02 Elementary Mandinka (also MANDI 122)
Spring. 4 credits. Prerequisite: AS\&RC 121, Sec. 02.
V. Carstens and staff.

Foundation provided in all basic language skills, with an emphasis on speech and aural comprehension. Classes provide speaking and listening practice.

## [AS\&RC 122 Sec 03 Elementary Zulu

 (also ZULU 122)4 credits. Prerequisite: AS\&RC 121, Sec. 03. Not offered 1994-95.
V. Carstens and staff.

Foundation provided in all basic language skills, with an emphasis on speech and aural comprehension. Classes provide speaking and listening practice.]

## AS\&RC 123 Sec 01 Continuing Yoruba

 (also YORUB 123)Fall. 4 credits. Prerequisite: AS\&RC 121 \& 122, Sec. 01.
V. Carstens and staff.

Building on AS\&RC 121-122 this is an all-skills course with a functional emphasis. Class will be conversational.

AS\&RC 123 Sec 02 Continuing
Mandinka (also MANDI 123)
Mandinka (also MANDI 123)
Fall. 4 credits. Prerequisite: AS\&RC $121 \&$ 122, Sec. 02.
V. Carstens and staff.

Building on AS\&RC 121-122 this is an all-skills course with a functional emphasis. Class will be conversational.

## [AS\&RC 123 Sec 03 Continuing Zulu (also ZULU 123)

4 credits. Prerequisite: AS\&RC $121 \& 122$,
Sec. 03. Not offered 1994-95.
V. Carstens and staff.

Building on AS\&RC 121-122, this is an allskills course with a functional emphasis. Class will be conversational.]

## AS\&RC 131 Swahili

Fall. 4 credits.
A. Nanji.

Beginner's Swahili. Part 1--Grammar.
Requires no knowledge of language.

## AS\&RC 132 Swahili

Spring. 4 credits. Prerequisite: Swahili 131. A. Nanji.

Continued study of the basic grammatical formation of the language and the introduction of reading material ranging from songs to short stories. A great many drills help develop the student's comprehension. Swahili tapes are highly used.

## AS\&RC 133 Swahili

Fall. 4 credits. Prerequisites: Swahili 131 and 132.
A. Nanji.

Advanced study in reading and composition.

## AS\&RC 134 Swahili

Spring. 4 credits. Prerequisite: Swahili 133. A. Nanji.

In this course of the sequence more emphasis is placed on the development of reading ability and the acquisition of writing skills. Students are expected to read and comprehend selected Swahili stories and write compositions on chosen topics. Ample consideration is given to oral practice in the classroom.

## AS\&RC 171 Black Families and the Socialization of Black Children

Fall. 3 credits.
Survey of key psychological dimensions of the Black experience, covering such issues as
(1) Race and Intelligence; (2) Black Identity;
(3) Black Family Structure; (4) Black English;
(5) Black Middle Class; and (6) Nature of Black Psychology.
ASARC 172 The Education of Black Americans: Historical and Contemporary Issues
Spring. 3 credits.
This is a course will be devoted to the history of Black education along with contemporary issues in Black education, such as the struggle for Black Studies, the development of independent Black schools, and problems of public schools in Black communities.

## AS\&RC 191 Africa: The Continent and Its People

Fall. 3 credits.
L. Edmondson.

An introductory interdisciplinary course focusing on Africa's geographical, ecological, and demographic characteristics; indigenous institutions and values; the triple cultural heritage of Africanity, Islam, and Western civilization; main historical developments and transitions; contemporary political, economic,
social, and cultural change. Africa's ties with the United States (from trans-Atlantic slavery to the present), its impact on the emerging world order, and its contribution to world civilization will also be explored.
AS\&RC 202 Swahili Literature (a)
Fall. 4 credits. Prerequisite: Swahili 134. A. Nanji.

Students gain mastery over spoken Swahili and are introduced to the predominant Swahili literary forms.

## AS\&RC 203 Sec 01 Intermediate

 Yoruba (also YORUB 203) © Spring. 3 credits. Prerequisite: AS\&RC 123, Sec. 01.V. Carstens and staff.

Intermediate conversation, grammar and composition.

## AS\&RC 203 Sec 02 Intermediate Mandinka (also MANDI 203) (3)

Spring. 3 credits. Prerequisite: AS\&RC 123, Sec. 01
V. Carstens and staff.

Intermediate conversation, grammar and composition.

## [AS\&RC 203 Sec 03 Intermediate

Zulu (also ZULU 203)
4 credits. Prerequisite: A.S\&RC 123, Sec. 03.

## Not offered 1994-95

V. Carstens and staff.

Intermediate conversation, grammar and composition.]

## ASRRC 204 History and Politics of

 Racism and SegregationFall. 4 credits.
S. Greene.

The course will deal with historical and/or contemporary patterns of racism and segregation using South Africa and the United States as case studies. The study will be undertaken within a theoretical framework that broadly defines racism and segregation and their implication.
AS\&RC 205 African Civilizations and Culture \# (i)
Spring. 3 credits.
D. Ohadike.

May be used for history requirement. This course is concerned with the development of African civilizations and cultures from the earliest times to the present day, together with their contributions to world history. The aim is to promote the understanding of Africa and the appreciation of its cultural forms through the study of the continent's social, political, and economic structures. The approach is multidisciplinary. The course deals with the civilizations of North Africa, the Nile Basin, and Ethiopia (examples: Carthage, Egypt, Kush, and Meroa); the kingdoms and empires of Sub-Saharan Africa (examples: Ancient Ghana, Mali, Songhai, Oyo, Benin, Kongo, and Nwene Mutapa); African kinship systems; religions; healing systems, music, political philosophy, and mechanisms of social control. The course also looks at the impact of Istam and Christianity on the development of African cultures.

## AS\&RC 211 West Indian Literature from <br> Abroad 앙

Spring. 3 credits.
A. Adams.
"Writing home": writing by West Indians who have emigrated to North America, Europe, or Africa, but whose cultural, social, psychological, spiritual center of gravity remains the

Caribbean (or its transplanted manifestation in the new domicile). Whether experienced as "exile," as with Lamming, "loneliness," as with Selvon, or as a search for the diasporic connection with the continent of ancestry, as with Conde, the West Indian literary artist abroad is, in some form, "writing home.

## [AS\&RC 220 Women of Africa and of the Diaspora in Liberation Movements

 (also Women's Studies 220)3 credits. Not offered 1994-95.
N. Assiè-Lumumba.

This course deals with women of Africa and of the African diaspora in liberation movements. The themes will include anti-slavery struggles in the Americas and the Caribbean, anti-colonization and decolonization movements, and anti-apartheid struggles in Africa. These movements, the women who participated in them, and especially the women who led them will be discussed within the broader historical, socio-economic, political, and cultural contexts. The women leaders to be studied include: Sojourner Truth, Harriet Tubman, Ida B. Wells-Bamett, and Angela Davis, Nzinga, Dona Beatrice, Yaa Asantewa, Nehanda, Nanny, Albertina Sisulu, and Winnie Mandela.]

## AS\&RC 231 African American Social and Political Thought

## Spring. 3 credits.

J . Turner.
This is an introductory course that will review and analyze the major theoretical and ideological formulations developed and espoused by African-Americans in the struggle for liberation. This semester we will focus specifically on the political philosophy and historical significance of Malcolm X, and the work and movement of Marcus Garvey, as the prime movers of nationalism and panAfricanism among Black people in this century. Such themes as slave resistance, nationalism, Pan-Africanism, emigration, antiimperalism, socialism and internal colonialism, and the political and social views of Black women will be discussed. Black political thought will be viewed in its development as responses to concrete conditions of oppression and expression.

## AS\&RC 271 Introduction to African

 Development (also City and Regional Planning 271 and Government 271) 잉Spring. 3 credits.
This course will consider diversity within Africa; colonial/post-colonial legacy; tensions between "center" and "periphery" within countries: key linkages among agriculture, food, nutrition, and poverty; significance of human resources (health, education, and women's role in development); pressures on natural resource base; links to the intemational economy.

## AS8RC 280 Racism in American Society

 Fall. 3 credits.D. Barr and J. Turner. This course will be a topical treatment of the history and theory of racism in the United States. The course will begin with an examination of basic concepts and theories of racism. From there we will examine the history of racial groups in America, AfricanAmericans, Native Americans, Asian Americans, and the Hispanic groups. Particular attention will be paid to the political economy of racism and the sociological and the psychological aspects of race relations in

America, with specific reference to the differences and intersections of race, class, gender, and ethnicity.
[AS\&RC 283 Black Resistance: South Africa and North America 4 credits. Not offered 1994-95.]
AS\&RC 285 Black Theater and Dramatic Literature
Fall. 3 credits.
This course is an introduction to the history of literature of Black American Drama. It also provides an opportunity for students to cultivate an interest in individual and group presentation of Black dramatic materials. Students who successfully complete this course will be granted preference for the limited enrollment in AS\&RC 425 (Advanced Seminar in Black Theatre and Dramatic Literature), which produces a public performance in the spring.

## AS\&RC 290 The Sociology of the AfricanAmerican Experience <br> \section*{Fall. 3 credits.}

J. Turner.

This is an introductory course to the field of Africana Studies. It assumes a historical/ sociological approach to the examination of the African-American experience. The course surveys the African beginnings of human kind and the classical role of Black people in world civilization and the making of early culture. The course treats issues in the humanities, social sciences, and history. This course is required for all undergraduate students majoring at the Africana Center.

## AS\&RC 301 Psychological Aspects of

 the Black ExperienceSpring. 4 credits.
This advanced undergraduate course highlights different aspects of the black experience. In recent years, it has centered on oppression and the psychology of Black social movements; however in the future the course theme may change from time to time.

## [AS\&RC 302 Social and Psychological Effects of Colonialization and Racism

4 credits. Not offered 1994-95.]

## [AS\&RC 303 Blacks in Communication

 MediaSpring. 3 credits. Not offered 1994-95 The focus is on the general theory of communications, the function of media in an industrialized society, and the social, racial, and class values implied in the communication process. There is a term paper, and the screening of significant American and Third World films.]

## AS\&RC 304 African American Art

Spring. 3 credits
S. Hassan.

This course investigates the different forms of African American visual artistic traditions in relation to their historical origins and sociocultural context from the early days of slavery to the present time. The course will start with an overview of African art and the experiences of the Middle Passage and slavery in relation to African American traditions in the decorative arts including: pottery, architecture, ironwork, quiltmaking, basketry. This is followed by a fine art survey starting with the eighteenth and nineteenth centuries,
continuing through the early twentieth-century Harlem Renaissance up to the present. Certain issues related to African American arts
and creativity such as "improvisation," "Black Aesthetic," and "Pan Africanism" will also be explored. Slides, films, film strips will be used extensively to illustrate topics discussed. Visits to museums and relevant current exhibits may be arranged.

## AS\&RC 310 Art in African Culture and Society

Fall. 3 credits
S. Hassan.

This course is a survey of the visual art and material cultural traditions of sub-Saharan Africa. It aims at investigating the different forms of visual artistic traditions in relation to their historical and sociocultural context. The symbolism and complexity of traditional African art will be explored through the analysis of myth, ritual, and cosmology. Indepth analysis of particular African societies will be used to examine the relationship of the arts to indigenous concepts of time, space, color, form, and sociopolitical order. New and contemporary art forms associated with major socioeconomic changes and processes of assimilation and acculturation will also be explored. These include tourist art, popular art, and elite art

## [AS\&RC 311 Government and Politics in Africa <br> 3 credits. Not offered 1994-95.

A. Mazrui.

Power and political participation in Africa. The colonial background and its political consequences. The pre-colonial continuities in the post-colonial politics. Ethnicity and allegiance in the African polity. The monarchical tendency in African political culture. From the warrior tradition to the military coup in the post-colonial era. From the elder tradition to presidential gerontocracy. From the sage tradition to intellectual meritocracy. Class versus ethnicity in African politics. The one-party versus the multiparty state. Sociocultural versus socio-economic ideologies. The gender question in African politics. The soldier and the state. The African political experience in a global context.)

## [AS\&RC 361 Introduction to African

 American History (from African Background to the Twentieth Century) \#3 credits. Not offered 1994-95.
Surveys the transition of Africans to America through the process of enslavement and their transformation into African Americans
Explores the transition from slavery to freedom through the process of emancipation and the transformation of African Americans from chattel slaves into rural peasants. Its purpose is to understand the internal dynamics of the Black experience from African origins to the age of segregation.]

## AS\&RC 370 African American History:

 The Twentieth CenturySpring. 3 credits.
R. Harris.

Examines the transition of African Americans from countryside to city through the process of migration and urbanization and their transformation into industrial laborers. Probes the transition from segregation to civil rights through the process of protest and the transformation of African Americans from second-class into first-class citizens. The purpose is to understand historical antecedents for the current socioeconomic, political, and cultural status of African Americans.

AS\&RC 380 African History: Earliest Times to 1800 \# ©
Fall. 3 credits.
S. Greene.

This course covers the history of Africa from the origins of humankind, through the emergence of small-scale societies and state systems, such as Egypt, Meroe, Mali, Bunyoro, the Swahili city-states and the Luba-Lunda complex, that had regional and international significance. Emphasis is placed on under standing the way in which historic ecological conditions, political developments, and religious change affected gender, class, and ethnic relations within these societies and their relations with other societies. The course also examines Africa's interaction with Islamic and European cultures up to 1800.

## AS\&RC 381 African History,

1800-Present 붕
Spring. 3 credits.
D. Ohadike.

This is a survey of African history in the nineteenth and twentieth centuries. Important topics include the European scramble and partition of Africa, resistance to European colonial conquest, African societies in the colonial period, independence and liberation movements, the rise of military regimes, gender relations and food security, the IMF and the debt Crisis.

## AS\&RC 402 Afrocentrism (also Society

 for the Humanities 402)Fall. 4 credits

## M. Bernal.

Survey of African American writings about African history; examination of works of Afrocentric writers; Afrocentrism as a social, political, and pedagogical movement;
Afrocentrism as "bogey," a discussion of the works of some critics of Afrocentrism.

AS\&RC 403 Rage, Revolution, and the African American Experience (also Soclety for the Humanities 403 and English 488)
Fall. 4 credits.
L. Brown.

An examination of the themes of African American rebellion and revolution in American literature.

AS\&RC 408 Multiculturalism (also Society for the Humanities 408 and Mistory 461)
Fall. 4 credits.
G. Okihiro.

Seminar on multiculturalism and its apparent polarities such as Eurocentrism and
Afrocentrism, unity and diversity, integration and transformation; neo-conservative challenge and radical critique; ethnic studies and the university.

AS\&RC 410 Black Politics and the American Political System
Spring. 4 credits
$J$. Turner.
The central thesis of African American politics has been its movements for political change and democratic access and human rights. This development since the seventeenth century is a complex political legacy. This course will conduct a close study of African American political practice and theoretical analysis of the American political system. Implications of the political systems for prospects and limitations to participation by Black people will be analyzed. Critical historical stages in the process of Black politics will be examined. The development
of electoral offices in federal and statewide politics, and the significant urban political power bases giving rise to African American mayorality politics in critical industrial centers, as well as rural hamlets will center the course Presidential politics-the Jesse Jackson campaigns-and new political formations including Black Republicans/conservatives will constitute the emphasis on contemporary events. The course will review the development of the literature in African American politics.

## [AS8RC 420 Public Policy and the

 African American Urban Community 4 credits. Not offered 1994-95; next offered 1995-96.J. Turner.

The socioeconomic conditions of the African American urban community will be the central focus of the course. Community development models will be explored in relationship to the social needs of the African American population. The changing configuration of internal organization of the African American community nationally will be examined.]

AS\&RC 422 African Literature 셩 Spring. 4 credits
A. Adams.

Women writers of Africa will be the focus of attention in this course. Questions of gender as well as complementary issues of equal importance in the artistic vision and expression of the woman writer in Africa will be considered in the works of Mariama Ba, Ama Ata Aldoo, Buchi Emecheta, Aminata Sow Fall, Bessie Head, as well as some "newer" writers. All works will be read in English

## ASaRC 425 Advanced Seminar in Black

Theater and Dramatic Literature Spring. 4 credits. Enrollment limited. This course will be devoted to the study, rehearsal, production, and public performance of a play or plays drawn from the annals of Black American dramatic literature. Students will participate in all the various phases and categories of theatrical production, from acting to production crews to theater group management. A field trip to a Black Theater attraction in New York City will also be arranged if possible. Students who have successfully completed AS\&RC 285 (Black Theater and Dramatic Literature) will be granted preference for the limited enrollment in this course

## [AS\&RC 430 African American Creative Writing Seminar

4 credits. Not offered 1994-95.
A limited number of students who have expressed both interest and aptitude in creative writing will have theopportunity to concentrate on the production of a piece of writing in either fiction or drama that proceeds from an Afro-centric wellspring. In addition, students will gain critical standards of evaluation through the examination and discussion of "role-model" materials from African American literature and cirama as well as considerations of the work of their fellow students in the seminar.)

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[AS&RC 431 History of Afro-American
    Literature
4 credits. Not offered 1994-95.]
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[AS\&RC 432 Modern Afro-American Literature
4 credits. Not offered 1994-95.
A study of fiction by Black writers, focusing on the political and sociological component that influenced the development and growth of Black writing in relationship to literary
themes and attitudes current in specific
periods and movements from post-World War 1 to the present.]

## AS\&RC 435 African Cinema (also Society for the Humanities 435) ©

Spring. 4 credits.
S. Hassan.

This course offers an overview of African cinema and filmmaking. It surveys historically the evolution of African cinema from its early days to the present. Through screening of selected African films, different trends within African cinema will be explored, such as "Return to the Sources" and the rediscovery of the pre-colonial past; the "Social Realist" narrative and critique of post-independence Africa; reconstructing the story of colonialism from the perspective of the colonized; and the entertainment genre. Techniques, style, and desthetics of African cinema will also be discussed. The course offers a unique opportunity of looking at African culture and society, and at issues of social change, gender, class, tradition, and modernization through African eyes.

## AS\&RC 451 Politics and Social Change in the Caribbean 잉

Spring. 4 credits.
L. Edmondson

A study of the historical, geostrategic, political, economic, and social (including racial and cultural) forces bearing on the domestic and international experiences of Caribbean societies. Special attention will be given to conflicting definitions and perceptions of the Caribbean; contending theories of Caribbean social structure and models of development: the continuing salience of struggles for change and transformation; prospects of regional integration; and Cariblean challenges to the global system, especially with regard to the region's relations with the United States in the context of the East-West conflict and its position in the Third World in the context of the North-South cleavage

## AS\&RC 455 Modern Caribbean

 Literature ©
## Fall. 4 credits

A. Adams.

This course will examine the prose literature of the Caribbean islands. Through the reading of several novels and short stories from the various languages and cultural strains that comprise the Caribbean societies, students will study the points of commonality and the diversity within this body of literature. The recurrence of certain historical, social, and cultural issues that have formed the multiethnic Caribbean peoples will be analyzed in their varying manifestations across the linguistic and other boundaries to uncover the underlying shared experience.

AS\&RC 459 Educational Innovations in Africa and the African Diaspora (also Social Sciences 459 and Women's Studies 459)

## Fall. 4 credits.

N. Assie-Lumumba

This course deals with theories and concepts of planned change for social development and their application to educational innovations
geared to promoting equal opportunity based on gender, race, and class in Africa and the African diaspora. The first part of the course will be concerned with the stage of innovations from their inception to their implementation. resistance, diffusion and impact on different social categories. The second part of the course will deal with concrete cases of educational innovations such as the creation of educational institutions and change in curriculum development and medium of instruction. Historical and contemporary cases of educational innovations will be presented and analyzed. The case studies include the development of African Studies as a discipline, the creation and expansion of historically black institutions such as Lincoln University in Pennsylvania, Tuskegee Institute in Alabama, Spelman College in Georgia, and the Westside Preparatory School of Chicago. The African cases to be studied include education for selfreliance in Tanzania, African languages as a medium of instruction in Nigeria and Mali, and television as a medium of instruction in Cote d'Ivoire. Gender will be a main focus in the analysis of the agents and beneficiaries of the innovations

## AS\&RC 475 Black Leaders and

 Movements in Afro-American History Fall. 4 credits.> R. Harris.

Analyzes the personalities, ideas, and activities central to the struggle for Afro-American liberation from the eighteenth-century to the present. Examines theories of leadership and the structure of protest movements with the goal of understanding current leadership needs and trends among Afro-Americans.

## AS\&RC 478 The Family and Society in Africa (also Women's Studies 478)

Fall. 4 credits.
N. Assiè-Lumumba

The family as a social institution is structured according to socio-economic, historical, political, and cultural specificities. The topics to be discussed include the concepts of nuclear and extended family, the place and role of different age-groups and generations in the family, marriage and related issues, such as down, divorce, parenthood, childrearing, gender roles, class differences, "family planning." The course also deals with the impact of westemization, urbanization, and modern economy on the structure of the family in Africa. Finally, the course addresses the legacy of African family values in the African diaspora. Examples will be drawn from urban and rural communities.

## AS\&RC 479 Women o Gender Issues in

 Africa (also Women's Studies 479) 중Spring. 3 credits
N. Assiè-Lumumba

There are two contrasting views of the status and role of women in Africa. One view portrays African women as dominated and exploited by men. According to another view women have a favorable social position in Africa: indigenous ideologies consider women to be the foundation of society, economically active and independent, possessing an identity independent of men. In this seminar we will discuss the status and role of women in Africa historically as well as in the contemporary period. Among the topics to be covered are: women in nonwesternized/precolonial societies, the impact of colonial policies on the status and position
of women, gender and access to schooling, women's participation in the economy and politics, the attitudes of African women toward feminism, and the 1985 NGO and the United Nations Nairobi Conferences on women.

## AS\&RC 483 Themes in African History

Fall and spring. 4 credits.
Fall, D. Ohadike; spring, S. Greene Designed to expose students to particular aspects of African history and historiography using, when necessary, work done in auxiliary disciplines. The course explores through case studies the precolonial interactions in ideas, peoples, and cultures; societal factors influencing the acceptance or rejection of new cultural forms; the extent to which the acceptance of new cultural forms affected relations of power, prestige, and gender. institutionally and materially.

## AS\&RC 498-499 Independent Study

 498-fall; 499-spring.Hours to be arranged. Africana Center faculty.
For students working on special topics, with selected reading, research projects, etc., under the supervision of a member of the Africana Studies and Research Center faculty.

## AS\&RC 501 Global Africa: Comparative Black Experience

Spring. 4 credits
A. Mazrui.

This seminar will address two diasporas in the Black experience. The diaspora of enslavement concerns slaves and descendants of slaves in both the Western and Eastern Diaspora. The diaspora of colonization concerns demographic dispersal as a result of colonialism. African-Americans are in their majority part of the Diaspora of Enslavement. Recent Algerian immigrants into France are part of the Diaspora of Colonization.
Jamaicans and Trinidadians in Britain are part of a double diaspora-products of both enslavement and colonialism. The course will address these areas of Black comparison Comparative Slavery-A Triple Heritage; Race and Race Mixture in Four Traditions; Comparative Emancipation from Slavery; Comparative Liberation from Colonialism; Comparative Struggle for Civil Rights; The Gender Question in Global Africa; Comparative Quest for Global Equality.]

## AS\&RC 503 African Aesthetics

Fall. 4 credits.
S. Hassan.

The goal of this course is to investigate in depth the principles of aesthetics and philosophy of African visual arts. The course will offer a critical survey of the different writings and the growing body of research on this relatively new area of inquiry. The objectives of the course are to review how African aesthetics has been studied to date, to provide a critical analysis of the different approaches to the subject and related issues, and to suggest future directions of research. In-depth analysis of particular African societies will be used to examine the relationship of arts and aesthetics to indigenous concept of time, space, color, form, and sociopolitical order. In addition, issues related to African aesthetics and arts such as style, gender, class, and social change will also be explored.

## [AS\&RC 505 Workshop in Teaching about Africa @

$1-4$ credits. Prerequisites: graduate standing or permission of instructor. Offered alternate years. Not offered 1994-95. Next offered 1995-96.]

## AS\&RC 510 Historiography and Sources: The Development of Afro-American History

Spring. 4 credits. Prerequisite: upperclass or graduate standing or permission of instructor. R. Harris

Studies the way Black historians in particular have explained the Afro-American past.
Examines the development of writing on AfroAmerican history from the earliest writers to the present. Seeks to determine the principles for interpreting Afro-American history.
Acquaints participants with the methodologies and sources central to understanding the AfroAmerican experience
[AS\&RC 530 Womanist Writing in Africa and the Caribbean ©
Fall. 4 credits. Not offered 1994-95.
M 1:25-3:55. A. Adams.
Theoretical essays on the nature, relevance, and articulation of feminist thought from African and Caribbean writers will complement literary texts. Gender issues, as manifested both at home and in emigrant situations abroad will be examined in texts by such writers as Sistren, Conde, Dangarembga, Aidoo, Warner-Vieyra, Ba, Emecheta, Kincaid W. Mandela. (Francophone works may be read in the original by individuals who so desire.)]

## AS\&RC 571 Graduate Seminar in Black Psychology

Fall. 4 credits. Prerequisite: permission of instructor.

R 9:05-12:05.
This is an upper-level undergraduate and graduate seminar clevoted to psychological issues in the Afro-American experience. This seminar will examine the theoretical and empirical literature of Black family-kinship systems and Black self-concept

AS\&RC 598-599 Independent Study 598-fall; 599-spring. Variable credit. For all graduate students.

AS\&RC 698-699 Thesis
698, fall; 699, spring. Limited to Africana Studies and Research Center graduate students.

## Agriculture, Food, and Society Concentration

A. G. Power, coordinator; G. Altschuler, M. M. Devine, emeritus; M. J. Esman, J. Fessenden MacDonald, C. C. Geisler, A. Gillespie, B. Ginsberg, D. J. Greenwood, S. L. Kaplan, D. R. Lee, T. J. Lowi, T. F. Lynch, T. A. Lyson, P. L. Marcus, P. McMichael, V. Nee, D. I. Owen, D. Pimentel, N. T. Uphoff, D. Usner. Office: 275 Clark Hall, 255-6042.

Agriculture, Food, and Society is an interdisciplinary concentration that is designed to introduce students to the study of agricultural and food issues from diverse perspectives within the liberal arts. The Agriculture, Food, and Society concentration seeks to make available to students a coherent program of study in which the role of agriculture in modern or prehistorical-historical and developed or developing societies can be understood in biological, social, scientific, and
umanistic perspective. The concentration draws upon courses in several colleges-in particular, the Colleges of Arts and Sciences, Agriculture and Life Sciences, and Human Ecology.
The concentration is administered by a committee, the members of which are drawn from the faculty associated with the concentraion. The members of this committee include faculty from each of the major colleges from which courses in the concentration are drawn The work of the committee is supported administratively through the Biology and Society Major. The office of the Biology and Society Major ( 275 Clark Hall) also provides a central location for students to receive information about relevant course offerings, upcoming seminars and presentations, faculty interests, and so on.

## Basic Requirements

The requirements for the Agriculture, Food, and Society concentration are designed to ensure a broad background in the biological, socioeconomic, and humanistic dimensions of agricultural and food issues. These requirements include foundation courses in biology; the Senior Seminar BioS/B\&SOc/S\&TS 469, Agriculture, Food, and Society; plus a minimum of five electives totaling 15 credits drawn from the courses offerings.

Students enrolling in the Agriculture, Food, and Society concentration should take the following foundation courses in biology to prepare themselves for course work in agricultural science: a two-semester introductory biology sequence selected from Biological Sciences $109 / 110,105 / 106$, or
101-104. (Advanced placement in biology with a score of 4 or 5, or Biological Sciences $107 / 108$, offered during the eight-week Cornell summer session, also satisfies the biological sciences requirement). These courses may be used to meet group 1 (physical or biological sciences) distribution sequence requirements in the College of Arts and Sciences.

It is recommended (but not required) that students in the Agriculture, Food, and Society concentration elect one or more freshman writing seminars with agriculturally related content to meet basic college requirements for graduation. The electives for the concentration, from which a minimum of five courses and 15 credits must be taken, are organized into three groups: agricultural and nutritional science, humanities, and social science, history. Students must select one agricultural and nutritional science course, one humanities course, and three social science or history courses. A maximum of six of the 15 credits may be earned in 100 -level courses.
In addition, students are required to take the senior seminar, B\&Soc/BioSci/S\&TS 469, Food, Agriculture and Society. Adjustments to these and other requirement of the concentration may be made with the approval of the student's Agriculture, Food, and Society faculty adviser.

## American Indian Program

Barbara Abrams, Interim Director (300 Caldwell Hall, 255-6587)

The American Indian Program (AIP) is a multidisciplinary, intercollege program consisting of academic, research, extension, publications and student support components.

Academic component. The AIP includes a range of courses that enhance students' understanding of the unique heritage of North American Indians and of their relationship to other peoples in the United States and Canada. Students are challenged by such topics as the sovereign rights of Indian nations and the contemporary relevance of Indian attitudes toward the environment. The program's instructional core consists of courses focusing on American Indian life with an emphasis on the Iroquois and other Indians of the Northeast. Core courses are supplemented by a variety of offerings in several different departments.
Concentration. The AIP offers a concentration in American Indian Studies to undergraduate students in conjunction with their majors defined elsewhere in the university. The concentration will be earned upon completion of five courses-Rural Sociology 100 (Introduction to American Indian Studies) and Rural Sociology 175 (Issues in Contemporary American Indian Societies) plus three other courses selected from the AIP course listing below-for a total of at least 15 credits
Students choosing a concentration in American Indian Studies should consult with the AIP's Director of Undergraduate Studies: D. H. Usner, Department of History, 322 McGraw, 255-6753.

Student support. The student support staff assist Native American students in completing an enriched Comell education by coordinating academic tutoring, financial aid, personal counseling, and other student services. Akwe:kon, the American Indian Program residence house, is one option available for students interested in a living environment that promotes intercultural exchange.
Research. Research priorities include Indian education, social and economic development, agriculture, environmental issues and cultural preservation. This research, which has serious implications in Indian communities, will be of interest to non-Indian and Indian graduate students.
Outreach. The AlP's Outreach unit seeks to develop solutions to problems identified by Indian communities. In this way the AIP can facilitate the application of institutional expertise and resources to community needs.
Publications and public relations. Alp publishes its own multidisciplinary journal, Akwe:kon Journal, and sponsors conferences, guest lectures, and forums on important local, national, and international Indian issues. AIP also contributes articles and information to the national Indian press.

## COURSE OFFERINGS

Course offerings vary from year to year. For full descriptions and schedules of courses, consult the individual departmental listings and the American Indian Program. The following courses are offered, or have been offered in the past.
ANTHR 230 Cultures of Native North America @ \#
ANTHR 354 The Peopling of America \#
ANTHR 663 Hunters, Gatherers, and the Origins of American Agriculture © \#

ANTHR 665 Native American Contributions to Anthropological Thought

ARCH 398/CRP 495 American Indian Landscape, Architecture, and Planning

CRP 360/666 Pre-industrial Cities and Towns of North America \#

CRP 363/547 American Indians, Planners, and Public Policy
ENGL 168 FWS Culture Studies: NativeAmerican Indian Poetry

ENGL 260 Topics in American Indian Literature
ENGL 278 Native American Indian Poetry
ENGL 668 Culture Studies: Native American Literature

ENGL 669 Critical Approaches to American Indian Autobiography
ENGL 687 American Indian Literature: Issues of Transition, Colaboration, and Alternate Discourse

HIST 209 Political History of American Indians in the United States \#

HIST 276 American Indian History, 1500-1850 \#
HIST 277 American Indian History since 1850
HIST 370 Resistance and Adaptation: Native American Responses to the Conquest \#
HIST 429 American Indians in the Eastern United States

HIST 624 Graduate Seminar in American Indian History
NR 494 Land and Culture: Systems of Native American Resource Management
R SOC 100 Introduction to American Indian Studies

R SOC 175 Issues in Contemporary American Indian Societies

R SOC 318 Ethnohistory of the Iroquois \#
R SOC 440 Social Impact of Rapid Resource Development

R SOC 442 American Indian Philosophies: Selected Topics

## Independent Study

Independent study courses can be arranged with American Indian Studies faculty in their respective departments.

## American Studies

J. Porte, chair and director of undergraduate studies; G. Altschuler, S. Blumin, L. Brown, J. Brumberg, M. Kammen, I. Kramnick,
T. Lowi, D. McCall, R. L. Moore, R. Polenberg,
S. Samuels, M. E. Sanders, J. Silbey, F. Somkin,
S. Wong. Emeritus: S. C. Strout

## The Major

The major in American studies, appropriate for a wide variety of future professions, is basically a program of coordinated study in the history, literature, and politics of the United States. The prerequisites are two courses from the following: American Studies 101, American Studies 102, English 275, English 268, Government 111. Students who contemplate becoming American studies majors are encouraged to speak with the chair as early as possible to arrange for a major adviser.
In consultation with their advisers, American studies majors elect, in addition to the prerequisites, 36 credits (or nine courses) of work in American history, American literature, and American government. Their work must include courses in all of the three large periods into which the nation's development
can be divided (defined for the purposes of the program as colonial, nineteenth century, and twentieth century). To gain both breadth and depth, they select as an area of concentration either a single period (or the connections between two of the periods) and take 1) at least 16 credits in one period and at least 8 credits in each of the other two, or 2 ) at least 12 credits in each of the two periods whose connections constitute the focus of the study and at least 8 credits in the third. Each student must take one of the adviser-approved seminars at the 400 or 600 level. When the subject matter is appropriate, such a seminar may count toward the satisfaction of the period requirements. Students divide their work among history, literature, and politics in whatever proportion serves their interests, so long as their advisers consider their programs to be well-balanced. No more than 18 credits may be in any one department.
Beyond the basic core requirements for the major, 8 credits of work in the history or literature or both of another related culture are required; students are also encouraged to take at least 4 credits in American thought, society, or culture studies from the perspective of another discipline such as anthropology, economics, history of art, or sociology. (This last 4 -credit supplement may be satisfied outside the college.)
Courses in American history that will satisfy the 36 -credit requirement are offered by the Department of History; those in American literature are offered by the Department of English, the Department of Theatre Arts, and the Africana Studies and Research Center; those in American government are offered in the Department of Government. Occasionally a course that fits an individual student's program may be offered elsewhere. Substitution will depend on the adviser's approval. Advisers determine what courses count for the interdisciplinary seminar
Honors. Candidates for honors must maintain an average of $B+$ in courses pertinent to the major. To be eligible for a degree with honors in American Studies, a student must in the senior year either write an honors essay for American Studies 493, Honors Essay Tutorial, or submit to the American Studies Committee three term papers written for courses in the major and take an oral examination in the declared area of special interest.
Cornell-in-Washington Program. American Studies majors may apply to the Comell-inWashington program to take courses and participate in a closely supervised externship during a fall or spring semester.

AM ST 101 Introduction to American History (also History 101)
Fall. 3 credits.

> M W F 11:15-12:05. G. Altschuler.

AM ST 102 Introduction to American History (also History 102)
Spring. 3 credits.
TBA. G. Altschuler.
[AM ST 200 Popular Culture in Twentieth-Century America 4 credits. Will be offered in alternate years. Not offered 1994-95
This course will analyze the evolution of popular culture in the United States from 1900 to the present. To understand how popular culture shapes and reflects American values, we will examine best sellers, films, sports,
advertising, television, and music. Topics include: Cultural Heroes and the Cult of Individualism in the 1920s; The Hays Code and the Black Sox Scandal; The Western; Mae West and the "New Woman"; Jackie Robinson and the American Dilemma; Liking Ike and Loving Lucy; Elvis, The Beatles, and Guns N' Roses; People, USA Today, and the Era of Infotainment. For a more detailed outline of the course, see Professor Altschuler, B-20 Day Hall.]

AM ST 258 Historical Development of Women as Professionals, 1800 to the Present (also Muman Development and Family Studies 258, History 238, and Women Studies 238)
Spring. 3 credits
T R 10:10-11:40. J. Brumberg.
AM ST 262 Asian American Literature (also English 262 and Asian Studies 262)

Fall. 3 credits.
T R 1:25-2:40. S. Wong.
AM ST 275 The American Literary Tradition (also English 275)
Fall, spring. 3 credits.
Fall: T R 1:25-2:40. J. Porte. Spring:
TBA. B. Maxwell.
AM ST 276 Literature in Cold War Culture, 1945-1960 (also English 276)

Fall. 3 credits.
T R 10:10-11:25. B. Maxwell
[AM ST 302 Social Movements in American Politics (also Government 302)

4 credits. Not offered 1994-95.]
AM ST 304 American Culture in Historical Perspective (also Mistory 304)

Fall. 4 credits.
M W F 1:25-2:15. M. Kammen.
AM ST 311 Structure of American Political History (also History 311)
Fall. 4 credits.
M W F 10:10-11:00. J. Silbey
[AM ST 312 Structure of American Political History (also History 312)
4 credits. Not offered 1994-95.]
[AM ST 316 The American Presidency (also Government 316)
4 credits. Not offered 1994-95.
[AM ST 330 The Age of Jackson, 18151850 (also History 330)
4 credits. Not offered 1994-95.]
[AM ST 331 American Civil War and Reconstruction, 1850-1877 (also History 331]
4 credits. Not offered 1994-95]
AM ST 332 The Urbanization of American Society: 1600 to 1860 (also History 332)

Fall. 4 credits.
M W F 11:15-12:05. S. Blumin.
AM ST 333 The Urbanization of American Society: 1860 to 2000 (also History 333)

Spring. 4 credits.
TBA. S. Blumin.
[AM ST 336 The American Ethos of Entrepreneurialism: Capitalism and Society in Developing America, 1607-1877 (also History 336)
4 credits. Not offered 1994-95.]
[AM ST 337 Entrepreneurialism and Organization in the Age of the Corporation: Capitalism and Society in Modern America, 1840-2000 (also History 337)
4 credits. Not offered 1994-95.]
AM ST 345 Intellectual/Cultural Life of Nineteenth-Century Americans (also History 345 and Religious Studies 345)

Fall. 4 credits
M W F 12:20-1:10. R. L. Moore.

## AM ST 346 Modernization of the

 American Mind (also History 346)Spring. 4 credits.
TBA. R. L. Moore
[AM ST 359 American Families in Historical Perspective (also Human Development and Family Studies 359, Women Studies 357, and History 359)
3 credits. Not offered 1994-95.J
AM ST 360 Painting and Everyday Life in Nineteenth-Century America (also History of Art 360)
Fall. 4 credits.
T R 10:10-11:25. L. L. Meixner.

## AM ST 361 Early American Literature (also English 361)

Spring. 4 credits.
TBA. S. Samuels.
[AM ST 364 American Literature between the Wars (also English 364)
4 credits. Not offered 1994-95.]
AM ST 366 The Nineteenth-Century American Novel (also English 366)
Fall. 4 credits.
T R 2:55-4:10. J. Porte.
[AM ST 465 Proseminar in American Studies (also English 465)
4 credits. Not offered 1994-95.]
[AM ST 479 Jewish-American Writing (also English 479 and Jewish Studies 478)
4 credits. Not offered 1994-95.]

## AM ST 485 American Modernist Writing

 (also English 485)Spring. 4 credits.
TBA. J. Porte
AM ST 493-494 Honors Essay Tutorial 493, Fall; 494, Spring. Up to 4 credits each semester. See J. Porte for appropriate advisers.

## AM ST 500 Research Seminar In

 American Studies (also History 500)Fall or spring. 8 credits each semester. Offered only in Washington, D.C. J. Silbey.

Required of all Cornell-in-Washington students pursuing the American experience option. Weekly lectures on the scope and methods of the various American Studies disciplines; presentation of research by visiting scholars; and the pursuing of an individual research project by each student, based on the resources available in Washington.

## Center for Applied Mathematics

The Center for Applied Mathematics administers a broadly based interdepartmental graduate program that provides opportunities for study and research over a wide range of the mathematical sciences. This program is based on a solid foundation in analysis, algebra, and methods of applied mathematics. The remainder of the graduate student's program is designed by the student and his or her Special Committee. For detailed information on opportunities for graduate study in applied mathematics, students should contact the director of the Center for Applied Mathematics, 657 Engineering and Theory Center.
There is no special undergraduate degree program in applied mathematics. Undergraduate students interested in an applicationoriented program in mathematics may select an appropriate program in the Department of Mathematics, the Department of Computer Science, or some department of the College of Engineering.

A listing of selected graduate courses in applied mathematics can be found in the description of the center on page 15.

## Asian American Studies Program

The Asian American Studies Program is a university-wide academic program housed administratively within the College of Arts and Sciences. Its aim is to promote teaching, research, and educational activities related to Asian Americans and to serve as a resource to the campus and regional communities. The program's undergraduate courses, offered within the program and cross-listed with departments in various colleges, meet distribution requirements and count toward a concentration in Asian American Studies. The program does not offer a graduate course of study, but students can undertake graduate work in Asian American Studies within selected disciplines of the university.

## Undergraduate Concentration

The program's undergraduate concentration affords students an opportunity to develop a multidisciplinary approach to the study of Asians in America. The course of study stresses developments within the United States, but also underscores the transnational and comparative contexts of Asian America and the field's connections with African American, American Indian, Latino, and Women's Studies. Students must work with a faculty adviser from among the program's affiliated faculty and must complete at least fifteen (15) units of credits as follows: (a) AAS 110 and two (2) additional courses in Asian American Studies; (b) one (1) course in Africana, American Indian, Hispanic American, or Women's Studies*; and (c) one (1) course in East Asian, South Asian, or Southeast Asian Studies." ("These courses must be approved by the student's faculty adviser, and they should address issues of race, gender, or the histories and cultures of Asian peoples.) Students must file an application for the concentration with the Asian American Studies Program.

## Resource Center

The program's Asian American Studies Resource Center provides meeting space for the more than twenty-five undergraduate student organizations of the Cornell Asian

Pacific Student Union and the graduate student Asian Pacific American Graduate Association. It also holds a modest print collection of books, periodicals, and newspapers; a current news clip file; a comprehensive data base of publications on Asian Americans since 1977; and a sizable collection of videotapes on the Asian American experience.

## Research

The program encourages faculty and student research on Asian Americans by sponsoring guest lectures, conferences, film festivals, readings, and exhibits. It also funds research projects and student travel to conferences and research sites. The Asian American Studies Workshop is the program's principal research initiative, engaging Comell's faculty and students with invited faculty from other universities in a year-long intensive study of selected themes

## Affiliated Faculty

Gary Y. Okihiro, director; T. Chaloemtiarana (Southeast Asia Program), P. Chi (Consumer Economics and Housing), B. de Bary (Asian Studies), J. V. Koschmann (History), L. C. Lee (Human Development and Family Studies), D. R. McCann (Asian Studies), H. Mullen (English), V. Nee (Sociology) G. Okihiro, (History), R. E. Ripple (Education), N. Sakai (Asian Studies), P. S. Sangren (Anthropology), K. W. Taylor (Asian Studies), S. Wong (English

## Courses

AAS 110 Introduction to Asian American Studies
Spring. 3 credits
T R 11:40-12:55. TBA
Interdisciplinary, cross-cultural introduction to Asian American Studies focusing on contemporary issues. Major themes include: identity and stereotypes, gender, family, community, education, migration and labor, and antiAsianism. Coverage will be given to both Hawaii and the U.S. mainland, and to Asian Indians, Chinese, Filipinos, Hawaiians, Japanese, Koreans, and Southeast Asians.

## AAS 213 Asian American History (also

 History 213)
## Fall. 4 credits

T R 1:25-2:40. T. Fujita Rony.
Comparative introductory history of Asian Indians, Chinese, Filipinos, Japanese, and Koreans in the U.S. from 1850 to World War II. Themes include U.S. expansionism in the Pacific, Asian migrant labor in Hawaii and the American West, the anti-Asian movement, and Asian American resistance

## AAS 262 Asian American History (also English 262

Fall. 3 credits.
T R 10:10-11:25. S. Wong
This course will introduce students to the wide range of writings by Asian Americans and to some critical issues concerning the production and the reception of Asian American texts. In reading through selected works of prose, poetry, and drama, we will be asking questions about the historical formation of Asian American identities and the problem of defining an Asian American literary tradition.

## ARTS AND SCIENCES - 1994-1995

[AAS 350 The Art and Politics of Defining the Self in Media Images (also Theatre Arts 350)
Spring. 3 credits. Not offered 1994-95.
The focus of this course is an exploration of the way films deal with the representation of people of poor within the American experience. Through the analysis of selected films and class discussions we will explore filmic representations of history, culture, class, gender, and identity]

## [AAS 385 Verse Writing (also English 385)

Not offered 1994-95
This course will have two focii. One will be an unusual selection of traditional, modernist. and contemporary East Asian and American expansions of poetical "form" that students will use as models (or irritants) for their own experiments. Poets whose work we will look at include Matsuo Basho, C. K. Williams, classical Buddhist exegetes. Theresa Cha, and Yi Sang, among others. Secondly, as we explore these forms, we will reexamine some of our basic assumptions about what it means to write "contemporary" poetry. Those wishing to enroll in this class should bring a sample of poems to our first meeting.]

## [AAS 412 Undergraduate Seminar in Asian American History (also History 412)

Spring. 4 credits, Not offered 1994-95 W 2:30-4:25. G. Okihiro.
A reading and research seminar that will cover various topics in Asian American history. The topic will be the idea of the "yellow peril" in European and American thought.]
[AAS 435 Asian American Images in Film 3 credits. Prerequisite: AAS 110 or permission of instructor. Not offered 1994-95. Staff.
Examination of images of Asians in American film and television productions within their historical and socio-cultural contexts. Use of film and media theory to assess the impact of those images on both Asian and non-Asian American viewers. Students will be challenged to create, in video or on paper, images that avoid stereotypes and depict more realistically the Asian American experience.]

## [AAS 465 Identity and Personality (also HDFS 465)

Not offered 1994-95
The seminar will review psychological theory and research dealing with Asian Americans. Topics such as family and kinship patterns, personality and identity issues, academic performance and achievement, immigration and adjustment, etc., will be examined within the context of the various Asian ethnic cultures and American society.]

## [AAS 478 Self and Nation in AsianAmerican Literature (also English 478)

Not offered 1994-95.
A study of the ways in which Asian American writers have constructed discourses of self and nation. Topics will include nationalism, feminism, identity politics, and theories of minority discourse. In our reading of selected works of prose, poetry and drama by Chinese American, Filipino American, Japanese American and Korean American writers, we will be asking questions about the relation of these works to the moment of their production and reception, and the manner in which these textual representations engage with shifting cultural and political struggles.

Writers under discussion may include: Carlos Bulosan, Theresa Hak Kyung Cha, Frank Chin, Jessica Hagedorn, David Henry Hwang,
Maxine Hong Kingston, Joy Kogawa, David Mura.]

## AAS 495 Independent Study

Fall or spring. 1-4 credits.
Topic and credit hours to be mutually arranged between faculty and student. Independent Study Forms must be approved by Asian American Studies Program Office.

## [AAS 611 Asian Americans, Civil Rights, and the Law (also Law 610)

Not offered 1994-95.
Examination of major immigration and civil rights laws and Supreme Court cases that have affected Asian Americans. Topics include America's immigration policy, alien land laws, and Asian American community development; Japanese Americans and World War II and the redress and reparations movement; Asian women; Asian labor; voting rights and Asian American empowerment; anti-Asian violence and the criminal justice system; equal educational opportunity and affirmative action; and language rights and the "English only" initiatives. Comparative review of Asian Americans and other ethnic minorities within the American legal system.]

## Biology and Society Major

S. Jasanoff, chair; W. R. Lynn, director of undergraduate studies, colleges of Arts and Sciences and Agriculture and Life Sciences; K . Obendorf, advising coordinator, College of Human Ecology; R. Barker, D. Bares, B. Bedford, A. Boehm, R. Boyd, U. Bronfenbrenner, emeritus, S. M. Brown Jr., emeritus, P. Bruns, S. Ceci, B. Chabot, C. C. Chu, T. Dawson, P. Dear, S. Dittman, C. Eberhard, G. W. Evans, G. W. Feigenson, J. Ford, J. Fortune, C. Geisler, M. Gilliland, S. Gilman, C. Greene, D. Gurak, J. Haas, R. Howarth, H. C. Howland, K. A. R. Kennedy, B. Knuth, A. Lemley, M. Lenzenweger, D. Levitsky, B. Lewenstein, B. A. Lewis, J. Fessenden MacDonald, L. Palmer, A. Parrot, D. Pimentel, T. Pinch, W. Provine, H. Ricciutí, emeritus, S. Robertson, M. Rossiter,
P. Schwartz, M. Small, N. Sturgeon,
J. M. Stycos, P. Taylor, J. Ziegler

The biology and society major is ideally suited for students who wish to combine training in biology with exposure to perspectives from the social sciences and humanities on the social, political, and ethical aspects of modern biology. In addlition to providing foundational training in basic biology, biology and society students obtain background in the social dimensions of modern biology and in the biological dimensions of contemporary social issues.
The biology and society major is offered to students enrolled in the College of Arts and Sciences and the College of Human Ecology. Undergraduates in the College of Agriculture and Life Sciences can develop an approved sequence of courses from the biology and society curriculum under general studies. The major is coordinated for students in all colleges through the biology and society office. Stuclents can get information, specific course requirements, and application procedures for the major from the office in 275 Clark Hall, 255-6042.
Because the major is multidisciplinary, students must attain a basic understanding of
the several disciplines it comprises. The curriculum includes courses in ethics; mathematics; statistics; history. philosophy, and social studies of science and biology; and basic biology (e.g., genetics and development; biochemistry and molecular-cell biology; ecology; evolutionary biology) as well as integrative courses offered through Biology and Society. In addition, majors are required to take a core course and must develop a theme: a coherent and meaningful grouping of courses representative of their special interest in biology and society. Students should develop the theme and select the courses in consultation with a member of the biology and society faculty. Courses must be above the 100 level, at least 3 credits, and taken for a letter grade if used to fulfill a major requirement.
There are student advisers and faculty available (according to posted office hours or by appointment) in the biology and society office, 275 Clark Hall or 278 Clark Hall (advising office), to answer questions and to provide assistance.

## Admission to the Major

All students should have completed a year of college-level biology and submit an application during their sophomore year. Juniors are considered on a case-by-case basis. Upperdivision applicants should realize the difficulties of completing the major requirements in fewer than two years. The application includes (1) a one-page statement explaining the student's intellectual interests in the biology and society major and why the major is consistent with the student's academic goals and interests; (2) the theme the student wishes to pursue in the major; (3) a tentative plan of courses fulfilling biology and society requirements, including courses taken and those the student plans to take; and (4) a transcript of work taken at Cornell University and elsewhere if applicable, current as of the date of application.
Acceptance into the major requires completion of the course sequence in introductory biology. Sophomores in the process of completing this prerequisite may be admitted to the major on a provisional basis. It is the student's responsibility to assure that final acceptance is granted on satisfactory completion of the introductory biology sequence. Although only introductory biological science is a prerequisite for acceptance, students will find it useful to have completed some of the other requirements (listed below) by the end of their sophomore year, preferably in the first semester. Human Ecology students should also consult the current Human Ecology Guide and meet with the college advising coordinator, Kay Obendorf, 202 Martha Van Rensselaer Hall, 255-3151.

## Major Requirements

1) Basic courses
A. Biological sciences 101-104 or 105-106 or 107-108 (prerequisite for admission to Biology and Sociery)
B. College calculus (one course):* Math 106, 111, 112 or any higher level calculus
Recommended but not required: General chemistry (one year sequence) (prerequisite to biochemistry
and other chemistry courses): Chemistry 103-104, 207-208, or 215-216
2) Foundation Courses (should be completed by end of junior year)
A. Ethics: One course; Bio\&Soc 205 (also BioSci 205 and Phil 245) or Bio\&Soc 206 (also BioSci 206 and Philosophy 246)
B. Social sciences/humanities foundation: Two courses; one from any two of the following subject areas: History of Biology/History of Science; Philosophy of Science; Sociology of Science; Politics of Science; and Science Communication**
C. Biology foundation (Breadth requirement): Three courses; one from three of the following subject areas Ecology (BioSci 261); Evolutionary Biology (BioSci 378); Biochemistry, Molecular and Cell Biology (BioSci 231 or 330 or 331 ); Microbiology (BioSci 290); Genetics and Development (BioSci 281 or 282 or Plant Breeding 225); Neurobiology and Behavior (BioSci 221 or 222); Botany (BioSci 241); and Physiology and Anatomy (BioSci 311)
D. Biology foundation (Depth requirement): One biology course for which one of the above (2.C.) is a prerequisite
E. Statistics: One course selected from Stat 200, ILR 210, Stat 215, Agr Ec 310, Ed 353, Soc 301, Psych 350, Math 372, Econ 319, OR\&IE 370, Stat 601, CRP 320, or B\&SOc 202
3) Core Course: (one course). Should be completed by end of junior year

B\&Soc 301 Biology and Society: The Social Construction of Life (also Bio Sci 301/S\&TS 401); or Phil 286: Science and Human Nature (also S\&TS 286)
4) Theme (five courses that correspond to the theme selected by the student). These courses must be above the 100 -level, at least 3 credit hours and taken for a letter grade)
A. Natural sciences issues (One course)
B. Biology elective (One course, with significant biology content, from Bio. Sci., Nutr. Sci., Agr. Sci., HDFS, Psych., Agron., An. Sci., Ento., Food Sci., Microbiol., Nat. Res., Plant Breeding, Plant Patho. or Vet. Med.)
C. Humanities/social sciences electives** (Two courses. Courses from the list of Senior Seminars may be used as theme electives if not used to meet another requirement).
D. Senior Seminar (One course taken senior year). Courses change yearly

* Students may petition to take a second statistics course (an advanced course, in sequence with the statistics course taken in the foundation) in place of the calculus requirement.
** Among the courses taken to meet the social sciences and humanities requirements (2.A, 2.B, 3, and 4.C), a minimum of two social science courses and two humanities courses must be chosen.

History of biology/history of science and philosophy of science courses may be counted toward the humanities requirement for the major

## Themes in the Major

Biology and society students must elect a particular specialization within the major and select their courses accordingly. There are currently six recommended themes in the biology and society major: biology, behavior, and society; biology and human population; biology and public policy; environment and society; food, agriculture, and society; and health and society. Students may also develop their own themes (which in recent years have included topics such as biotechnology and society, and agriculture, environment, and society) in consultation with their faculty adviser. Students are expected to select courses taken to meet the foundation, core, and theme requirements so as to build a coherent theme. Sample curricula for the recommended themes and for several studentdeveloped themes are available in the biology and society office.

## Independent Study

Projects under the direction of a biology and society faculty member are encouraged as part of the program of study in the student's theme area. Applications for research projects are accepted by individual faculty members. Students may enroll for $1-4$ credits in Biology and Society 375 (Independent Study) with written permission of the faculty supervisor and may elect either the letter grade or the S-U option. Biology and Society majors from the colleges of Arts and Sciences and Agriculture and Life Sciences may elect to do an independent study project as an alternative to, or in advance of, an honors project. Applications and information on faculty research, scholarly activities, and undergraduate opportunities are available in the Biology and Society office, 275 Clark Hall. Independent study credits may not be used in completion of the major requirements.

## Honors Program

The honors program is available to biology and society majors from the colleges of Arts and Sciences and Agriculture and Life Sciences and is designed to challenge the academicallytalented undergraduate student. Students who enroll in the honors program are given the opportunity to do independent study and to develop the ability to evaluate research dealing with issues in biology and society. Students participating in the program should find the experience intellectually stimulating and rewarding.
Selection of Students: During the first three weeks of the fall semester, senior biology and society majors are considered for entry into the honors program by the Honors Program Committee. Applications for the honors program are available at the biology and society office, 275 Clark Hall. To qualify for the honors program, students must explain how the honors work will fit into their overall program, must have an overall Cornell cumulative grade-point average of at least 3.00 , and must have at least a 3.30 cumulative grade-point average in all courses used to meet the major requirements. Students in the College of Agriculture and Life Sciences must also meet the requirements of that college and
be selected by one of the existing college honors committees.

If, after admission to the honors program, a student fails to maintain a high scholastic average, or if for any other reason(s) he or she is considered unsuited for honors work, the student reverts to candidacy for the regular bachelor's degree. The student who does not continue in the honors program receives credit for any work passed in the program but is not eligible for a degree with honors.
Project Requirements: The satisfactory completion of a special project and the writing and oral defense of an honors thesis are required. The project must include substantial research, and the completed work should be of wider scope and higher quality than the work normally required for an advanced course.
Initiative for formulation of ideas, developing the proposal, carrying out the study, and preparation of a suitable thesis lies with the student. Honors projects will be under the direction of two advisers. Candidates must first find a biology and society faculty member willing to serve as the adviser and, together with the adviser, find a second adviser among the faculty at large. The purpose of the second adviser is to guarantee expertise in the subject matter covered by the thesis. Students in the College of Agriculture and Life Sciences must select this adviser from the area in which their thesis will be reviewed.
Students must enroll in Biology and Society 499 for one or both terms of their senior year after consultation with the biology and society thesis adviser. They take from 3 to 5 credits per term with up to a maximum of 8 credits in Biology and Society 499. Students are encouraged to enroll for both terms to give them time to develop a project properly for the thesis. If registering for a two-semester honors project, students must register for the total credits desired for the whole project each term (e.g., 8 credits for the fall term and 8 credits for the spring term). Students should note, however, that Biology and Society 499 , because it is a special honors course, is to be taken in addition to those courses that meet the regular major requirements. Honors projects cannot be used to fulfill the senior seminar requirement.

Honors Thesis: Students and their advisers should meet regularly during the period of research and writing for the honors thesis. The responsibility for scheduling these meetings, and for carrying out the research agreed on, rests with the student. Advisers are expected to make themselves available for discussion at the scheduled times and to offer advice on the plan of research, as well as provide critical and constructive comments on the written work as it is completed. They are not expected, however, to have to pursue students either to arrange meetings or to ensure that the research and writing are being done on schedule.
There is no prescribed length for a thesis, as different topics may require longer or shorter treatment, but normally it should be no longer than seventy double-spaced, typed pages. The thesis must be completed in a form satisfactory for purposes of evaluation and submitted to the two thesis advisers and one member of the Biology and Society faculty appointed by the Biology and Society chair by

April 15. The candidate must meet with the three reviewers to formally defend the thesis by April 29.
Evaluation and Recommendation: Two copies of the completed and defended thesis (suitably bound in a plastic or hard-backed cover), together with the advisers' recommendations, must be submitted to the Honors Program Committee by May 10.
Following the formal defense of the thesis, the thesis advisers will each submit to the Honors Program Committee a recommendation that includes (1) an evaluation of the honors work and the thesis, (2) an evaluation of the student's academic record in the biology and society major, and (3) a recommendation for or against awarding honors. (For College of Arts and Sciences students, a recommendation for the level of honors must be included.)
Copies of the thesis and recommendations will be circulated to the Honors Program Committee. As the committee may have little knowledge of the subject area of the thesis, letters of recommendation should be carefully prepared to help the committee ensure consistency in the honors program. Unless there is serious disagreement, the recommendation of the advisers should stand. If there is disagreement, the Honors Program Committee will make the decision after consultation with the interested parties

## Freshman Writing Seminars

B\&5OC 103 In the Company of Animals Fall. 3 credits.
A. Boehm.

## [B\&SOC 104 Ecosystems and Ego

 SystemsSpring. 3 credits. Not offered 1994-95. M. Gilliland.]

## [B\&SOC 108 Living on the Land

Fall. 3 credits. Not offered 1994-95. A. Boehm.]
[B8SOC 109 Women and Nature (also English 105.4/W/ 106)
Fall. 3 credits. Not offered 1994-95.]

## BeSOC 113 Writing as a Naturalist (also

 English 113)Fall and spring. 3 credits.
M W F 11:15-12:05. D. Staudt.
B\&SOC 114 Ecology and Social Change (also Science and Technology Studies 114)
Spring. 3 credits.
T R 1:25-2:40. P. Taylor.
[B\&SOC 115 The American Way: Addiction and Consumption
Spring. 3 credits. Not offered 1994-95 M. Gilliland.]
[B\&SOC 118 Civilizing Nature: Race, Gender, and the Cultural Politics of Science (also Science and Technology Studies 118)
Spring. 3 credits. Not offered 1994-95. K. Philip.]

## BaSOC 121 Designing Future

 Generations (also Science and Technology Studies 121)Fall. 3 credits.
M W F 11:15-12:05. T. Steen.
This course will focus on eugenics, the "improvement" of future generations through the selection of a "superior" breeding pool. We will study the comparative history of
eugenics in several countries. First, students will develop a basic knowledge of the topic. Later in the course, we will raise more specific questions. How has the idea of "eugenicsscience" been used to justify racism, nationalism, and class discrimination? Currently, a new concept, "new eugenics," is being discussed. Therefore, we will also discuss the question of whether or not the idea of eugenics has changed since the birth of molecular biology. By the end of the course, students will develop a thorough understanding of eugenics, and will be able to think critically about it from their own perspective.

## [B2SOC 123 Biology on Women and

 Women in Biology (also Science \& Technology Studies 123 and Women's Studies 123)Spring. 3 credits. Not offered 1994-95.]

## B\&SOC 124 Technoculture (also Science

 and Technology Studies 124) (pending EPC approval)Spring. 3 credits.
Cole.
It is a common cultural assumption that new technologies are changing the way humans related to their machines, themselves, and one another. The Internet, genetic engineering, artificial intelligence, nanotechnology, virtual reality, space travel, "smart" weapons, and new reproductive technologies are only a few of the emerging technological developments that are currently provoking discussion of the relationship between humans and machines. In this course, we will read a wide variety of responses to new technological developments, both historical and current. We will examine a variety of fiction and non-fiction genres including history, philosophical tracts, postmodern academese, epic journalistic narratives, engineers' reflections, futurology, political arguments, Luddite rants, and science fiction novels and films in order to probe the question of what it means to write about technology. Writing assignments will explore some of these genres with the goal of developing a style conducive to writing about technology. Readings will include Samuel Butler, Lewis Mumford, Buckminster Fuller, Walter Benjamin, Kurt Vonnegut, Samuel Florman, Alvin Toffler, and William Gibson.

## [B\&SOC 167 Science In and Out of the

 Lab (also Science and Technology Studies 167)Fall. 3 credits. Not offered 1994-95. Staff.J

## II. Foundation Courses

## A. Etbics (select one)

B\&SOC 205 Ethical Issues in Health and Medicine (also Science and Technology Studies 205 and Biological Sciences 205)
Spring. 4 credits. Limited to 75 students. Registered students not attending the first week will be dropped from the course. Open to sophomores, juniors, and seniors.

T R 8:40-9:55. Staff.
We examine ethical problems that emerge from cases of health care and search for practical solutions, while also delving deeper into unclerstanding the nature of ethical responsibility and the tools of ethical analysis. This is a "lab" course in philosophy, with considerable work-both individually and in groups-on specific cases, problems, and fundamental ethical questions. Major sections include: life, death, reproduction and ethics:
concepts of health care; health care and society; and research. Note: A more detailed description of this course is available in the biology and society office, 275 Clark Hall.

## B\&SOC 206 Ethics and the Environment (also Science and Technology Studies 206 and Biological Sciences 206)

Fall. 4 credits. Limited to 50 students. Open to all undergraduates; permission of instructor required for freshmen.

T R 11:40-12:55. N. Sethi.
We address how ethical analysis helps shape our responses to environmental problems. Case studies will help guide our assessments. This is a "lab" course in philosophy: you will be challenged to develop ethical solutions or approaches on your own and in groups.
Major aims include: articulating the relationships between knowledge and values; and distinguishing between ethics and economics, ecology, ideology, politics, and prudence or wisdom. A background in basic ecology OR environmental issues OR ethics is strongly recommended. Note: A more detailed description of this course is available in the biology and society office, 275 Clark Hall.
B. Social Sciences/Humanities Foundation ( 2 courses, 1 from any 2 areas)

1. History of Biology and History of Science
[B\&SOC 288 History of Biology (also Science and Technology Studies 288)

Spring. 3 credits. Not offered 1994-95. Staff.]

## [B8SOC 322 Medicine and Civilization

 (also German Studies 322)Fall. 3 credits. Offered altemate years. Not offered 1994-95.
S. Gilman.

What is sickness? What is health? Who is the physician? Is a physical illness different from mental illness? Where is medicine practiced? Is being a patient or a doctor different from culture to culture and from age to age? This course will introduce the undergraduate student to the historical and cultural context of medicine. Our sources will range from the texts of ancient Greek medicine to contemporary films and novels dealing with medicine. We will examine the historical and social context of mental illness as well as physical illness from the standpoint of patient, physician, and "society." All of the primary readings are available in English.]

## HIST 282 Science in Western Civilization (also Science and Technology Studies 282)

Spring. 4 credits. T R 11:40-12:55. P. Dear
BIOES 207 Evolution (also Science and Technology Studies 287 and History 287)

Fall. 3 credits. (May not be taken for credit after Biological Sciences 378, Evolutionary Biology.)

TR 10:10-11:00. W. B. Provine.
S\&TS 233 Agriculture, History, and Society: From Squanto to Biotechnology
Fall. 4 credits.
M W F 12:20-1:10. M. Rossiter.

S\&TS 433 Comparative History of Science
Spring. 4 credits

> W 12:20-2:15. M. Rossiter.

S\&TS 444 Historical Issues of Gender and Science (also Women's Studies 444)

Spring. 4 credits.
M 12:20-2:15. M. Rossiter.

## 2. Philosophy of Science

PHIL 286 Science and Human Nature (also Science and Technology Studies 286)
Spring. 4 credits. May be used to meet the philosophy of science requirement if not used
to meet the core course requirement.
M W F 10:10-11:00, plus disc. R. Boyd.
PHIL 381 Philosophy of Science: Knowledge and Objectivity (also Science and Technology Studies 381)

Fall. 4 credits. Limited to 30 students. R. Boyd.
[PHIL 389 Philosophy of Science: Evidence and Explanation (also Science and Technology Studies 389)

Spring. 4 credits. Not offered 1994-95. R. Miller.]

## 3. Sociology of Science

B\&SOC 301 Biology and Society: The Social Construction of Life (also Biological Science 301 and Science and Technology Studies 401)
Fall. 4 credits. Prerequisite: one year of introductory biology. Limited to 75 students. May be used to meet the sociology of science requirement if not used to meet the core course requirement.

Sem and disc, M W 2:30-4:25. P. Taylor.
B\&SOC 342 Sociology of Science (also Science and Technology Studies 442 and City and Regional Planning 442)
Spring. 4 credits.
T R 10:10-11:25. S. Yearley.
A view of science less as an autonomous activity than as a social institution. We will discuss such issues as controversies in science, textual analysis, gender, and the social shaping of scientific knowledge.
R SOC 208 Technology and Society Fall. 3 credits. C. Geisler.

## 4. Politics of Science

[B\&SOC 406 Biotechnology and Law (also Science and Technology Studies 406|
Fall. 4 credits. Limited to 16 students. Recommended: a course in genetics or rDNA, a course in American government or law, or permission of instructor. Fee for course reading materials. Not offered 1994-95. S. Jasanoff.

Biotechnology, with its myriad applications in areas such as medicine and agriculture, is developing more rapidly than the social institutions that are capable of controlling it This course explores the use and potential abuse of biotechnology in areas such as genetic screening and counseling, reproductive technologies, intentional release of genetically engineered organisms, patents, and ownership of human tissue. Particular attention will be given to evolving legal and management strategies for regulating the
applications of biotechnology. Readings are from science, medicine, law, and public policy. A research paper is required.]
[B\&SOC 407 Law, Science, and Public Values (also Government 407 and Science and Technology Studies 407)

Fall. 4 credits. Not offered 1994-95.
Lec, T R 1:25-2:40, plus disc. S. Jasanoff. This course explores the varied interactions between science and the legal process that have developed in recent years as a result of attempts to bring greater public accountability to the use of science and technology. It examines the activities of both legislatures and courts in controlling science and analyzes the values underlying these initiatives. Three major types of science-law interactions form the focus of the course: expert testimony in the courtroom, regulation of hazardous technologies, and legal control of professional standards in science and medicine. Specific topics include the regulation of toxic chemicals and nuclear power, controversies about biotechnology, reproductive technologies and biomedical research, and scientific misconduct.]
[S\&TS 415 The Politics of Technical Decisions (also City and Regional Planning 541 and Government 628)
Fall. 4 credits. Not offered 1994-95.
M. Dennis.]

S\&TS 425 Global and Domestic Dimensions of Science and Technology Studies Policy (also Government 468)
Fall. 4 credits. Instructor permission for upper-level undergraduates.

M 1:25-4:25. H. Gottweis.
[\$8TS 431 Introduction to Science and Technology Policy (also Government 401)

Fall. 4 credits. Not offered 1994-95.
H. Gottweis.]

## 5. Science Communication

[B\&SOC 300 Investigative Research on the Social Impact of Science falso Textiles and Apparel 301 and Science and Technology Studies 402)

Spring. 4 credits. Prerequisite: one year of science and prior consultation with instructors. Offered alternate years. Next offered 1996.
P. Taylor and P. Schwartz.

Students choose a current issue in the social impact of biological or physical sciences and work through the steps of investigation from issue definition to spoken presentations and proposals for action. In a workshop setting, students comment on and learn from other's projects and discuss case studies and articles, with occasional guest speakers and films.]

COMM 352 Science Writing for the Mass Media (also Science and Technology Studies 352)
Fall. 3 credits. Not open to freshmen.
Limited to 25 students. Prerequisite: one college writing course.

M W 9:05-9:55. B. Lewenstein.

## COMM 360 Scientific Writing for Public

 InformationFall or spring. 3 credits. Limited to 25
nonfreshman or graduate students per section.
Prerequisite: any college-level writing course.
J. Hardy and L. vanBuskirk.
C. Biology foundation (Breadth Requirement): Three courses: one from three of the following subject areas:

1. Biochemistry, Molecular and Cell Biology
BIOBM 231 General Biochemistry
Fall. 3 credits.
J. M. Griffiths.

BIOBM 330 Principles of Biochemistry, Individual Instruction
Fall or spring. 4 credits.
I. Blankenship.

BIOBM 331 Principles of Biochemistry, Lectures
Fall. 4 credits. ( 2 credits if taken after
Biological Sciences 231)
G. Feigenson, R. Barker and B. K. Tye.

## 2. Ecology

BIOES 261 Ecology and the Environment Fall. 4 credits.
T. Dawson and R. Root.
3. Genetics and Development

## BIOGD 281 Genetics

Fall, spring, or summer. 5 credits.
R. S. MacIntyre, T. Fox and
M. L. Goldberg.

BIOGD 282 Human Genetics
Spring. 3 credits. ( 2 credits if taken after
Biological Sciences 281)
R. Calvo.

## PL BR 225 Plant Genetics

Spring. 4 credits. Offered alternate years. M. A. Mutschler.

## 4. Evolutionary Biology

## BIOES 378 Evolutionary Biology

Spring. 4 credits.
R. G. Harrison.

## 5. Microbiology

## BIOMI 290 General Microbiology

 LecturesFall, spring, or summer. 3 credits.
Prerequisties: Biological Sciences 101-102 and 103-104 and Chemistry 104 or 208, or equivalent. Recommended: concurrent registration in Biological Sciences 291. M. Cordts and S. Merkel.
6. Neurobiology and Behavior

BIONB 221 Neurobiology and Behavior I: Introduction to Behavior
Fall. 3 or 4 credits ( 4 credits with discussion and written projects). Not open to freshmen. S. Emlen and staff.

BIONB 222 Neurobiology and Behavior II: Introduction to Neurobiology
Spring. 3 or 4 credits. ( 4 credits with discussion and written projects). Not open to freshmen. Limited to 20 students. R. Booker and staff.

## 7. Botany

BIOPL 241 Introductory Botany
Fall. 3 credits. Prerequisite: one year of introductory biology or permission of instructor.
K. Niklas.

## 8. Physiology and Anatomy

BIOAP 311 Introductory Animal Physiology, Lectures (also Veterinary Medicine 346)
Fall. 3 credits. Prerequisite: one year of college biology, chemistry, and mathematics. Recommended: previous or concurrent course in physics.
E. R. Loew and staff.

NS 341 Muman Anatomy and Physiology Spring. 4 credits.
V. Utermohlen.
D. Biology foundation (depth requirement): One course for which one of the above breadth requirement courses (2C) is a prerequisite.
E. Statistics (select one)
[BeSOC 202 Statistical Analysis for the Life Sciences
Summer. 4 credits. Limited to 20 students. Fee for course materials. Not offered 1994-95. P. Taylor.

Statistical analysis includes the construction of observations (in experiments and in the field), summarizing data (statistics, distributions, correlation), testing hypotheses and other statistical inference (including "goodness of fit"). Concepts and methods will be introduced through lectures, practice classes and discussions. Real cases from the life sciences will be used, and the different interpretations, hidden assumptions, limitations and misuse of statistically derived results will be emphasized.]

## AG EC 310 Introductory Statistics <br> Fall and spring. 4 credits. <br> C. van Es.

CRP 320 Introduction to Statistical Reasoning for Urban and Regional Analysis
Fall. 3 credits.
Saltzman.

## ECON 319 Introduction to Statistics and

 ProbabilityFall or summer. 4 credits. Prerequisites:
Economics 101-102 and Mathematics 111-112. Y. Hong.
[EDUC 353 Introduction to Educational Statistics
Spring. 3 credits. Prerequisite: Education 352 (1 credit) or concurrent registration. Not offered 1994-95. J. Millman.]

ILR 210 Statistics: Statistical Reasoning
Fall and spring. 4 credits. Staff.
MATH 372 Elementary Statistics
Fall. 4 credits. Staff.
OR\&IE 370
Fall. 4 credits.
L. Weiss.

PSYCH 350 Statistics and Research Design
Fall. 4 credits.
T. Gilovich.

SOC 301 Evaluating Statistical Evidence Fall. 4 credits.
E. Bell.

STATS 200 Statistics and the World We Live In
Fall. 3 credits.
C. E. McCulloch.

STATS 215 Introduction to Statistical Methods
Fall. 3 credits.
R. W. Doerge.

## STATS 601 Statistical Methods I

Fall. 4 credits.
G. Churchill.

## III. Core Courses

B\&SOC 301 Biology and Society: The Social Construction of Life (also Biological Sciences 301 and Science and Technology Studies 401)
Fall. 4 credits. Prerequisite: one year of introductory biology. Limited to 75 students.

Sem and disc, M W 2:30-4:25. P. Taylor. Controversial issues, past and present, in the life sciences and tools for analysis of the social, historical, and conceptual underpinnings of these issues. Topics include evolution and natural selection, heredity and genetic determinism, biotechnology and reproductive interventions, ecology and environmental change. Analytic themes include bias, metaphor, historical semantics, styles of explanation, determinism, causality, interest, social construction, and gender. Through discussions and writing assignments, students will develop analytic skills and their own responses to current issues.

## PHIL 286 Science and Human Nature

 (also Science and Technology Studies 286\}Spring. 4 credits.
Lecs, M W F 10:10-11:00, plus disc.
R. Boyd.

An examination of attempts in the biological and social sciences to offer scientific theories of human nature and human potential and to apply such theories to explain important social and psychological phenomena. Topics vary, and may include issues in psychology. such as behaviorism, Freudianism, and artificial intelligence, or issues in the foundations of historical theory, such as methodological individualism and economic determinism, as well as relevant issues in the biological sciences.

## IV. Themes

A. Issues - Natural Sciences (one course)
[BASOC 201 Biotechnology: The 'New' Biology (also Biological Sciences 201)

Spring. 3 credits. Prerequisite: one year of introductory biology or equivalent. This course is for students not majoring in biological sciences. Not for students who have taken or are currently enrolled in BIOGD 281 , BIOBM 330, or 331. Letter grades only. Not offered $1994-95$.

Lecs, T R 2:30-4:25. J. Fessenden
MacDonald, J. Calvo, S. Howell. Rec T or
R 3:35 (stan week 3; assignments made
during week 2 ).
Designed for nonmajors, a general introduction to the application and issues of modern molecular biology in medicine and agriculture. Information on recombinant DNA technology, monoclonal antibodies, plant cell culture techniques, and embryo manipulation methods is presented. Topics include medical diagnostics and treatments; environment, agriculture, and food; and economic, social-
policy, regulatory, ethical, and legal issues that surround biotechnology. The course is taught in three modules and the topics vary from year to year. Topics for 1995 are human gene mapping and genetic screening; crop plant biotechnology, and immunodiagnostics and therapy (AIDS and cancer.) Recommended for those students who want to understand some new research discoveries, their applications, and social, legal, ethical, and policy issues stemming from them.)

## B\&SOC 214 Blological Basis of Sex Differences (also Biological Sciences 214 and Women's Studies 214) <br> Fall. 3 credits. Prerequisite: one year of

 introductory biology. Limited to non-biology majors and freshman and sophomore biology majors. S-U grades optional. Offered alternate years.Lecs, T R 8:30-9:55; occasional discs to be arranged. J. E. Fortune.
The structural and functional differences between the sexes are examined. Emphasis is placed on mechanisms of mammalian reproduction; where possible, special attention is given to studies of humans. Current evidence on the effects of gender on nonreproductive aspects of life (behavior, mental, and physical capabilities) is discussed. The course is intended to provide students with a basic knowledge of reproductive endocrinology and with a basis for objective evaluation of sex differences in relation to contemporary life.

## B8SOC 232 Recombinant DNA

 Technology and Its Applications (also Biological Sciences 232) Spring. 3 credits. Limited to first-year students with Biology AP 4 or 5 .Lecs and discs, M W F 11:15. J. Calvo. An introduction to molecular approaches to biology. Basic concepts underlying recombinant DNA technology together with strategies for cloning genes are discussed. Much of the course deals with applications of recombinant DNA technology to basic research and to biotechnology. Applications to be discussed include screening for genetic diseases, animal and plant improvement, and production of insulin, interferon, blood-clotting factors, growth hormones, vaccines, and feedstock chemicals. Scientific, historical, regulatory, social, and ethical issues are presented and discussed. Recommended especially for students desiring a firm background in recombinant DNA technology in preparation for taking genetics and biochemistry.

## [B\&SOC 347 Muman Growth and

 Development: Biological and Social Psychological Considerations (also Human Development and Family Studies 347 and Nutritional Sciences 347)Spring. 3 credits. Prerequisites: Biological Sciences 101 or 109 or equivalent, and Human Development and Family Studies 115 or Psychology 101. Offered alternate years. Next offered 1994-95.
J. Haas and S. Robertson.

A review of major patterns of physical growth from the fetal period through adolescence, with consideration of biological and socioenvironmental determinants of growth as well as physical and psychological consequences of variations in growth patterns. An examination of normal patterns of growth is followed by an analysis of major sources of variations in growth (normal and atypical).]

ASTRO 202 Our Home in the Solar System
Spring. 3 credits.
P. J. Gierasch and M. Cordts.

BIOPL 246 Plants and Civilization Spring. 3 credits.
D. Bates.
[BIOES 275 Human Biology and Evolution (also Anthropology 275 and Nutritional Sciences 275)
Fall. 3 credits. Offered alternate years. Not offered 1994-95.
J. Haas and K. A. R. Kennedy.]

## NTRES 201 Environmental Conservation

 Spring. 3 credits. T. Fahey.NS 222 Maternal and Child Nutrition
Spring. 3 credits. G. Garza.
[NS 361 Biology of Normal and Abnormal Behavior (also Psychology 361)
Fall. 3 credits. Not offered 1994-95. B. Strupp ]

Ns 650 Public Health Nutrition Spring. 3 credits. Staff.
HDFS 370 Abnormal Development and Psychopathology
Spring. 3 credits. M. Lenzenweger.
B. Biology elective (One course with significant biology content from BioSci., Nutr. Sci., Agr. Sci., HDFS, Psych., Agron., An.Sci., Ento., Food Sci., Microbiol., Nat. Res., Plant Breeding, Plant Patho. or Vet. Med.)
Examples of biology electives
AN SCI 300 Animal Reproduction and Development
Spring. 3 credits.
J. Parks.

NS 331 Physiological and Biochemical Bases of Human Nutrition
Spring. 3 credits.
M. Stipanuk.
C. Humanities/Social Science elective (two courses)
Courses listed earlier as social science/ humanities foundation courses (2.B.) are particularly appropriate as social science/ humanities electives. However, a single course cannot be used to meet both requirements. Additional courses that are recommended as social science or humanities electives are:
Examples of social science electives
AO ECON 464 Economics of Agricultural Development
Spring. 3 credits.
R. Barker.
[ANTHRO 211 Nature and Culture
Spring. 3 credits. Not offered 1994-95. P. S. Sangren.]

BIOES 673 Human Evolution: Concopts, History, and Theory (also Anthropology 673)
Fall. 3 credits. Offered alternate years. K. A. R. Kennedy.

CRP 480 Environmental Politics
Spring. 4 credits.
R. Booth

CRP 451/551 Environmental Law
Fall. 4 credits.
R. Booth.

CRP 656 Land Resources Protection Law Fall. 3 credits.
R. Booth.

HDFS 258 The Historical Development of Women as Professionals, 1800 to the Present (also Women's Studies 238 and History 238)
Fall. 3 credits. Limited to 120 students. T R 10:10-11:40. J. Brumberg.
HDFS 451 History of Childhood in the United States
Spring. 3 credits.
M W F 10:10-11:00. J. Brumberg.
HSS 315 Human Sexuality
Spring. 3 credits.

> T R 2:30-3:45. R. Heasley.

HSS 325 Health Care Services and the Consumer
Fall. 3 credits. Offered alternate years. R. House.

HSS 330 Ecology and Epidemiology of Health
Spring. 3 credits.
E. Rodriguez.
[HSS 491 Contemporary Issues in Women's Health
Fall. 3 credits. Not offered 1994-95.
T R 10:10-11:25. A. Parrot.]
HS5 634 Health Care OrganizationProviders and Reimbursement
Fall. 3 credits.
T R 12:20-1:35. J. Kuder.
HSS 688 Long-Term Care and the Aged: Alternative Health and Social Services Delivery Systems
Spring. 3 credits. R. Battistella.

NTRES 400 International Environmental Issues
Fall. 4 credits.
R. McNeil.

NS 245 Social Science Perspectives on Human Nutrition
Fall. 3 credits.

> J. Sobal and D. Sanjur.

NS 457 National and International Food Economics (also Economics 374)
Spring. 3 credits.
E. Thorbecke.
[PSYCH 255 Psychology and Medicine
Fall. 3 credits. Prerequisite: an introductory psychology course. Limited to 60 students.
Not offered 1994-95.]
PSYCH 326 Evolution of Human Behavior
Fall. 4 credits. Offered altemate years. R. Johnston.

R SOC 201 Population Dynamics (also Sociology 205)
Spring. 3 credits.
J. M. Stycos.

R SOC 205 Rural Sociology and International Development
Spring. 3 credits.
P. McMichael.

R SOC 324 Environment and Society
Fall. 3 credits.
M. J. Pfeffer.
[R SOC 490 Society and Survival
Fall. 3 credits. Not offered 1994-95.
D. Gurak.]

Examples of humanities electives
[GERST 347 Reading Freud: Race, Gender, and Psychoanalysis (also Psychology 389, English 347 and Comp. Lit. 347)
Spring. 3 credits. Offered alternate years.
Optional: 1-credit clinical discussion section. Not offered 1994-95. S. Gilman.]

NTRES 407 Religion, Ethics, and the Environment
Spring. 4 credits.
R. Baer.

PHIL 241 Ethics (by petition for breadth requirement)
Fall. 4 credits.
R. Miller.
[PHIL 368 Global Climate and Global Justice (also Government 468)
Fall. 4 credits. Not offered 1994-95. H. Shue.]
[PHIL 681 Classification, Reality, and Knowledge: Realism, Social Construction, and Objectivity (also Science \& Technology Studies 681)
Spring. 4 credits. Not offered 1994-95 R. Boyd.]

S\&TS 626 Workshop on Law, Science, and Technology (also GOVT 626)
Spring. 4 credits. Enrollment limited.
Permission of the instructor required. W 2:00-4:25. S. Jasanoff.

## D. Senior Seminars

B\&SOC 447 The History of Biology (also History 415 and Science and Technology Studies 447 and Biological Sciences 467)
Fall. 4 credits. Limited to 18 students. A
Common Learning course.
T R 12:20-2:15. W. Provine.
B\&SOC 404 Human Fertility in Developing Nations (also Rural Sociology 408)
Spring. 3 credits. Prerequisite: a population course or permission of instructor. Offered alternate years
J. M. Stycos.

A review of the major literature dealing with the social causation of variation in human fertility. Emphasis will be on international comparisons and on the methodology of field research.
[B\&SOC 406 Biotechnology and Law (also Science and Technology Studies 406)
Fall. 4 credits. Limited to 16 students. Recommended: a course in genetics or DNA, a course in American government or law, or permission of instructor. Fee for course reading materials. Not offered 1994-95. S. Jasanoff.]

## [BeSOC 414 Population Policies (also

 Rural Sociology 418)Spring. 3 credits. Prerequisite: a population course or permission of instructor. Offered alternate years. Not offered 1994-95.
J. M. Stycos.

The ways in which societies try to affect demographic trends. Special focus is on government policies and programs to influence fertility.]
[B\&SOC 426 Medicine and the Law
Fall. 4 credits. Letter grades only. Limited to 16 students. Not offered 1994-95.
L. Palmer

The role of law in modern medicine (and the related biomedical sciences) will be examined from the perspective of the social functions of law and medicine. A number of policy and ethical issues will be considered, including the role of hospitals and other health organizations in doctor-patient interactions, the social aspects of physician-patient interactions, reproductive technologies, the effect of medical malpractice on health-care delivery, legal issues in the care of the newborn, and health-care decisions for incompetents and terminally ill patients.]
BASOC 428 Medical Service Issues in Health Administration (also Human Service Studies 628)
Spring. 3 credits. Limited to seniors and graduate students. Permission of instructor. Only Biology and Society majors can receive Arts credits for this course.
V. Utermohlen.

A survey of the issues that affect interactions between the health-care consumer and the health-care team, including disease processes (how disease occurs and progresses), the health-care team and illness, third-party payment and illness, and resource allocation.

## B\&SOC 451 AIDS and Society

Fall. 3 credits. Limited to students who have been approved by course coordinators. A Common Learning course.

W 2:30-4:30. S. Dittman and
V. Utermohlen.

Discussions of the effect of HIV infection and AIDS on society will consist of seminars on the biology of the virus, medical treatment, transmission and prevention, and personal, social, and political impact of HIV/AIDS. Students will have the opportunity to initiate and carry out AIDS education projects on campus.
[B8SOC 460 Social Analysis of Ecological Change (also Rural Sociology 660 and Science and Technology Studies 660)
Fall. 4 credits. Prerequisite: one year of science. Limited to 20 graduate students and seniors with permission of instructor. Offered alternate years. Next offered fall 1995. P. Taylor.

Scientific studies of ecological and social processes, together with the analysis of those studies and their interpretation by historians, sociologists, and anthropologists. Topics include post-WWII cybernetics, systems ecology, the tragedy of the commons, the Limits to Growth, ecological degradation, political ecology, global models, conservation biology, and climate change.]

## B\&SOC 461 Environmental Policy (also

 Biological Sciences 661 and Agriculture and Life Sciences 661) Fall and spring. 6 credits. Limited to 12 students. Prerequisite: permission of instructor. This is a two-semester course.Sec, R 2:30-4:30. D. Pimentel.
This course uses an interdisciplinary approach to focus on complex environmental and energy problems. Ten to twelve students, representing several disciplines, investigate
significant environmental problems. The research team spends two semesters preparing a scientific report for publication in Science or BioScience.

B\&SOC 469 Food, Agriculture, and Society (also Biological Sciences 469 and Science and Technology Studies 469)
Spring. 3 credits. Prerequisite: an introductory ecology course or permission of instructor.

Lecs, T R 1:25-2:40. A. G. Power. A multidisciplinary course that deals with the social and environmental impact of food production in the United States and developing countries. Agroecosystems of various kinds are analyzed from biological, economic, and social perspectives. The impacts of traditional, conventional, and alternative agricultural technologies are critically examined in the context of developed and developing economies. Specific topics include pest management, soil conservation, plant genetic resources, biotechnology, and sustainable development.

## HDFS 610 Processes in Human

 DevelopmentSpring. 3 credits. Limited to 20 students. Open to graduate students and juniors and seniors in HDFS and related fields with recommendation from a faculty member and instructor's permission. Prerequisite: a minimum of one course in statistics.

## U. Bronfrenbrenner.

## HSS 625 Health Care Services: Ethical and Legal Perspectives

Fall. 3-4 credits. If using this course as a senior seminar, $B \& S$ Soc majors must take it for 4 credits by writing a major paper. Permission of instructor required for registration. Enrollment limited to 10 undergraduatespreference given to HSS students. A. Parrot.

HSS 631 Managed Health Delivery Systems: Primary-Ambulatory Care Spring. 3 credits.
R. Battistella.
[S\&TS 415 The Politics of Technical Decisions (also City and Regional Planning 541, Government 628)
Fall. 4 credits. Not offered 1994-95. M. Dennis.]

S8TS 427 The Politics of Environmental Protection in America (also Government 427)
Fall. 4 credits.
M W F 1:25-2:15. S. Jasanoff.
S\&TS 688 International Environmental Policy (also Government 687)
Spring. 4 credits.
S. Jasanoff.

## V. Other Courses

B\&SOC 375 Independent Study
Fall or spring. 1-4 credits. Prerequisite: must have written permission of faculty supervisor and Biology and Society major. Staff.
Projects under the direction of a Biology and Society faculty member are encouraged as part of the program of study within the student's concentration area. Applications for research projects are accepted by individual faculty members. Students may enroll for $1-4$ credits in Biology and Society 375 (Independent Study) with written permission of the
faculty supervisor and may elect either the letter grade or the S-U option. Students may elect to do an independent study project as an alternative to, or in advance of, an honors project. Applications and information on faculty research, scholarly activities, and undergraduate opportunities are available in the Biology and Society office, 275 Clark Hall. Independent study credits may not be used in completion of the major requirements.

## BeSOC 400 Undergraduate Seminar

 Fall or spring. Variable credit. May be repeated for credit.Staff.
From time to time different seminars on topics of interest to undergraduates are offered. Topics and instructors are listed in the biology and society supplement issued at the beginning of each semester.

## B\&SOC 499 Honors Project

Fall or spring; two-semester projects are acceptable. 3-5 credits each term with a maximum of 8 credits for the entire project. Open only to biology and society students in their senior year.

Staff.
Students enrolled in Biology and Society 499 will receive a letter grade at the end of their final term, whether or not they complete a thesis and whether or not they are recommended for honors. Students enrolled for the whole year in 499 may receive either a letter grade for both terms or a grade of "R" for the first term with a letter grade for both terms submitted at the end of the second term. When a student is enrolled for two terms, the student and the thesis adviser must reach a clear agreement at the outset as to which grade will be assigned for the first term and on the basis of what sort of work. Minimally an honors thesis outline and bibliography should be completed during the first term. Applications and information are available in the Biology and Society office, 275 Clark Hall.

## Cognitive Studies Program

F. Keil (psychology), B. Lust (human development and family studies), codirectors. B. Bloom, R. Constable, B. Donald, T. Henzinger, D. Huttenlocher, R. Rubinfeld, G. Salton, A. Segré, D. Subramanian (computer science); J. Dunn. J. Novak, R. Ripple, D. Schrader (education); R. Canfield, S. Ceci, B. Koslowski, B. Lust, M. Potts, S. Robertson, G. Suci (human development and family studies); J. Russo (Johnson Graduate School of Management); J. Bowers, G. Chierchia,
A. Cohn, M. Diesing, J. Gair, W. Harbert,
S. Hertz, A. Jongman, A. Landman, J. Lantolf, S. McConnell-Ginet, C. Rosen, J. Sereno, M. Suñer, L. Waugh, J. Whitman, D. Zec (modern languages and linguistics); A. Nerode, R. Shore (mathematics); T. Seeley, (neurobiology and behavior); R. Boyd, M. Crimmins, C. Ginet, H. Hodes,
S. Shoemaker (philosophy); J. Cutting, R. Darlington, D. Field, B. Finlay, B. Halpern, A. Isen, F. Keil, B. Khurana, C. Krumhansl, E. Spelke (psychology)

Cognitive studies is comprised of a number of disciplines that are linked by a major concern with fundamental capacities of the mind, such as perception, memory, reasoning, language, and the organization of motor action. In the College of Arts and Sciences these disciplines are represented in the departments of Computer Science, Linguistics, Mathematics, Philosophy, and Psychology. Elsewhere in
the university they are represented in the Department of Human Development and Family Studies (College of Human Ecology), the Section of Neurobiology and Behavior (Division of Biological Sciences), and the Department of Education (College of Agriculture and Life Sciences).
The issues addressed in cognitive studies arise at several levels. At the broadest level are problems of characterizing such basic notions as "mind," "knowledge," "information," and "meaning." At a more specific level are questions regarding the abstract operating principles of individual components of the mind, such as those underlying visual perception, language ability, and understanding of concepts. These principles concern the organization and behavior of the components and also how they develop and change. At the most specific level are questions about the properties of the elementary computational structures and processes that constitute these components.
Important insights into issues of these kinds have been achieved in recent years as a result of the various cognitive studies disciplines converging in their theoretical and methodological approaches. It is this convergence, in fact, that warrants grouping the disciplines together under the single term "cognitive studies." Even greater progress can be expected in the future as a consequence of increasing cooperation among the disciplines.

## Undergraduate Concentration

The committee for undergraduate concentration in cognitive studies consists of: Thomas Henzinger, computer science, 5-3009, 4158 Upson Hall, tahocs.cornell.edu; James Gair, linguistics, 5-5110, 407 Morrill Hall, jwg20.comell.edu; Carl Ginet, philosophy, 5-6818, 224 Goldwin Smith, cag2@cornell.edu; David Field, psychology, 5-6393, 250 Uris Hall, dif3@cornell.edu. Initial inquires concerning the undergraduate concentration should be made with the Cognitive Studies coordinator, Sue Wurster, 255-6431, who will provide application materials and set up a meeting with a relevant member of the committee. If, after meeting with the committee member, a concentration seems appropriate, the applicant will be assigned an adviser selected from all faculty members who are in the field of Cognitive Studies.
The undergraduate concentration in cognitive studies provides a framework for the design of structured, individualized programs of study in this growing interdisciplinary field. Such programs of study are intended to serve as complements to intensive course work in a single discipline as represented by an individual department. It is considered crucial that students gain a strong background in an individual department, independent of their work in the concentration. This background provides both a foundation and a focus for the concentration work.

In light of the importance of a strong background in an individual department, it is required that a student seeking admission to the concentration have completed or plan to complete any three courses in one department from among the list of courses below. (Such a student will typically be a major in the department, but being a major is not necessary. The Section of Neurobiology and Behavior counts as a department here.) To enter the concentration formally, the student
should consult with a member of the concentration committee, who will assign the student a concentration adviser who has expertise in the student's main areas of interest and is outside of the student's major department.
The concentration requires that the student take several courses (usually a minimum of three) from departments other than the one from which the student takes the three courses needed for admission to the concen tration. The student must gain approval for this selection of courses from the concentration adviser. The courses will generally be chosen from among the list below, but other courses are permissible in individual cases.

The courses selected should form a coheren cluster that makes sense to both the adviser and the student; an unstructured selection of three courses from the approved set might well be inadequate.
In addition, the concentration encourages each student to be involved in at least one independent research study that bears on research issues in cognitive studies, if possible. It is recommended that students report on their research activities in an annual undergraduate forum sponsored by the program. The Undergraduate Committee is committed to helping stuclents find an appropriate research placement when needed.

Students who successfully complete these requirements will have their concentration in Cognitive Studies officially represented on their diploma. Students in good standing in the concentration will be eligible to compete for a limited number of summer research fellowships and travel awards to relevant conferences in the cognitive sciences. In addition, students who have completed all requirements for the concentration will be eligible for enrollment in the graduate proseminar in Cognitive Studies (Cognitive Studies 773-774).

In addition to assisting in and approving the student's selection of courses, the concentration adviser serves as a general source of information about the field of cognitive studies, relevant resources around the university, and job and graduate school opportunities. For further information, consult the undergraduate committee listed above

## Graduate Minor

For information, consult the program office (273A Uris Hall, 255-6431, or the graduate field representative, Barbara Lust 255-0829, bcl40comell.edu)

## Courses

## Computer Science

COM S 172 An Introduction to Artificia Intelligence
Spring. 4 credits. Not offered every year.
COM 5211 Computers and Programming Fall or spring. 3 credits.

## COM S 212 Modes of Algorithmic Expression

Fall or spring. 4 credits.
COM S 280 Discrete Structures
Fall or spring. 4 credits.

COM S 381 (or 481) Introduction to Theory of Computing
Fall. 3 or 4 credits.

## COM S 410 Data Structures

Fall or spring. 4 credits

## COM S 411 Programming Languages and Logics <br> Fall. 4 credits.

COM 5462 Robotics and Machine Vision Spring. 3 credits.

COM S 463 Robotics and Machine Vision Lab
Spring. 2 credits
COM 5472 Foundations of Artificial Intelligence
Fall. 3 credits
COM S 473 Practicum in Artificial Intelligence
Fall. 2 credits.
COM 5482 Introduction to Analysis of
Algorithms Spring. 4
[COM S 486 Applied Logic (also Mathematics 486)
Fall. 4 credits. Not offered 1994-95.]

## Education (College of Agriculture and Life Sciences)

EDUC 210 Psychology of Learning and Memory
Fall. 3 credits
J. A. Dunn.

EDUC 301 Knowing and Learning in Science and Mathematics
Fall. 3 credits
J. Trumbull.

EDUC 312 Learning to Learn
Spring. 3 credits.
J. Novak

## Human Development and Family Studies (College of Human Ecology)

HDFS 331 Learning in Children Fall. 3 credits. M. Potts.

HDFS 333 Cognitive Processes in Development
Spring. 3 credits.
G. Suci.

HDFS 334 The Growth of the Mind Spring. 4 credits. B. Lust
[HDFS 432 Cognitive Development and Education
Spring. 3 credits. Not offered 1994-95 M. Potts.]

HDFS 436 Language Development (also Psychology 436 and Linguistics 436)
Spring. 4 credits. B. Lust

HDFS 438 Thinking and Reasoning
Spring. 3 credits.
B. Koslowski.

HDFS 439 Cognitive Development: Infancy through Adolescence
Fall. 3 credits.
B. Koslowski.
[HDFS 472 Typical and Atypical Intellectual Development
Spring. 3 credits. Not offered 1994-95. S. Ceci.]

Modern Languages and Linguistics
LING 101 Theory and Practice of Linguistics
Fall, spring or summer. 4 credits.
Fall: A. Cohn; spring: staff.
LING 201 Introduction to Phonetics and Phonology
Spring. 4 credits.
D. Zec.

LING 203 Introduction to Syntax and Semantics
Fall. 4 credits.
M. Diesing.
[LING 264 Language, Mind, and Brain
Fall. 4 credits. Not offered 1994-95.
J. Bowers.]

LING 301-302 Phonology I, II
Fall and spring. 4 credits each term.
Fall, D. Zec; Spring, A. Cohn.
LING 303-304 Syntax I, II
Fall and spring. 4 credits each term.
Fall: W. Harbert; spring: staff.
LING 309-310 Morphology I, II
Fall and spring. 4 credits each term. Fall: L. Waugh; spring: staff.
LING 319-[320] Phonetics I, II
Spring. 4 credits each term. A. Jongman.
[LING 325 Pragmatics
Spring. 4 credits. Not offered 1994-95. S. McConnell-Ginet.]
[LING 334 Non-Linear Syntax
Fall. 4 credits. Not offered 1994-95. C. Rosen.)
[LING 370 Language and Cognition (also Psychology 370)
Spring. 4 credits. Not offered 1994-95. J. Bowers.]

LING 400 Semiotics and Language
Spring. 4 credits. L. Waugh.

LING 401 Language Typology
Fall. 4 credits. C. Rosen.

LING 421-422 Semantics I, II
Fall and spring. 4 credits each term Staff.
LING 436 Language Development (also Psychology 436 and HDFS 436)
Spring, 4 credits. B. Lust.
[LING 450 Computational Linguistics
Fall. 4 credits. Not offered 1994-95. F. Landman.]

## Mathematics

MATH 481 Mathematical Logic (also Philosophy 431)
Spring. 4 credits.
MATH 483 Intensional Logics and Alternatives to Classical Logics (also Philosophy 436)
Spring. 4 credits.
[MATH 486 Applied Logic (also Computer Science 486)
Fall. 4 credits. Not offered 1994-95.]
[MATH 487 Applied Logic II
Spring. 4 credits. Not offered 1994-95.]
Neurobiology and Behavior (Division of Biological Sciences)
BIONB 221 Neurobiology and Behavior I: Introduction to Behavior
Fall. 3 or 4 credits.
P. Sherman.

BIONB 222 Neurobiology and Behavior II: Introduction to Neurabiology
Spring. 3 or 4 credits.
R. Booker
[BIONB 326 The Visual System
Spring. 4 credits. Not offered 1994-95. H. Howland.]

BIONB 328 Biopsychology of Learning and Memory (also Psychology 332)
Spring. 3 credits.
T. DeVoogd.
[BIONB 396 Introduction to Sensory Systems (also Psychology 396)
Spring. 3 or 4 credits. Not offered 1994-95. B. Halpern.]

BIONB 424 Neuroethology
Spring. 3 credits. C. D. Hopkins.

BIONB 492 Sensory Function (also Psychology 492)
Spring. 3 credits. H. Howland, B. Halpern.

BIONB 496 Bioacoustic Signals in Animals and Man
Spring. 3 credits.
C. Clark, R. R. Hoy

## Philosophy

PHIL 231 Introduction to Formal Logic Fall or spring. 4 credits.
H. Hodes, fall; J. Jarrett, spring.
[PHIL 261 Knowledge and Reality Spring. 4 credits. Not offered 1994-95.]

PHIL 262 Philosophy of Mind
Fall. 4 credits.
S. Shoemaker.

PHIL 286 Science and Human Nature
Spring. 4 credits.
R. Boyd.

PHIL 318 Twentieth-Century Philosophy
Fall. 4 credits.
H. Hodes.
[PHIL 331 Formal Logic
Spring. 4 credits. Not offered 1994-95.J
PHIL 332 Philosophy of Language
Spring. 4 credits.

> H. Langsam.
[PHIL 361 Metaphysics and Epistemology
Spring. 4 credits. Not offered 1994-95.]
PHIL 381 Philosophy of Science: Knowledge and Objectivity
Fall. 4 credits.
R. Boyd.
[PHIL 382 Philosophy and Psychology 4 credits. Not offered 1994-95.]
[PHIL 389 Philosophy of Science: Evidence and Explanation
4 credits. Not offered 1994-95.]
[PHIL 431 Deductive Logic (also Mathematics 481)
Fall. 4 credits. Not offered 1994-95.]

## [PHIL 433 Philosophy of Logic

4 credits. Not offered 1994-95.]
PHIL 436 Intensional Logic (also Mathematice 483)
Spring. 4 credits. H. Hodes.
[PHIL 437 Problems in the Philosophy of Language
Spring. 4 credits. Not offered 1994-95.]

## PHIL 461 Metaphysics

Spring. 4 credits.
R. Boyd, S. Mohanty.

## Psychology

PSYCH 205 Perception
Spring. 3 credits.
J. E. Cutting.

## PSYCH 209 Development

Spring. 4 credits.
F. Keil.
[PSYCH 214 Issues in Cognitive Psychology
Fall. 3 credits. Not offered 1994-95. Staff.]
PSYCH 215 Psycholinguistics
Fall. 3 or 4 credits.
Staff.
PSYCH 305 Visual Perception
Fall. 4 credits.
J. Cutting.
[PSYCH 309 Development of Perception and Representation
Fall. 3 credits. Not offered 1994-95. E. Spelke.]

PSYCH 311 Introduction to Human Learning and Momory
Fall. 3 credits.
E. S. Spelke.

PSYCH 316 Auditory Perception
Spring. 3 or 4 credits.
C. L. Krumhansl.

PSYCH 332 Biopsychology of Learning and Memory (BIONB 328)
Spring. 3 credits.
D. F. Gudermuth.

PSYCH 342 Human Perception: Applications to Computer Graphics, Art, and Visual Display
Fall. 3 credits.
D. Field.
[PSYCH 361 Biopsychology of Nomal and Abnormal Behavior (also Nutritional Sciences 361)
Fall. 3 credits. Not offered 1994-95. B. Strupp.]
[PSYCH 396 Introduction to Sensory Systems (also BIONB 396)
Spring. 3 or 4 credits. Not offered 1994-95. B. Halpern.]
[PSYCH 412 Laboratory in Cognition and Perception
Spring. 4 credits. Not offered 1994-95. D. Field.]

PSYCH 414 Comparative Cognition
Spring. 3 credits. F. Spelke,
[PSYCH 415 Concepts, Categories, and Word Meanings
Fall. 4 credits. Not offered 1994-95 F. Keil.]

PSYCH 417 The Origins of Thought and Knowledge
Spring. 4 credits. F. Keil.

## PSYCH 418 Psychology of Music

Fall. 3 or 4 credits. C. Krumhansl.

## [PSYCH 425 Brain and Behavior

Fall. 3 or 4 credits. Not offered 1994-95. B. Finlay.\}

PSYCH 436 Language Development (also Linguistics 436 and HDFS 436)
Spring. 4 credits. B. Lust.

## [PSYCH 490 History and Systems of

 PsychologyFall. 4 credits. Not offered 1994-95. Staff.

PSYCH 492 Sensory Function (also BIONB 492)
Spring. 3 credits B. Halpern, H. Howland

## Graduate Courses and Seminars

The following courses and seminars are generally for graduate students only
However, some may be appropriate for advanced undergraduates. The director of the concentration must approve an
undergraduate's use of any of these for satisfying the concentration requirements.

COGST 773-774 Proseminar in Cognitive Studies I and II (also Com S 773/774; Ling 773/774; Phil 773/774; Psych 773/774)
Fall: R grade; spring: S-U only. 4 credits. T 1:25-2:40. Staff.
This year-long seminar is intended to provide graduate students with an interdisciplinary introduction to the study of knowledge, its representation, acquisition, and use. (Also see description under Com S 773/774; Ling 773/ 774; Phil 773/774; Psych 773/774.)

COGST 600/700 Graduate Seminars
HDFS 600/700 Graduate Seminars
LING 600/700 Graduate Seminars
MATH 581 Logic
MATH 655 Mathematical Foundations of Computer Modeling and Simulation

MATH 684 Recursion Theory
MATH 688 Automated Theorem Proving
PHIL 700 Graduate Seminars
PSYCH 500-700 Graduate Seminars

## College Scholar Program

Dean Lynne Abel, director, 55 Goldwin Smith Hall, 255-3386.
The College Scholar program is described in the introductory section of Arts and Sciences.

COLLS 397 Independent Study
Fall or spring. $1-4$ credits. Prerequisite: permission of program office.

## COLLS 499 Honors Research

Fall or spring. 1-8 credits; a maximum of 8 credits may be earned for honors research. Prerequisite: permission of program director. Each participant must submit a brief proposal approved by the honors committee.

## East Asia Program

140 Uris Hall
J. V. Koschman, director; E. M. Gunn, associate director, S. Akiba, R. Barker,
T. Bestor, K. W, Brazell, P. Chi,
T. Christensen, S. G. Cochran, J. Cody,
B. de Bary, C. d'Orban, J. M. Law, L. C. Lee,
T. P. Lyons, D. R. McCann, J. R. McRae,
T. L. Mei, V. Nee, C. A. Peterson, J. R. Piggott,
V. Pucik, N. Sakai, P. S. Sangren, T. Shiraishi, V. B. Shue, R. J. Smith, R. J. Sukle, H. Wan, J. K. Wheatley, J. Whitman, M. W. Young

East Asian studies at Cornell is led by thirtyfour faculty members from five colleges, who participate in a program of research and teaching on the civilizations and cultures of East Asia. Courses are offered through various departments in most of the humanities and social science disciplines, as well as in the fields of business, city and regional planning, international and comparative labor relations and rural sociology. Language courses in Mandarin, Cantonese, Korean, and Japanese are offered, in addition to the Full-year Asian Language Concentration (FALCON) in Japanese and Mandarin. Undergraduates major in the Department of Asian Studies and concentrate on the language and culture of one East Asian country, while graduate students may work toward an M.A. in East Asian studies, a dual M.B.A./M.A. degree, or an M.A./Ph.D. degree in a discipline such as agricultural economics, anthropology, city and regional planning, government, history, history of art, linguistics, literature, rural sociology, or sociology. A variety of fellowships, travel grants, awards, and assistantships are available for graduate students concentrating on East Asia.

The formal program of study is enriched by a variety of extracurricular activities, including a Japanese and Chinese language house, various film series, career workshops, art exhibits, and numerous lectures, symposia and performances related to East Asia. The Wason Collection in Olin Library is a comprehensive collection of books on East Asia in Western languages, Japanese, Chinese, and Korean. The Mary Rockwell Galleries of the Herbert F Johnson Museum of Art have an excellent collection of East Asian art.

## Freshman Writing Seminars

For information about the requirements for freshman writing seminars and descriptions of seminar offerings, see the John S. Knight Writing Program section, and consult the John S. Knight Writing Program brochure, available from college registrars in August for the fall term and in late October for the spring term.

## Human Biology Program

J. Haas (nutritional sciences), director, 211 Savage Hall, 255-8001, B. Finlay (psychology), J. Fortune (physiology/women's studies), E. Frongillo (nutritional sciences), R. Johnston (psychology), K.A.R. Kennedy (ecology and
systematics/anthropology), D. Levitsky (nutritional sciences), D. McClearn (ecology and systematics), P. W. Nathanielsz (physiology), D. L. Pelletier (nutritional sciences),
W. Provine (ecology and systematics/history), R. Robertshaw (physiology), S. Robertson (human development and family studies), R. Savin-Williams (human development and family studies), M. Small (anthropology)
Human biology integrates the methods and theories of many disciplines, such as biological anthropology, nutrition, neurobiology, physiology, psychology, demography, ecology, genetics, and paleontology, into a comprehensive study of biological diversity in Homo sapiens. A central focus of this interdisciplinary approach to the study of the human organism is an understanding of evolutionary processes that explain our biological variation through space and time The program of study seeks to educate future biological scientists to address the concerns of a society that is becoming more demanding of the scientific community to place its specialized biological knowledge in a broad context. The human biology curriculum is of particular relevance to undergraduate students in premedical and predentistry programs, biological anthropology, nutrition, human development, ecology and systematics, psychology, physiology, genetics, and the health-related sciences. It serves to bring together students with a common interest in humankind as defined from these diverse fields and to provide a forum for studentfaculty interaction on various topics relating to human evolution and biological diversity. Human biology is not a major but a curriculum of study that provides majors in various departments with a program for selecting elective courses that deal with the biology of the human species. Students in their junior year may develop a program of study in human biology while majoring in a number of different departmental fields.

## Basic Requirements

The requirements for a program of study in human biology are designed to ensure sufficient background in physical sciences and mathematics to enable the student to pursue a wide range of interests in the fields of modern biological sciences, anthropology, and fields related to the evolution and physical diversity of the human species. Adjustments may be made in these requirements, depending upon the student's academic background and affiliation with colleges and schools within the university
The basic requirements are one year of introductory biology (Biological Sciences 101-103 plus 102-104 or 105-106 or Biological Sciences 107-108 offered during the eightweek Comell Summer Session); one year of general chemistry (Chemistry 103-104 or 207-208 or 215-216); one year of college mathematics (Mathematics 111-112 or 105-106 or 111-105); one course in genetics (Biological Sciences 281 or 282); one course in biochemistry (Biological Sciences 231, 330 or 331). It is recommended that students planning graduate study in biological anthropology, psychology, and related fields in the medical and nutritional sciences take a course in statistics. Students shouk consult their faculty adviser in human biology for help in selecting appropriate courses.

Elective courses should be taken that will enable the student to acquire breadth in the subject matter of human biology outside of their departmental major. Therefore only 6 of the 15 human biology elective credits may also fulfill requirements for the major. Courses should be selected that also provide sufficient exposure to the integration of basic anatomical and physiological sciences with the behavior of individuals and groups within the context of evolutionary theory and ecology. The courses listed below are representative of the offerings in human biology and are included to assist the student in organizing a curriculum of study. They are organized into three groups that reflect the three levels of integration noted above:
(1) human anatomy and physiology,
(2) human behavior, and (3) human evolution and ecology. Students should choose at least one course from each of these areas of integration. It is anticipated that the student will include in a program of study at least one of the laboratory courses offered. It is expected that a student will take a minimum of 15 credits from among these courses.
There is no foreign language requirement for human biology beyond what is dictated by specific departments and colleges. The requirements for the human biology curriculum are set alongside requirements of the undergraduate majors as these are defined by different departments. Students with independent majors may design their own programs of study under the guidelines provided by their college. Although a student may indicate an interest in human biology in the freshman year and be able to obtain early guidance from a faculty adviser representing the curriculum of study, it is more usual for students to establish their course programs in the first semester of the junior year. The student may request one of the faculty advisers in his or her department who is listed as faculty in human biology to be their principal adviser, or he or she may have an adviser in the department of the major and seek the advice of a human biology faculty adviser in matters pertaining to satisfaction of the requirements. In certain cases a faculty adviser may represent both the major and the curriculum of study in human biology.

## Courses

## Human Anatomy and Physiology

BIO S 214 The Biological Basis of Sex Differences (also Women's Studies 214)

Spring. 3 credits.
BIO S 274 Functional and Comparative Morphology of Vertebrates
Spring. 4 credits.
BlO S 311 Introductory Animal Physiology, Lectures (also Veterinary Medicine 346)
Fall. 3 credits.
BIO S 319 Animal Physiology Experimentation (also Veterinary Medicine 378)
Fall. 3 credits.

## BIO S 458 Mammalian Physiology

Spring. 3 credits.
BIO S 474 Laboratory and Field Methods in Human Biology (also Anthropology 474)

Spring. 5 credits.

NS 115 Nutrition and Health: Concepts and Controversies
Fall. 3 credits.
NS 222 Maternal and Child Nutrition Spring. 3 credits.
NS 331 Physiological and Biochemical Bases of Human Nutrition Spring. 3 credits.
NS 341 Human Anatomy and Physiology Spring. 4 credits.
NS 361 Biology of Normal and Abnormal Behavior (also Psychology 361)
Fall. 3 credits.
NS 441 Nutrition and Disease
Fall. 4 credits.
PSYCH 322 Hormones and Behavior
(also Biological Sciences 322)
Spring. 3 or 4 credits.
PSYCH 425 Brain and Behavior
Fall. 3 or 4 credits.
VET M 331 Medical Parasitology
Fall. 2 credits.

## Human Behavior

ANTHR 390 Primate Behavior and Ecology
Spring. 4 credits.
ANTHR 490 Primates and Evolution Spring. 4 credits.
Blo s 301 Biology and Society li The Social Construction of Life (also Biology and Society 301)
Fall. 4 credits.
BIO S 427 Animal Social Behavior Fall. 3 credits.
HDFS 344 Infant Behavior and Development
Fall. 3 credits.
HDFS 645 Seminar in Infancy: Newborn Behavioral Organization
Spring. 3 credits.
HSS 315 Human Sexuality: A Biosocial Perspective
Spring. 3 credits.
NS 245 Social Science Perspectives of Human Nutrition

## Fall. 3 credits.

Ns 347 Human Growth and Development: Biological and Behavioral Interactions (also Human Development and Family Studies 347)
Spring. 3 credits.
PSYCH 326 Evolution of Human Behavior Fall. 4 credits.
PSYCH 425 Brain and Behavior
Fall. 3 or 4 credits.
R SOC 408 Human Fertility in Developing Nations (also B Soc 404)
Fall. 3 credits.
R SOC 438 Social Demography
Fall. 3 credits.
Human Evolution and Ecology
ANTHR 101 Introduction to Anthropology: Biological Perspectives on the Evolution of Human Kind
Fall. 3 credits.

ANTHR 203 Early People: The Archaeological and Fossil Record (also Archaeology 203)
Spring. 3 credits.
ANTHR 390 Primate Behavior and Ecology
Spring. 4 credits.
ANTHR 391 The Evolution of the Human Life Cycle
Spring. 3 credits.
ANTHR 490 Primates and Evolution Spring. 4 credits.

## B10 S 207 Evolution

Fall. 3 credits.
BIO S 261 Ecology and the Environment Fall. 4 credits.
BIO S 272 Functional Ecology: How Animals Work
Spring. 4 credits.
BIO S 275 Human Biology and Evolution (also Anthropology 275 and Nutritional Sciences 275)
Fall. 3 credits.
BIO S 371 Human Paleontology (also Anthropology 371)
Fall. 4 credits.
BIO \$378 Evolutionary Biology
Spring. 4 credits.
BIO S 461 Population and Evolutionary Ecology
Fall. 4 credits.
BIO S 464 Microevolution and Macroevolution
Spring. 4 credits.
BIO S 470 Ecological Genetics Spring. 4 credits.
BIO S 471 Mammology
Fall. 4 credits.
BIO S 481 Population Genetics
Fall. 4 credits.
BIO S 482 Human Genetics and Society Fall. 3 credits.

## BIO S 484 Molecular Evolution

 Spring. 3 credits.BIO 5673 Human Evolution: Concepts, History and Theory lalso Anthropology 673)
Fall. 3 credits.
B\&SOC 447 History of Biology-Evolution (also History 447)
Fall. 4 credits.
HSS 330 Ecology and Epidemiology of Health
Fall. 3 credits.
NS 306 Nutritional Problems of Developing Nations
Spring. 3 credits.
PSYCH 326 Evolution of Human Behavior Fall. 4 credits.

## R SOC 201 Population Dynamics

Spring. 3 credits.

## VET M 331 Medical Parasitology

## Fall. 2 credits.

VET M 664 Introduction to Epidemiology Fall. 3 credits.

## Independent Major Program

Dean Lynne Abel, director, 55 Goldwin Smith Hall, 255-3386.
The Independent Major Program is described in the introductory section of Arts and Sciences

## IM 351 Independent Study

Fall or spring. 1-4 credits. Prerequisite: permission of the program office.

## IM 499 Honors Research

Fall or spring. $1-8$ credits; a maximum of 8 credits may be earned for honors research. Prerequisite: permission of program director. Each participant must submit a brief proposal approved by the honors committee.

## Intensive English Program

E. J. Beukenkamp, director

This full-time, noncredit, nondegree program is designed to meet the requirements of foreign students who need to acquire proficiency in English to pursue universitylevel studies in the United States, as well as for visitors, personnel in business, hospitality industry, legal work, medicine, and others seeking competence in the language
The intensive nature of the program leads to a command of the language in all its aspectslistening, speaking, reading, and writing-in the shortest possible time.
Integrated courses are offered both fall and spring semesters at three levels: beginning (Test of English as a Foreign Language [TOEFL] score below 370), intermediate (TOEFL score below 450), and advanced.

Students who have gained full admission to, or who already are registered in, degreegranting programs at Cornell should consult the section, Modern Languages and Linguistics, for information regarding courses in English as a second language.
The Intensive English Program is administered by the Department of Modern Languages and Linguistics, Cornell University, Morrill Hall, Ithaca, New York 14853-4701, U.S.A. Application materials and information are available directly from the program by calling $607 / 255-4863$, or by faxing 607/255-7491.

International Relations Concentration<br>Peter J. Katzenstein, faculty coordinator

Cornell University offers a unique setting for undergraduates with an interest in international relations. Cornell's several undergraduate colleges and many departments include course offerings that provide a strong grounding in the field as well as an opportunity to study more than sixty languages.
The purpose of the Concentration in International Relations is to provide a structure for undergraduate students with interest in international law, economics, agriculture, foreign trade, international banking, government service, international organizations, cross-cultural affairs, or education. Students can major in one of the existing departments, such as history, government, anthropology, or economics, or design an independent major. Integral to the curriculum in international relations is both a focus on global issues and processes and an understanding of their impact on particular countries or geographic regions.

## Requirements for students entering Cornell prior to fall 1994:

1) Two courses in government:
a) Government 181 or 281: Introduction to International Relations (fall).
b) One appropriate 300 -level government course, either in international relations or in the foreign policy of a particular country.
2) Two courses in economics:
a) One from the following offerings: Economics 361:* International Trade Theory and Policy (fall); Economics 362: ' International Monetary Theory and Policy (spring), Economics 363: International Economics (fall); Economics 371: Economic Development (fall).
b) One from the following offerings: Economics 366: The Economies of Central Europe and the Former USSR (spring); Economics 367: Comparative Economic Systems (spring); Economics 370: Socialist Economies in Transition (fall); Economics 374: National and International Food Economics (spring). (*Students can take Economics 361 and 362 to fulfill the economics requirement.)
3) Two courses in history:
a) History 314: History of American Foreign Policy, 1912 to the Present (spring).
b) Any history course dealing with a modern nation or region other than the United States.

Typical choices among the sequences listed above would be to study European history and government and Economics 361, 362, or 367 , or Third World history and government and Economics 371 and other listed economics courses. Under certain conditions, it may be possible to substitute other courses for those listed above. In addition, students are strongly encouraged to acquire full proficiency in a modern foreign language.

## New course requirements for students entering Cornell in fall 1994 and after:

The new requirements are designed to expose students to a broad range of perspectives in international relations while allowing them to tailor their course selections to specific interests. Courses throughout the university are grouped into four subject areas:

1) International Economics and Development; 2) World Politics and Foreign Policy;
2) Transnational Processes and Policies; and 4) Cultural Studies. Within these four subject areas, courses are also identified as "core" or "elective." Students must complete seven courses selected from the four groups according to one of two strategies. Option A emphasizes the politics and economics of international relations. Option B puts greater stress on culture. In choosing either option, students should ensure that they acquire familiarity with more than one geographic region or country.
Option A:

- One core course from Groups 1, 2, and 4
- One elective from Groups $1,2,3$, and 4

Option B:

- One core course from Groups 1,2, and 4
- One elective from either Group 1 or Group 2
- One elective from Group 3, and two additional electives from Group 3 or Group 4
Students should take note that many of the core courses have prerequisites. Courses in cultural studies have prerequisites for purposes of the IR Concentration. The list of electives here is representative but not complete. Many other courses throughout the university can qualify as electives for the IR Concentration.
Group 1: International Economics and Development
Core: AGEC 430 International Trade Policy (prereq. Econ 101-102)
ECON 361 International Trade Theory and Policy (prereq. 101-102, 313)
ECON 362 International Monetary Theory and Policy (prereq. 101-102, 314)
ECON 363 Intemational Economics (prereq. Econ 101-102)
ECON 371 Economic Development (prereq. Econ 101-102, 313)

ECON 372 Applied Economic Development (prereq. Econ 101-102, 313)
Elective: AGEC 464 Economics of Agricultural Development
AS\&RC 271 Introduction to African Development
ECON 374 National and International Food Economics
GOVT 354 America in the World Economy
ILRIC 333 Comparative Political Economy of Industrial Societies
RSOC 205 International Development
(Students can take Economics 361 and 362 to fulfill Group 1)

## Group 2: World Politics and Foreign <br> Policy

Core: GOVT
181/281 Introduction to International Relations
HIST 314 History of American Foreign Policy, 1912-Present (or Govt 385 American Foreign Policy, if 314 not offered in a given year)
Elective: GOVT 381 The Politics of Defense Spending
GOVT 384 War and Peace in the Nuclear Age
GOVT 392 International Relations of the Middle East
HIST 279 Seminar on the Cold War
HIST 309 The U.S, and the Third World

SOC $310 \begin{aligned} & \text { Sociology of War and } \\ & \text { Peace }\end{aligned}$
Group 3: Transnational Processes and Policies
[NO CORE]
Elective: BIO G 206 Ethics and the Environment

GOVT 491 Normative Elements in Intemational Relations

GOVT 436 Environmental Politics and Policy
NTRES 400 International Environmental Issues

RSOC 475 Global Patterns of International Migration
S\&TS 324 Environment and Society

S\&TS 425 Global and Domestic Dimensions of Science and Technology Policy
Group 4: Cultural Studies
Core: ANTHR 380 State, Nation and Everyday Life (prereq. Anthr 102 or 200)
ANTHR 385 Sex, Morality, and the Law (prereq. Anthr 102 or 200)
ANTHR 436 Language, Culture, and Society (prereq. Anthr 102 or 200)

ANTHR 460 Culture and International Order (prereq. Anthr 102 or 200)

COM L 365 The Contemporary Novel (prereq. Coml 202)

## LING

405/406 Sociolinguistics (prereq. Ling 101)

WOMNS
362 Global Perspectives on Gender (prereq. Womns 206, 210, or 218)

Elective: ANTHR 470 Social and Cultural History of Contemporary Europe
ASIAN 414 Literature and Society
AS\&RC 479 Women and Gender Issues in Africa
ENGL 264 Ethnic Literature: Bridges and Boundaries
GOVT 344 Government and Politics of Southeast Asia

RUSSL 390 The Power of Nationalism

## Language Requirement

IR Concentrators entering Cornell in fall 1994 and after are expected to complete additional language study beyond the College of Arts and Sciences degree requirement. This study can be accomplished in one of two ways:

1) Two years of one foreign language (proficiency plus one course)
2) Two languages at proficiency

## Study Abroad

IR Concentrators are strongly encouraged to study abroad to bring a practical dimension to their expertise in international issues. Those who choose this option will find the requirements for the concentration highly compatible with study abroad.
All courses used to fulfill the concentration requirements must be taken for a letter grade. Transcripts will reflect successful completion of the requirements for the concentration. In addition, students will receive a special certificate signed by the faculty coordinator of the international relations concentration. Students interested in pursuing the concentration should discuss it with their faculty adviser. To enroll and for further information, contact Barbara Lantz, Assistant Dean for International Programs, 55 Goldwin Smith Hall, tel. 255-5004.

## Center for International Studies

See Interdisciplinary Centers, Programs, and Studies, p. 16.

## Program of Jewish Studies

D. I. Owen, director (Ancient Near Eastern and Biblical History and Archaeology), R. Brann (Judeo-Arabic Studies), P. Hyams (Medieval Jewish History), L. Kant (Early Judaism and Christianity), A. Nadler (Eastem European Jewish Civilization), R. Polenberg (American-Jewish History), J. Porte (AmericanJewish Writers), D. S. Powers (Arabic and Islamic Studies), G. Rendsburg (Biblical and Semitic Studies), N. Scharf (Hebrew language), D. Schwarz (Anglo-Jewish Literature), S. Shoer (Hebrew and Yiddish Languages), Y. Szekely (Judaica Bibliography)
The Program of Jewish Studies was founded as an extension of the Department of Semitic Languages and Literatures (now the Department of Near Eastern Studies) in 1973 and attained status as an intercollegiate program in 1976.

The program has grown out of the conviction that Judaic civilization merits its own comprehensive and thorough treatment and that proper understanding of any culture is inconceivable without adequate knowledge of the language, literature, and history of the people that created it. Accordingly, the offerings in the areas of Hebrew language and literature have been considerably expanded, and courses in ancient, medieval, and modern Jewish history have been added to the program.
It is a broadly based, interdisciplinary program, bringing together faculty from the various Cornell colleges.

The Program of Jewish Studlies supports teaching and research in the overall area of Judaic Studies. It is a secular, academic program, the interests of which are diverse and cross-cultural. The program recognizes its special relationship to teaching and research in classical Judaica and Hebraica which are pursued by the members of the Department of Near Eastern Studies.

It presently enables students to obtain basic instruction and specialization in the fields of Semitic languages; the Hebrew Bible; medieval and modern Hebrew literature; ancient, medieval, and modern Jewish history; and Holocaust studies. In some of these fields students may take courses both on graduate
and undergraduate levels. Faculty throughout the university provide breadth to the program by offering courses in related areas of study.

## Courses Offered

## JWST 105-106 Elementary Modern

Hebrew I and II (also NES 101-102)
Fall and spring. 6 credits each semester.
Enrollment limited to 15 each section.
M-F. Sec 01: 10:10-11:00; 02: 11:15-12:05; 03: 1:25-2:15. S. Shoer.

JWST 197 Introduction to Near Eastern Civilization (also NES 197 and RELST 197) © \#

Fall. 3 credits each term. Required for all NES department majors. NES 197 or 198 and any other NES course will constitute a sequence to fulfill the distribution requirement in either the Social Sciences or Humanities, depending on the second course used in combination with NES 197 or 198.

M W F 2:30-3:20. R. Brann.

## JWST 201-202 Intermediate Modern

 Hebrew I and II (also NES 201-202)Fall and spring. 4 credits each semester.
Enrollment limited to 15 students each section M-R. Sec 01: 10:10-11:15; 02: 1:25-2:15. N. Scharf.

JWST 223 Introduction to the Bible (also NES 223 and RELST 223)
Fall. 3 credits each semester.
M W F 10:10-11:00. G. Rendsburg.
JWST 244 Introduction to Ancient Judaism (also NES 244 and RELST 244) 휼

Spring. 3 credits
T R 1:25-2:40. G. Rendsburg.
JWST 247 Introduction to Jewish Art and Archaeology from the Hellenistic to the Rabbinic Period (also CLASS 249, NES 247, RELST 247, and ARKEO 247)
Fall. 3 credits.
T R 2:55-4:10. L. Kant.
In this course, we will examine material evidence of Judaism from the fourth century B.C.E. to the fifth century C. E. Equal attention will be given to Palestine and the Diaspora. We will look at various kinds of structures, including tombs and cemeteries, prayer buildings and synagogues, houses, fortresses, palaces, and the Jerusalem Temple. All types of objects will come under consideration, such as paintings, mosaics, sarcophagi, jewelry and gemstones, coins, inscriptions, and papyri. In general, we will attempt to understand this material both in terms of its Near Eastern heritage and the powerful influence of the Graeco-Roman environment. Attention will also be paid to relations to early Christian art and archaeology.
JWST 274 Jewish Civilization in Eastern Europe, 1814-1939 (also RUS LIT 274)

Fall. 2 credits.
R 1:25-4:25. A. Nadler.
An introduction to the social, intellectual, and literary history of the Jews of Eastern Europe in the modern period, as reflected in primary texts (in English translation). The course will explore the full range of Jewish religious, cultural, and political movements of this period, such as hasidism, the haskala (Jewish englightenment), and the varieties of modern Jewish nationalism, through the prism of their greatest literary works.

JWST 294 Modern Mistory of the Near East: Changing Politics, Society, and Ideas (also GOVT 358 and NES 294) 룽

Fall. 4 credits. Fulfills the college distribution requirement in history or the social sciences

T R 2:55-4:10. M. Litvak.

## JWST 301-302 Advanced Modern Hebrew I and II (also NES 301-302) (2)

Fall and spring. 4 credits. Enrollment limited to 15 students.

M W F 2:30-3:20. N. Scharf.
JWST 339 Muslims, Christians and Jews in Islamic Spain: Literature and Society (also NES 339, COMP LIT 334, RELST 334, SPAN LIT 339) © \#
Fall. 4 credits.
M W F 12:20-1:10. R. Brann.
JWST 344 The History of the Early Christianity (also NES 324, RELST 325) \#

Fall. 4 credits
T R 1:25-2:40. L. Kant.
JWST 362 The History and Archaeology of Ancient Syria (also ARKEO 362/ 662 and NES 362/662) 웅
Spring. 4 credits. Prerequisite: Any
archeology or ancient history course or permission of instructor.

T R 11:40-12:55. D. I. Owen.
JWST 491-492 Independent StudyUndergraduate
Fall and spring. Variable credit. Staff.
JWST 499 Independent Study-Honors
Fall and spring. Variable credit. Staff,

## Courses Not offered 1994-95.

JWST 101-102 An Introduction to the Classics of Jewish Literature (also NES 121-122 and RELST 121-122)

JWST 171 The Hebrew Muse: Explorations in Classical Jewish literature (also NES 171)
JWST 220 Aramaic (also Near Eastern Studies 238)
JWST 221 Readings in Classical Hebrew Literature: The Art of Biblical Narrative (also Near Eastern Studies 221)
JWST 222 Readings in Classical Hebrew Literature: The Art of Biblical Poetry (also Near Eastern Studies 222)

JWST 224-225 Elementary Biblical Hebrew I \& II (also Near Eastern Studies 232-235 and Near Eastern Studies 423-424)
JWST 226 Exodus and Conquest (also Near Eastern Studies 226)
JWST 227 Introduction to the Prophets (also NES 227 and RELST 227) © \#

JWST 228/628 Genesis (also Near Eastern Studies 228 and 628 and Religious Studies 228)

JWST 229 Women in the Hebrew Bible (also NES 292 and Women's Studies 292)
JWST 243 Classics of Hebrew Literature, a Survey: The Hebrew Literary Tradition (also Comparative Literature 231 and NES 231)
JWST 250 Response to the Holocaust
JWST 251 The Holocaust: The Destruction of European Jewry, 1933-1945
JWST 255 The Emergence of the Modern Jew: 1648-1948 (also Near Eastern Studies 245)

JWST 261 Ancient Seafaring (also ARKEO 275 and NES 261) © \#

JWST 263 Introduction to Biblical History and Archaeology (also Archeology 263, Near Eastern Studies 263 and Religious Studies 264)

JWST 264 Agriculture and Society in the Ancient Near East (also Near Eastern Studies 264)

JWST 283 The Lyrics of Love and Death: Medieval Hebrew Poetry in Translation (also Comparative Literature 333 and NES 233)
JWST 293 Judaism, Christianity and Islam in Comparative Perspective (also NES 293)

JWST 322 Undergraduate Seminar in Biblical Literature: Prophecy in Ancient Israel (also Near Eastern Studies 322)
JWST 332 Ancient Near Eastern Literature (also Near Eastern Studies 332)

JWST 340 Topics in Religion: Religious Symbols in Near Eastern Late Antiquity (also Near Eastern Studies 320 and Religious Studies 340) (@)

JWST 346 Jews of Arab Lands (also NES 346)
JWST 348 Varieties of Judaism in the GraecoRoman World (also Near Eastern Studies 348 and Religious Studies 348)

JWST 361 Interconnections in the Eastern Mediterranean World in Antiquity (also Near Eastern Studies 361)

JWST 366 The History and Archaeology of the Ancient Near East (also Archaeology 310 and Near Eastern Studies 366)
JWST 383 Seminar in Medieval Hebrew Literature: The Short Story (also Near Eastern Studies 303)

JWST 384 Seminar in Medieval Hebrew Literature: The Novel (also NES 304)
JWST 400 Seminar in Advanced Hebrew (also NES 400) ©
JWST 402 Seminar in Hebrew Literature and Poetics (also Near Eastern Studies 402)
JWST 420 Readings in Biblical Hebrew Prose (also NES 420, RELST 420) (3) \#

JWST 421 Readings in Biblical Hebrew Poetry (also Near Eastern Studies 421 and Religious Studies 423)
JWST 428 Medieval Hebrew Biblical Exegesis (also Near Eastern Studies 428)

JWST 450 Undergraduate Seminar in Recent American History: Benjamin N. Cardoza and the American Judicial Tradition (also History 440)

JWST 478 Jewish-American Writing (also English 479)

JWST 482 Readings in Judeo-Arabic: Medieval Judeo-Arabic and Hebrew Poetics (also Near Eastern Studies 432)

JWST 627 The Song of Songs (also Near Eastern Studies 627 and Religious Studies 627)

## John S. Knight Writing Program

The director of the John S. Knight Writing Program is Jonathan Monroe, associate professor in the Department of Comparative Literature and George Elliott Reed Professor of Writing and Rhetoric. Katherine Gottschalk, senior lecturer in the Department of English, is the Walter C. Teagle Director of Freshman Writing Seminars. The program's offices are in 159 Goldwin Smith Hall, 255-4061
M. Gilliland (Writing Workshop), K. Hjortshoj (Writing Workshop), B. LeGendre (Writing Workshop), J. Martin (Writing Workshop), G. Matassarin (Writing Workshop), J. Pierpont (Writing Workshop).

The John S. Knight Writing Program helps to coordinate the teaching of writing for undergraduates in six of the university's schools and colleges (the School of Industrial and Labor Relations and the colleges of Agriculture and Life Sciences; Architecture, Art, and Planning; Arts and Sciences; Engineering; and Human Ecology). The program administers writing seminars for freshmen and upperclass students, tutorial writing classes, and seminars in the teaching of writing. More than thirty academic departments and programs participate in the program.

## Advanced Writing Seminars

For upperclass students, the program collaborates with the Department of English in offering English 288-89, "Expository Writing." This course helps students write with more confidence and skill in all disciplines, while provoking inquiry into particular areas of study, forms or uses of writing, or topics intimately related to the written medium. Students may choose among a variety of sections focusing on such themes as "Writing about the Social World," "Writing in the Humanities," "Issues and Audiences," "Understanding the News," and "The Languages of Science."

## Freshman Writing Seminars

For freshmen the program offers the freshman writing seminars-more than 155 different courses in the humanities, social sciences, expressive arts, and sciences. Freshman writing seminars help students write good English expository prose-prose that, at its best, is characterized by clarity, coherence, intellectual force, and stylistic control. These seminars teach writing within a field while offering freshmen the opportunity to participate in a small seminar. Although they differ widely in content, all seminars adhere to the following requirements:

1) at least eight-and, at most, about fourteen-completed, formal written assignments, totaling a minimum of thirty pages.
2) opportunities for serious rewriting, not mere editing, of essays (some of these rewriting assignments may satisfy the above requirement).
3) ample classroom time spent on work directly related to writing.
4) reading assignments in the course subject that are small enough-maximum about 75 pages per week-to permit regular, concentrated work on writing.
5) individual conferences, usually at least two a semester.

Offerings change from semester to semester. Each term's freshman writing seminars are described in a brochure available from college registrars.
To ensure that stuclents will enjoy the benefits of small writing classes, freshman writing seminars are limited to no more than seventeen students. Instead of pre-enrolling in their writing courses, students request placement in one of five writing seminars by filling out ballots available from their college registrars. Over ninety percent receive one of their top three choices. In the fall, students may change their writing seminars at the

Freshman Writing Seminar Exchange; and in the spring, students may change their writing seminars at the University Course Exchange. Changes can also be made at special Freshman Writing Seminar add/drop sessions held during the first two weeks of each semester.
The colleges and the school served by the program accept freshman writing seminars in fulfillment of their individual graduation requirements in categories referred to variously as "freshman writing," "oral and written expression," and the like. The program does not decide whether students may graduate: it makes courses available. Individual colleges and schools administer their own graduation requirements.
Currently, most undergraduate students are required to take two freshman writing seminars. Architecture students, however, need only one. Hotel students fulfill their requirement through Hotel Administration 165, which should be taken with Hotel Administration 265 during the first two semesters at Comell. Agriculture and Life Sciences students can take freshman writing seminars or choose from among a variety of other courses to fulfill their requirement.

All students who score " 4 " or " 5 " on the Princeton Advanced Placement Examination in English receive three credits. Such credits are awarded automatically; no application to the John S. Knight Writing Program or the Department of English is necessary. How these credits may be applied to freshman writing or other distribution requirements depends on the student's college and score All students who score " 5 ," except Architecture and Fine Arts students, may apply their three credits towards the writing requirements of their college. Of students who score " 4 ," only Agriculture and Life Sciences students and Industrial and Labor Relations students may apply their three credits toward the writing requirements of their college. Students should always consult their college registrars to be certain that they understand their writing requirements.
Students who have already taken a freshman writing seminar, or who score " 4 " or " 5 " on the Princeton AP exam, or " 700 " or better on the English Composition or CEEB tests, may enroll, space permitting, in the following upper-level freshman writing seminars: English 270, 271, and 272.

Although there are no exemptions from college writing requirements, some students may fulfill all or part of their college's writing requirement through transfer credits or writing-course substitutions.
For work done at other institutions to be accepted as equivalent to freshman writing seminars, students should demonstrate that they have done a reasonably equivalent amount of writing in a formal course. (It is not sufficient to write, for example, one thirtypage term paper.) Students in the College of Engineering and the College of Arts and Sciences must file an "application for transfer evaluation" to request writing credit for such courses; students in other colleges should consult their college registrars.
In unusual circumstances, upper-level students may petition to use a Comell writing course other than a freshman writing seminar to satisfy part of their writing requirement. The

John S. Knight Writing Program must approve all such petitions in advance.
Although Cornell "summer writing program" seminars may fulfill college writing requirements, they do not automatically count toward those requirements. Students who have taken these courses must ask their college registrars to assign the credits in the appropriate categories.
For information about the requirements for freshman writing seminars and descriptions of seminar offerings, consult the John S. Knight Writing Program brochure, available from college registrars in August for the fall term and in late October for the spring term.

## Teaching Writing

Each summer and fall, the program offers instruction in the teaching of writing to new staff members in the freshman writing seminars and other interested instructors Teaching Writing I, offered in the summer, is primarily a course for graduate students; the same course is offered in the fall as Teaching Writing II. The program also sponsors a summer apprenticeship program for a limited number of graduate students, and a summer seminar for faculty members interested in the teaching of writing.

## Writing Workshop

The John S. Knight Writing Program offers Workshops in English Composition for freshmen (or transfer students needing writing credit) through the Writing Workshop. These tutorials in English composition are designed for students who have had little training in composition or who have serious difficulty with writing assignments.
Writing 137 and 138 are graded S-U only, and students receiving a grade of $S$ are normally granted credit toward their college writing requirements. Students who think this course might be appropriate, including non-native speakers of English scoring less than 600 on the Test of English as a Foreign Language (TOEFL), should attend the assessment sessions offered by the Writing Workshop during orientation week each fall. The workshop also offers a walk-in service (see below) to help students with problems in essay writing. The director is Joe Martin, senior lecturer in the Writing Workshop. The workshop offices are in 174 Rockefeller Hall, 255-6349.

## The Walk-In Service

Through the Walk-In Service, the Writing Workshop offers tutoring assistance in writing to any student who needs help with a writing project. The Walk-In Service has tutors available during the academic year in 174 Rockefeller and north- and west-campus residential areas. The director is Mary Gilliland. For information contact the Writing Workshop. 174 Rockefeller Hall, 255-6349.

## WRIT 137-138 Workshops in English

 Composition137 , fall; 138, spring. 3 credits each term. Each section limited to 12 students. S-U grades only.

Hours to be arranged. J. Martin and staff. An intensive writing experience, this course is designed for those whose composition skills need extra attention. In class discussion, students respond to each other's work and analyze brief additional readings. The average
weekly syllabus includes small classes, a tutorial with the instructor, and a paper plus revision. Each section of this course is individually shaped to respond to the needs of students in that particular class.

## Latin American Studies

Lourdes Beneria, Robert Blake, David Block, Debra Castillo, Carlos Castillo-Chavez, Maria Cook, David Cruz de Jesus, Tom Davis, Eleanor Dozier, Gary Fields, William Goldsmith, Jere Haas, Jean-Pierre Habicht, John Henderson, Thomas Holloway, Zulma Iguina, Billie Jean Isbell, Steven Jackson, Teresa Jordan, John Kronik, Steven Kyle,
David R. Lee, Antonio Monegal, Luis Morató, Craig Morris, Jura Oliveira, José Piedra, Thomas Poleman, Alison Power, Mary Roldan, Jeannine Routier-Pucci, Diva Sanjur, Roberto Sierra, Joseph M. Stycos, J. Margarita Suner, David H. Thurston, Jonathan Tittler, Armand VanWambeke, Hector Velez, Lawrence Williams, Frank Young
The Latin American Studies Program encourages and coordinates faculty and student interests in Latin America. A variety of special lectures, films, and seminars supplement the regular course offerings. Undergraduate students may arrange an independent major in Latin American studies, and graduate students may pursue a minor in Latin American studies while majoring in the graduate field of their choice. The College of Arts and Sciences offers Latin American studies courses in anthropology, economics, government, history, and sociology. In addition, there is a varied language, literature, and linguistics curriculum in Spanish, Portuguese, and Quechua. The student may also pursue Latin American studies in the College of Agriculture and Life Sciences; the College of Architecture, Art, and Planning; the College of Human Ecology; and the School of Industrial and Labor Relations.

For further information and a current course listing, students should contact the program office at 255-3345 or 190 Uris Hall.

## Law and Society

P. Hyams, director, 307 McGraw Hall, 255-2076, C. Carmichael (comparative literature), D. A. Dunning (psychology), G. Hay (economics), P. Hyams (history), S. Jasanoff (science and technology studies), M. Katzenstein (government), D. B. Lyons (philosophy), R. Miller (philosophy), M. B. Norton (history), R. Polenberg (history), D. Powers (Near Eastern studies), J. Rabkin (government), L. Scheinman (government)
The Law and Society Program offers an interdisciplinary concentration for undergraduates who are interested in the law from the perspectives of the social sciences and the humanities: anthropology, comparative literature, economics, government, history, philosophy, psychology, science and technology studies, and sociology. In addition, undergraduates in the College of Arts and Sciences can major in law and society through the Independent Major Program. Students who wish to graduate with a concentration in law and society should consult the director of the program or one of the advisers listed above to plan a coherent program of study. Such a program should ordinarily include at least four courses from the following list. Other courses may be substituted with the approval of the adviser

AS\&RC 280 Racism in American Society
ANTHR 385 Sex, Morality, and the Law (also Women's Studies 385)

COM L 324 Law and Religion in the Bible (also Religious Studies 324)

COM L 326 Christianity and Judaism
COM L 328 Literature of the Old Testament (also Religious Studies 328)

ECON 304 Economics and the Law
ECON 354 Economics of Regulation
GOVT 307 Law and Social Change
GOVT 313 The Nature, Functions, and Limits of Law

GOVT 314 Freedom of Expression
GOVT 323 The "Fourth" Branch
GOVT 324 Legal Reasoning and Legal Adoption

GOVT 327 Civil Liberties in the United States

GOVT 328 Constitutional Politics: The United States Supreme Court

GOVT 364 Liberty, Equality, and the Social Order

GOVT 389 International Law
GOVT 407 Law, Science, and Public Values

GOVT 412 Voting and Political Participation

GOVT 414 The Administrative State
GOVT 428-429 Government and Public Policy: An Introduction to Analysis and Criticism

GOVT 457 Comparative Public Law: Legal Controls on Government in Europe and America

GOVT 489 International Law and Regime Development

HIST 210 Supreme Court and Civil Liberties

HIST 275 Crime and Punishment: From the Puritans to Mickey Spillane

HIST 318 American Constitutional Development

HIST 336 Capitalism and Society in the U.S.

HIST 368 Marriage and Sexuality in Medieval Europe

HIST 430 Law and Authority in American Life

HIST 436 Conflict Resolution in Medieval Europe

HIST 437 Sexuality, Society, and the State in the Near East

NES 357 Islamic Law and Society
PHIL 242 Social and Political Theory
PHIL 319 Philosophy of Marx
PHIL 342 Law, Society, and Morality (also Law 666)

PHIL 343 Political Obligation and Civil Disobedience (also Law 676)

PHIL 346 Modern Political Philosophy
PHIL 444 Contemporary Legal Thought (also Law 710)

PHIL 446 Topics in Social and Political Philosophy
PSYCH 265 Psychology and Law
SOC 310 Sociology of War and Peace
SOC 348 Sociology of Law
WOMNS 372 Sex Discrimination in Law and Social Policy

B\&SOC 406 Biotechnology, Society, and Law

B8SOC 407 Law, Science, and Public Values

BsSOC 426 The Social Functions of Law and Medicine

AGEC 320 Business Law I
CRP 451 Environmental Law
CRP 480 Environmental Politics
CRP 656 Land Resources Protection Law
CEE 524 Contemporary Issues in Environmental Law and Policy
CEE 525 Environmental Law I
CE\&H 465 Consumers and the Law
ILR 607 Arbitration and Public Policy
ILR 680 Problems in Union Democracy
NTRES 401 Environmental and Natural Resources Policies

## Medieval Studies

Danuta Shanzer, director; B. B. Adams,
F. M. Ahl, C. M. Arroyo, R. Brann,
K. W. Brazell, E. W. Browne, R. G. Calkins, A. M. Colby-Hall, R. T. Farrell, A. S. Galloway,
A. B. Groos, W. E. Harbert, T. D. Hill,
P. R. Hyams, J. H. Jasanoff, J. J. John,
C. V. Kaske, W. J. Kennedy, N. Kretzmann,
J. R. McRae, M. Migiel, J. M. Najemy,
C. A. Peterson, J. R. Piggott, D. S. Powers,
D. M. Randel, S. Senderovich, W. Wetherbee

Undergraduates interested in Medieval Studies have an opportunity to take courses in the following areas of instruction: medieval Hebrew, Arabic, and Latin; Old English, Middle English, and Old Irish; Old Provençal and medieval French; medieval Spanish and Italian; Old Saxon, Old High German, Middle High German, Gothic, and Old Norse; Old Russian and Old Church Slavonic; comparative literature; medieval archaeology, art, and architecture; medieval history; Latin paleography; medieval philosophy; musicology; comparative Slavic linguistics, comparative Romance linguistics, and comparative Germanic linguistics.
Undergraduates who want to unclertake an independent major or a concentration in Medieval Studies should consult the director of the program, 259 Goldwin Smith Hall.

Information for prospective graduate students is contained in the catalog of the Graduate School and in a brochure on Medieval Studies, which can be obtained from the director.

## Graduate Seminars

Courses in various aspects of medieval studies are offered each year in numerous cooperating departments, including Classics, Comparative Literature, English, History, History of Art, Modern Languages and Linguistics, German Studies, Romance Studies, Russian Literature, Music, Asian Studies, Near Eastern Studies, and Philosophy, and by the Society for the Humanities. An up-to-date listing of courses and their descriptions is available at the Medieval Studies office.

## Modern European Studies Concentration

Susan Tarrow, coordinator
Students from any college may choose an undergraduate concentration in Modern European Studies to complement any major in any college. The purpose of the concentration is to provide a coherent structure for students with an interest in interdisciplinary study in the field of European studies.
The concentration has three tracks: European politics, economics and society; modern
European history; and European culture. The requirements for the concentration are:

1) Competence in at least one modern European language, Romance, Germanic or Slavic (i.e., completion of a 300 -level course or equivalent with a grade of at least B-, or demonstration of an advanced level of competence in an oral proficiency interview test where available).
2) Completion of at least one course in each of the three areas listed below:
a) European Politics, Society and Economics

Anthr 350 Anthropology of Europe
Econ 367 Comparative Economic Systems: Soviet Union and Europe

Econ 370 Socialist Economies in Transition
Govt 325 Eastern European Politics
Govt 332 Western European Politics
Govt 338 European Political Development
Govt 342 The New Europe
Govt 350 Comparative Revolutions
Soc 366 Transitions from State Socialism
b) Modern European History

Hist 242 Europe since 1789 \#
Hist 353 Nineteenth-Century European Intellectual History
Hist 354 Twentieth-Century European Intellectual History
Hist 362 European Cultural History 1815-1870 \#

Hist 363 European Cultural History 1870-1945
Hist 383 Europe 1900-1945
Hist 384 Europe 1945-68
Hist 385 Europe 1968-1990

## c) Humanities

Any general course dealing with modern Europe (19th and 20th centuries) in one of the following departments: Comparative Literature, English, German Studies, History of Art, Music, Philosophy, Romance Studies, Theatre Arts. Examples of such courses include:
ArtH 260 Introduction to Art History: The Modern Era
ArtH 361 Nineteenth-Century European Art \#
COML 202 Great Books
COML 364 The European Novel
Music 108 Bach to Debussy *
Music 274 Opera \#
Music 383 Music of the Nineteenth Century \#

Phil 212 Modern Philosophy \#
Thetr 241 Introduction to Western Theatre II \#
Under certain conditions, it may be possible to substitute other courses for those listed above.
3) Three additional courses in any of the three areas.
a) Courses in European and comparative politics, anthropology, sociology, women's studies, and related courses in the School of Hotel Administration, the College of Agriculture and Life Sciences, and the School of Industrial and Labor Relations.
b) Courses in modern European history (post-1789).
c) Courses in (post-1789) English and European literatures, comparative literature, semiotics, fine arts, architecture, music, philosophy, film and theatre arts, and women's studies. All concentrators are encouraged to participate in the Language House Program, and to spend a semester or more in a program of study in Europe. Courses taken abroad may be applied to the concentration if they are approved for Cornell credit.
Undergraduates in the College of Arts and Sciences can major in European Studies through the Independent Major or College Scholar programs.
For a list of relevant courses and seminars, departmental advisers, and any further information, contact Susan Tarrow, coordinator of the Modern European Studies Concentration, at the Institute for European Studies, 120 Uris Hall (telephone 255-7592).

## Religious Studies

B. B. Adams, director; C. M. Arroyo, R. A. Baer Jr., K-e. Barzman, J. P. Bishop, R. Brann, R. G. Calkins. C. M. Carmichael, K. Clinton, J. Fajans, J. W. Gair, D. Gold, J. S. Henderson, T I). Hill, D. Holmberg, P. R. Hyams, J. J. John, L. H. Kant, C. V. Kaske, S. T. Katz, A. T. Kirsch, N. Kretzmann, J. M. Law,
D. Mankin, K. S. March, J. McRae,
C. Minkowski, R. L. Moore, P. Morewedge, D. J. Owen, L. Peirce, J. R. Piggott, D. S. Powers, D. M. Randel, G. Rendsburg, J. S. Rusten, P. S. Sangren. S. Saraydar, D. R. Shanzer, J. T. Siegel, T. A. Sokol, M. Washington, A. Wood

The program in Religious Studies is designed to meet the needs of three classes of students: those seeking interesting courses on religious topics as free electives or to fulfill distribution requirements; those desiring a more systematic exposure to the study of religion as a major component of their liberal arts experience; and those planning to pursue advanced academic work in religious studies or allied disciplines or subdisciplines (e.g., history of religions, anthropology, religion and literature, religion and psychology, ethics, or theology, as well as certain geographical area studies). To all these students the program offers an opportunity to acquire a fuller understanding and appreciation of one of the most fundamental aspects of human thought and behavior.

## The Major in Religious Studies

To graduate as a major in Religious Studies a student must (1) complete with letter grades the program's two core courses, Religious Studies 101 (Understanding the Religions of the World) and Religious Studies 449 (History and Methods of the Academic Study of Religion); and (2) complete with letter grades eight additional courses approved for the major, at least four of them at the 300 level or above. The following specifications of this second requirement are designed to promote breadth (2a) and depth (2b) of study.
(2a) At least four of a major's eight additional courses are to be selected to ensure some familiarity with two or more different religions, religious traditions, or religious phenomena. These courses may be at the introductory or advanced levels. For example, "Introduction to Asian Religions" (Asian Studies 250) might lead a student to take "The Religious Traditions of India" (Asian Studies 351), and then to combine these with the two "Medieval Culture" courses (History 365 and 366). Or a student might take four unrelated courses such as "Introduction to the Bible" (Near Eastern Studies/Jewish Studies 223), "Religion and Reason" (Philosophy 263), "Myth, Ritual, and Symbol" (Anthropology 320), and "Islamic History: 1258-1914" (Near Eastern Studies 258) to gain a sense of the range of intellectual activity associated with the academic study of religious traditions and religious practices.
(2b) At least two of these eight additional courses are to be selected to ensure depth of coverage in one religion or one group of closely related religions, religious traditions, or religious phenomena. In the first illustrative case described above, the student might combine "The Religious Traditions of India" with "Indian Meditation Texts" (Asian Studies 460) or "Classical Indian Philosophical Systems" (Asian Studies/Classics 395) to
acquire a measure of specialist strength in the religions of India. Alternatively, that student might combine "Introduction to Asian
Religions" with one or more courses dealing with Buddhism, such as "Chinese Buddhism" (Asian Studies 358) or "Japanese Buddhism" (Asian Studies 359), to develop an appropriate depth along a different dimension.
No more than one of the courses chosen to meet requirement 2a may be used to satisfy requirement $2 b$.
To engage in the kind of focused study envisioned under $2 b$, a student will be expected to attain proficiency in a language other than English to gain access to relevant sources, primary or secondary. For example, a knowledge of Greek or Latin might be required for the study of Christianity (as well as Greek or Roman religions); of Hebrew or Aramaic for Judaism; of Arabic for Islam; of Sanskrit or Hindi for Hinduism; of Pali or Chinese or Japanese for Buddhism. Religious phenomena like shamanism or totemism, though less firmly rooted in literary traditions, have generated substantial bodies of important scholarship in French and German, and an undergraduate major concentrating in this area of Religious Studies should be equipped to make independent use of such material. Courses used to satisfy this foreignlanguage proficiency requirement may not be applied to the course requirements described under 2 a and 2 b .
Most courses approved for the major are offered by cooperating departments within the College of Arts and Sciences; a comprehensive up-to-date list of these courses is maintained at the office of the Religious Studies Program. 309 Rockefeller Hall.
Given the multidisciplinary character of the program in Religious Studies, it is especially important for a prospective major to select a faculty adviser early on. A current list of advisers is available from the program director. Once an adviser has been selecred, a student is expected to prepare a brief statement outlining his or her intended course of major study (including study of an appropriate foreign language) and to file it with the program director for review by the faculty committee responsible for overseeing the program.

## The Major with Honors in Religious Studies

To be eligible for honors in Religious Studies, a student must maintain a GPA of 3.0 overall and 3.3 in courses other than language courses used to satisfy requirements for the major. In addition, he or she must enroll in Religious Studies 490 or 491 (Directed Study) and Religious Studies 495 (Honors Thesis), usually in the fall and spring of the senior year, respectively. Fach course carries four credits but only the first may be counted as one of the eight additional courses required for the major. Religious Studies 490, 491, and 495 are supervised by cooperating faculty members assigned to individual honors students or small groups of honors students to help them complete substantial independent projects. These projects will be evaluated by the Religious Studies Honors Committee, which is responsible for awarding honors and determining the degree of honors awarded.

## Courses Approved for the Major Sponsored by Religious Studies

RELST 101 Understanding the Religions of the World @\#
Spring. 3 credits.
M W F 1:25. D. Gold and others. A team-taught introduction to the contemporary study of religion and the religious traditions of the world. Topics covered include personal piety, mysticism, myth, development of religious institutions, and growth of scriptural canon. Required for majors in Religious Studies

RELST 260 Knowledge and the Sacred in Small-Scale Societies @
Summer. 3 credits. Enrollment limited to 20 . M-F 1:00-2:15. S. Saraydar
In our quest for ever greater technological sophistication, have we forgotten the sacred knowledge that guided our ancestors? Could this knowledge help us develop a vision of life that reaches beyond the seductive marvels of the industrialized world? We seek to answer such questions by examining religious philosophy and experience in selected smallscale societies of the past and present in North and South America, Australia, Africa, and Asia, with examples from the Navajo, Sioux, Bororo, Aranda, Azande, Zulu, Kung,
Chuckchee, Senoi, and other peoples. Comparisons are made with "pagan" religions of Europe as well as contemporary "world" religions.

## RELST 449 History and Methods of the

 Academic Study of ReligionFall. 4 credits. Prerequisite: completion of or concurrent enrollment in a course (other than a language course) approved for the major in Religious Studies. Permission of instructor required.

Time to be arranged. J. M. Law
Designed to provide a working familiarity with major methodological issues in the academic study of religion. The first half explores nineteenth-century Religionswissenschaft as a nonsectarian, academic approach to religious phenomena and texts. The second half surveys approaches currently in use, with illustrative readings associated with anthropology, hermeneutics, history. history of religions, literary studies, phenomenology, philosophy, sociology, and theology. Required for majors in Religious Studies.

RELST 490-491 Directed Study
490, fall; 491, spring. 2-4 credits each term. Hours to be arranged. Staff.

## RELST 495 Honors Essay

Fall or spring. 4 credits. Hours to be arranged. Staff.

## Courses Approved for the Major Sponsored by Other Units

The following courses offered by cooperating departments are all approved for the major in Religious Studies. For descriptions see the appropriate department listings. It is possible to register for some of these courses under a Religious Studies designation; for details see the program director, Professor Barry Adams, Department of English, 309 Rockefeller Hall
ANTHR 320 Myth, Ritual, and Symbol © Spring. 3 or 4 credits. To receive 4 credits, a student must take a section (to be arranged). J. Fajans

ANTHR 322 Magic, Myth, Science, and Religion e
Fall. 4 credits.
A. T. Kirsch.
[ANTHR 428 Spirit Possession, Shamanism, Curing, and Witcheraft (a)
Spring. 4 credits. Not offered 1994-95 D. H. Holmberg.]
[ANTHR 443 Religion and Ritual in Chinese Society
Fall. 4 credits. Not offered 1994-95 P. S. Sangren.]

ART H 230 Monuments of Medieval Art \#
Spring. 3 credits
R. G. Calkins.

ART H 332 Architecture in the Middle Ages \#
Fall. 4 credits.
R. G. Calkins.

ART H 335 Gothic Art and Architecture \#
Spring. 4 credits. R. G. Calkins
[ART H 336 Prelude to the Italian Renaissance \#
Fall. 4 credits. Not offered 1994-95 R. G. Calkins.]
[ART H 337 The Medieval Illuminated Book \#
Fall. 4 credits. Not offered 1994-95. R. G. Calkins.J

ART H 531 Problems in Medieval Art and Architecture \#
Fall. 4 credits.
R. G. Calkins.

Topic for 1994-95: Methods of Medieval Architectural History.
ASIAN 250 Introduction to Asian Religions ©
Spring. 3 credits. J. McRae.

ASIAN 351 The Religious Traditions of India ©
Spring. 4 credits. D. Gold.
[ASIAN 354 Indian Buddhism © :
Spring. 4 credits. Not offered 1994-95. C. Minkowski.]
[ASIAN 355 Japanese Religions ©
Spring. 4 credits. Not offered 1994-95. J. M. Law.J
[ASIAN 357 Chinese Religions © *
Fall. 4 credits. Not offered 1994-95. J. McRae.]

ASIAN 358 Chinese Buddhism \# \#
Fall. 4 credits J. McRae
[ASIAN 359 Japanese Buddhism © *
Spring. 4 credits. Not offered 1994-95. J. M. Law.]

ASIAN 395 Classical Indian Philosophical Systems © \#
Fall. 4 credits.
C. Minkowski.
[ASIAN 421 Religious Reflections on the Human Body
Fall. 4 credits. Not offered 1994-95. J. M. Law.]
[ASIAN 440 Meditation Schools of East Asian Buddhism ©
Spring. 4 credits. Not offered 1994-95. J. McRae.]
[ASIAN 460 Indian Meditation Texts © \# Spring. 4 credits. Not offered 1994-95. D. Gold.]
[CLASS 202 The Greek New Testament \#
Spring. 3 credits. Not offered 1994-95. J. S. Rusten.]
[CLASS 237 Greek Religion and Mystery Cults *
Spring. 3 credits. Not offered 1994-95; next offered 1996-97. K. Clinton.]
[CLASS 333 Greek and Roman Mystery Cults and Early Christianity *
Spring. 4 credits. Not offered 1994-95; next offered 1995-96. K. Clinton.]

CLASS 357 Greek Sanctuaries and Pausanias *
Fall. 3 credits. K. Clinton and J. Coleman.

CLASS 433 Greek Mystery Cults \#
Spring. 4 credits. Prerequisite: one term of 300 -level Greek or permission of instructor K . Clinton.
[CLASS 468 Augustine's Confessions *
Fall. 4 credits. Not offered 1994-95. D. R. Shanzer.]
[COM L 324 Law and Religion in the Bible "
Fall. 4 credits. Not offered 1994-95. C. M. Carmichael.]
[COM L 326 Christianity and Judaism \#
Spring. 4 credits. Not offered 1994-95. C. M. Carmichael.]

COM L 328 Literature of the Old Testament 웅
Fall. 4 credits.

> C. M. Carmichael.
[COM L 358 Literature and Religion: The Nature of the Mystic Text \#
Fall. 4 credits. Not offered 1994-95. C. M. Arroyo.]

COML421 Old Testament Seminar © * Fall. 4 credits. Limited to 20 students. C. M. Carmichael.

COML 426 New Testament Seminar
Spring. 4 credits. Limited to 20 students. C. M. Carmichael.

COML 429 Readings in the New Testament \#
Fall. 4 credits. Limited to 25 students. J. P. Bishop.

HIST 263 The Earlier Middle Ages \# Spring. 4 credits. J. J. John.

HIST 345 Intellectual and Cultural Life of Nineteenth-Century Americans
Fall. 4 credits. R. L. Moore.
[HIST 365 Medieval Culture, 400-1150 * Spring. 4 credits. Prerequisite: History 263 or instructor's permission. Not offered 1994-95. J. J. John.]

HIST 366 Medieval Culture, 1100-1300
Spring. 4 credits. Prerequisite: History 264 or instructor's permission.
J. J. John.

NTRES 407 Religion, Ethics, and the Environment
Spring. 4 credits.
R. A. Baer Jr.

## NTRES 611 Seminar in Environmental

 EthicsFall. 3 credits. Open to juniors and seniors
with instructor's permission.
R. A. Baer Jr.

Topic for 1994-95: Animal Welfare/Rights.
[NES 122 Introduction to the Classics of Jewish Literature \#
Spring. 3 credits. Not offered 1994-95. D. Regenspan.)
[NES 152 Introduction to Islam: Religion, Society and Politics \#
Spring. 3 credits. Not offered 1994-95. D. Powers.]

NES 197 Introduction to Near Eastern Civilization \# \#
Fall. 3 credits.
R. Brann.
[NES 198 Introduction to Near Eastern Civilization (e)
Spring. 3 credits. Not offered 1994-95. R. Brann.]

NES 223 Introduction to the Bible @ \#
Fall. 3 credits.
G. Rendsburg.
[NES 227 Introduction to the Prophets ©
Spring. 3 credits. Not offered 1994-95. G. Rendsburg.]
[NES 228 Genesis \# \#
Spring. 3 credits. Not offered 1994-95. G. Rendsburg.]

## NES 246 Seminar in Jewish Mysticism \#

Spring. 3 credits. S. T. Katz.

NES 247 Introduction to Jewish Art and Archeology
Fall. 3 credits.
L. H. Kant.

NES 248 Introduction to Classical Jewish History \#
Fall. 3 credits. Limited to 50 students. S. T. Katz.

NES 251 Introduction to Islam: Religion, Politics and Society \#
Spring. 3 credits.
P. Morewedge.
[NES 257 Islamic History: 600-1258 (2) \#
Fall. 3 credits. Not offered 1994-95. D. Powers.]
[NES 258 Islamic History: 1258-1914 @
Spring. 3 credits. Not offered 1994-95.
L. Peirce.]
[NES 263 Introduction to Biblical History and Archaeology : \#
Spring. 3 credits. Not offered 1994-95. D. I. Owen.]

NES 281 Gender and Society in the Muslim Middle East © \#
Spring. 3 credits.
L. Peirce.

NES 296 Mystery Cults, Mythologies, and Religions of Iran © \#
Fall. 3 credits.
P. Morewedge.

NES 324 History of Early Christianity: Jesus to Augustine \#
Fall. 4 credits.
L. H. Kant.

NES 339 Muslims, Christians, and Jews in Islamic Spain: Literature and Society @ \#
Fall. 3 credits.
R. Brann.
[NES 340 Judaism and Christianity: A Historical and Theological Encounter \#
Spring. 4 credits. Limited to 20 students. Not
offered 1994-95.
S. T. Katz.]

NES 351 Introduction to Islamic Law \#
Spring. 4 credits. Limited to 20 students. D. Powers

NES 393 Religion and Politics in the Middle East
Fall. 4 credits. Limited to 25 students. M. Litvak.

NES 418/618 Seminar in Islamic History: Muhammed and the Rise of Islam © \#
Fall. 4 credits. Limited to 20 students. D. Powers.
[NES 420 Readings in Biblical Hebrew Prose © \#
Spring. 4 credits. Not offered 1994-95. G. Rendsburg.]
[NES 421 Readings in Biblical Hebrew Poetry \# \#
Spring. 4 credits. Not offered 1994-95. G. Rendsburg.]
[NES 428 Medieval Hebrew: Biblical Exegesis \#
Spring. 4 credits. Not offered 1994-95. R. Brann.]
[NES 627 The Song of Songs
Fall. 4 credits. Graduate level or permission of instructor. Not offered 1994-95. G. Rendsburg.]
[PALI 131-132 Introduction to Pali: The Word of the Buddha
131 fall; 132 spring. 3 credits each term. Not offered 1994-95.
J. W. Gair.]

PHIL 213 Existentialism
Fall. 4 credits.
A. Wood.

PHIL 214 Philosophical Issues in Christian Thought \#
Spring. 4 credits.
N. Kretzmann.

PHIL 263 Religion and Reason
Fall. 4 credits.
N. Kretzmann.

## Russian and East European Studies <br> Major

Janet Mitchell, G. J. Staller (Economics); S. Beck (Field and International Studies Program); I. Ezergailis, D. Bathrick (German Studies); V. Bunce, M. Rush, S. Tarrow (Government); W. M. Pintner (History); U. Bronfenbrenner (emeritus, Human Development and Family Studies); P. Carden, G. Gibian, N. Pollak, M. Scammell, S. Senderovich, G. Shapiro (Russian Literature); W. Browne, R. L. Leed, S. Paperno (Slavic linguistics); D. Stark (Sociology); J. Devenyi (Theatre Arts).

The major in Russian and East European studies has the following requirements:

1) Proficiency in Russian or an East European language with one additional advanced (300-level) language or literature course, OR qualification in an East European language and qualification in another language useful for research in the area.
*These requirements, in the case of some languages, may require study abroad or coursework completed at another institution.
2) At least one course relating to Russia or Fastern Europe, at the 200 level or above in four of the following five departments: Government, Economics, History, Russian Literature and Sociology. Appropriate courses offered in other departments may be substituted for one of the above courses with the consent of the major adviser.
3) At least three additional courses at the 300 level or above, all from one of the following three departments: Government, History (within the History
Department courses may be at the 250 level or above), or Russian Literature. One of the three courses must be at the 400 level or above. 'The three courses must be approved by the major advisor in the department of concentration.
To apply for the major, students are directed to the Institute for European Studies (Slavic and East European Studies Program), 120 Uris Hall. Students should designate an adviser in the department where his or her work will be concentrated. Students are encouraged to study abroad and should discuss their plans with their advisers. For questions concerning the major or the Honors Program, students should consult with their major adviser or inquire at the Institute for European Studies.

## Honors Program in Russian and East European Studies

I. Students entering the Russian and East European Studies Major I Honors Program must have a cumulative average of at least 3.0 , no grade below a $B$ in courses connected with the major, and a cumulative average inside the major of at least 3.5. Each student will form a special honors committee consisting of their major adviser and two other faculty members not necessarily from the Russian and East European area.
II. Honors candidates must complete an honors thesis project during the senior year. The topic should be developed and approved in consultation with their major adviser. Part of the research should
include sources in Russian or an Eastern European language.
iII. Students may earn a total of eight credits for the courses in the honors program and should register for the appropriate number in the department of their major adviser.
IV. Ordinarily, in the first term of the senior year, students who meet the prerequisites will do independent research and reading in a particular area under supervision of their major adviser.
V. In the second term of the senior year students will complete the honors project by a date set by the Slavic and East European Studies Program. Students should keep their committee members informed as their work progresses Students will meet together with their whole honors committee to discuss the draft of the thesis or project and make recommendations for revision. When the project is completed, the committee will decide whether the project deserves honors, and, if so, after reviewing their academic record, will recommend students for a Bachelor of Arts cum laude, magna cum laude, or summa cum laude. The committee will also assign a grade for the honors research course.

## Courses

[COM L 337 Modern and Contemporary Theatre (also Theatre Arts 335)
Spring, 4 credits. Not offered 1994-95.
J. Devenyi.]

COM L 367 The Russian Novel (also Russian Literature 367)
Fall. 4 credits.
M W F 11:15-12:05. G. Gibian.
[COM L 381 Marxist Cultural Theory (also German Literature 381 and Government 372)
4 credits. Not offered 1994-95.]
COM L 385 Reading Nabokov (also Russian Literature 385 and English 379)

Fall. 4 credits. Limited to 25 .
T R 2:55-4:10. M. Scammell.
【COM L 389 Modern Literature in Poland, Czechoslovakia, Hungary, and Yugoslavia (also Russian Literature 389)

Fall. 4 credits. Not offered 1994-95.
G. Gibian.]

COM L 425 The Jew's Body (also Comparative Literature 625, German Studies 422/622 and Jewish Studies 422/622)
Spring. 4 credits. Readings will be primarily in English, though knowledge of another
language (such as Hebrew and Yiddish or
languages of the European Diaspora, such as
German, Italian, French, Russian, Polish, etc.)
could be helpful in certain contexts.
T 12:20-2:15. S. Gilman.
[COM L 690 Marxism and Contemporary Theory
4 credits. Not offered 1994-95.]
CZECH 131-132 Elementary Gzech
131 , fall; 132, spring. 3 credits. J. Josek.

CZECH 133-134 Continuing Czech
133, fall; 134, spring. 3 credits.
J. Josek
[ECON 329 Eastern Europe Today: Economics, Government, Culture (also Government 326 and Russian Literature 329)
Fall. 4 credits. Not offered 1994-95
G. Staller, M. Rush, G. Gibian.]

ECON 366 The Economies of Central Europe and of the Former Soviet Union: from Central Planning to Markets
Fall or spring. 4 credits. G. Staller.

ECON 367 Comparative Economic Systems: East and West
Fall or spring. 4 credits. G. Staller.

ECON 370 Socialist Economies In Transition
Fall or spring.
J. Mitchell.

ECON 381 Economics of Participation and Workers' Management
Fall or spring. 4 credits.
J. Vanek.

ECON 382 The Practice and Implementation of Self-Management
Fall or spring. 4 credits.
J. Vanek.

ECON 681 Economics of Participation and Self-Management
Fall or spring. 4 credits.
J. Vanek.

ECON 682 Seminar on Economics of Participation and Labor-Managed Systems
Fall or spring. 4 credits. J. Vanek.
[GERST 376 Contemporary Soviet Latvian Literature
Fall. 4 credits. Taught in Latvian. Not offered 1994-95. 1. Ezergailis.]
[GERST 377 Baltic Literature
Fall. 4 credits. Not offered 1994-95. I. Ezergailis.]
[GERST 381 Marxist Cultural Theory (also Comparative Literature 381 and Government 372)
4 credits. Not offered 1994-95.]
[GOVT 100.8 Power and Politics: The New Eastern Europe
4 credits. Not offered 1994-95.
T R 11:40-12:55. V. Bunce.]
GOVT 231 Introduction to Comparative Government and Politica
Spring. 4 credits.
M. Minkenberg.
[GOVT 325 Government and Politics of Eastern Europe
4 credits. Not offered 1994-95.]
[GOVT 326 Eastern Europe Today: Economics, Government, Culture
4 credits. Not offered 1994-95.]
[GOVT 330 The Soviet Union: Politics, Economics, and Culture
Not offered 1994-95.]
[GOVT 333 Government and Politics of the Former Soviet Union
4 credits. Not offered 1994-95.]
[GOVT 337 Marxism, Communism and Revolution
4 credits. Not offered 1994-95.]

## GOVT 342 The New Europe

Spring. 4 credits.
T R 2:55-4:10. P. Katzenstein.
GOVT 350 Comparative Revolutions
Spring. 4 credits.
M W F 1:25-2:15. S. Tarrow.
[GOVT 359 Soviet Foreign Policy
4 credits. Not offered 1994-95.]
[GOVT 376 Rethinking Marx
4 credits. Not offered 1994-95.]
[GOVT 397 The United States and Russia 4 credits. Not offered 1994-95.]
[GOVT 399 International Relations in the Former Soviet Union
Fall. 4 credits. Not offered 1994-95.]
[GOVT 446 Comparative Communism 4 credits. Not offered 1994-95.]
[GOVT 481 Foreign Policy of the U.S.S.R. 4 credits. Not offered 1994-95.]
[GOVT 486 International Security: Soviet Security Policy
4 credits. Not offered 1994-95.]
[GOVT 491 Superpower Security and Third World Conflicts
4 credits. Not offered 1994-95.]
COVT 637 Peasantry, State, and Revolutionary Socialism
4 credits. Not offered 1994-95.]
[GOVT 639 Politics of the Soviet Union Fall. 4 credits. Not offered 1994-95.]

## [GOVT 642 The Future of European

 Security4 credits. Not offered 1994-95.]
[GOVT 646 Issues in State Socialism Not offered 1994-95.]
[GOVT 657 Comparative
Democratization
4 credits. Not offered 1994-95.1
GOVT 660 Social Movements, Collective Action, and Reform
Fall. 4 credits.
M 4:30-6:30. S. Tarrow.
[GOVT 669 Modern Social Theory I 4 credits. Not offered 1994-95.]

GOVT 670 Modern Social Theory II Spring. 4 credits.
[HIST 218 The Russian Military Effort and Foreign Policy *
3 credits. Not offered 1994-95.
W 12:20-2:15. W. Pintner.]
[HIST 242 Europe Since 1789
4 credits. Not offered 1994-95.]
[HIST 252 Russian History to 1800 \#
4 credits. Not offered 1994-95.
T R 10:10-11:25. W. Pintner.]
HIST 253 Russian History Since 1800
Spring. 4 credits.
W. M. Pintner.

HIST 352 The End of the AustroHungarian Monarchy, 1848-1919
4 credits. Not offered 1994-95.]
HIST 383 Europe 1900-1945
Fall. 4 credits
[HIST 384 Europe, 1945-1968
Fall. 4 credits. Not offered 1994-95
J. Weiss.]

HIST 385 Europe in the 20th Century: 1968-1990
Spring. 4 credits.
J. Weiss.
[HIST 415 The United States and Russia, 1780-1914
4 credits. Not offered 1994-95.]
[HIST 464 Russian Social History
Spring. 4 credits. Not offered 1994-95
W. M. Pintner.]
[HIST 485 The Mistorical Origin of the Post-Soviet Sucessor States
Spring. 4 credits. Not offered 1994-95 W. M. Pintner.]

HIST 677 Seminar in Russian History Spring. 4 credits.

W 12:20-2:20. W. M. Pintner.
HIST 678 Seminar in European Political History
Spring. 4 credits. J. Weiss
[HUNGR 131-132 Elementary Hungarian 3 credits. Not offered 1994-95]
[ILRIC 331 Comparative Industrial Relations Systems: Non-Western Countries
3 credits. Not offered 1994-95.]
[ILRCB 606 Theories of Industrial Relations Systems
3 credits. Not offered 1994-95.]
NBA 583 Market Transitions in Eastern Europe
Fall. 3 credits.
POLSH 131-132 Elementary Polish
131, fall; 132, spring. 3 credits each term
W. Browne
[POLSH 133-134 Continuing Polish
133, fall; 134, spring. 3 credits each term. Not offered 1994-95.
W. Browne.]
[ROMAN 131-132 Elementary Romanian 131, fall; 134, spring. 3 credits. Not offered 1994-95.]
[ROMAN 133-134 Continuing Romanian 133, fall; 134, spring. 3 credits. Not offered 1994-95.]

RUSSA 103-104 Conversation Practice 103, fall; 104, spring. 2 credits each term.
L. Paperno and staff.

RUSSL 103 Freshman Writing Seminar: Classics of Russian Thought and Literature
Fall or spring. 3 credits.
Staff.
RUSSL 104 Freshman Writing Seminar: Nineteenth-Century Russian Literary Masterpieces
Fall or spring. 3 credits.
Staff.

RUSSL 105 Freshman Writing Seminar: Twentieth-Century Russian Literary Masterpieces
Fall or spring. 3 credits. Staff.
[RUSSL 108 Freshman Writing Seminar
Fall or spring. 3 credits. Not offered 1994-95. Staff.]

RUSSL 109 Russian Science Fiction
Spring. 3 credits. $P$. Burge.

RUSSA 121-122 Elementary Russian
121 , fall or summer; 122 , spring or summer. 4 credits each term.
S. Paperno and staff.

RUSSA 123 Continuing Russian
Fall. 4 credits.
V. Tsimberov and staff.

RUSSL 201-202 Readings in Russian Literature \#
201, fall; 202, spring. G. Shapiro.
3 credits each term.
RUSSA 203-204 Intermediate Composition and Conversation
203, fall, spring, or summer; 204, spring 3 credits each term.
L. Paperno and V. Tsimberov.

RUSSA 205-206 Reading Russian Press
205, fall; 206, spring. 2 credits each term. Staff.

RUSSA 207-208 Russian Phonetics for Beginners
207, fall; 208, spring. 2 credits. Staff.

RUSSL 207 Themes from Russian Culture I \#
Spring. 3 credits. M W F 2:30. G. Shapiro.
[RUSSL 208 Themes from Russian Culture II
Spring. 3 credits. Not offered 1994-95. M W F 1:25. G. Shapiro.]
[RUSSA 301-302 Advanced Russian Grammar and Reading
Not offered 1994-95.]
RUSSA 303-304 Advanced Composition and Conversation
303, fall; 304 , spring. 4 credits each term. L. Paperno, S. Paperno and V. Tsimberov

RUSSA 305-306 Directed Individual Study
305, fall; 306, spring. 2 credits each term. Staff

RUS5A 309-310 Advanced Reading
309, fall; 310, spring. 4 credits. L. Paperno.
[RUSSL 331 Introduction to Russian Poetry "
Fall. 4 credits. Not offered 1994-95. T R 2:55-4:10. S. Senderovich.]

RUSSL 332 Russian Drama and Theatre (also Theatre Arts 332)
Fall. 4 credits. Not offered 1994-95.]
[RUSSL 333 Twentieth-Century Poetry Spring. 4 credits. Not offered 1994-95. T R 11:40-12:55. N. Pollak.]

RUSSL 334 The Russian Short Story \# Fall. 4 credits. T R 1:25-2:40. G. Gibian.
[RUSSL 335 Gogol
Spring. 4 credits. Not offered 1994-95. Staff.]
[RUSSL 350 Education and the Western Literary Tradition (also Comparative Literature 350 and College Scholar 350)

Spring. 4 credits. Not offered 1994-95. P. Carden.]

RUSSL 367 The Russian Novel *
Fall. 4 credits. M W F 12:20. G. Gibian.

RUSSL 368 Soviet Literature from Revolutionary Times to "Glasnost"
Spring. 4 credits T R 1:25-2:40. M. Scammell.
[RUSSL 369 Dostoevsky (also Comparative Literature 383)
4 credits. Not offered 1994-95.]
[RUSSL 371 Literature of the Third Wave
Spring. 4 credits. Not offered 1994-95. M. Scammell.]
[RUSSL 373 Chekhov in the Context of Contemporary European Literature and Art (also CompL 395) \#
Fall. 4 credits. Not offered 1994-95. S. Senderovich.]
[RUSSL 375 Literature of the Soviet Period 1917-1945
Fall. 4 credits. Not offered 1994-95. M. Scammell.]
[RUSSL 376 Literature of the Soviet Period 1945-1985
Spring. 4 credits. Not offered 1994-95. M. Scammell.]
[RUSSL 379 The Russian Connection 4 credits. Not offered 1994-95.]
[RUSSL 380 Soviet Dissident Literature
Fall. 4 credits. Not offered 1994-95. T R 1:25-2:40. M. Scammell.]
RUSSL 385 Reading Nabokov (also CompL 385 and English 379)
Spring. 4 credits. T R 2:55-4:10. M. Scammell.
[RUSSL 388 Ideas and Form in Novels of Social Inquiry (also Comparative Literature 388)
4 credits. Not offered 1994-95. G. Gibian.]
[RUSSL 389 Contemporary Literature in Central and East Europe \{also Comparative Literature 389)
Fall. 4 credits. Not offered 1994-95. T R 1:25-2:40. G. Gibian.]
[RUSSL 390 The Power of Nationalism: Expressions of National Feelings in Politics, Literature, Mistory, and the Arts (also Comparative Literature 390)

Fall. 4 credits. Not offered 1994-95.
G. Gibian and others.]

RUSSL 393 Honors Essay Tutorial
Fall and spring. 8 credits. Hours to be arranged. Staff
Must be taken in two consecutive semesters in the senior year. Credit for the first semester will be awarded upon completion of the second semester. For information, please see the Director of Undergraduate Studies.
[RUSSL 400 Reading the Great Tradition "
Fall. 4 credits. Not offered 1994-95.
T R 1:25-2:40. S. Senderovich]
[RUSSA 401-402 History of the Russian Language
401, fall; 402, spring. 4 credits each term. Not offered 1994-95.

Staff.]
RUSSA 403-[404] Linguistic Structure of Russian
403, fall; [404, spring]. 4 credits. 404 not offered 1994-95. W. Browne.
[RUSSA 407-408 Russian Phonetics 407, fall; 408, spring. Not offered 1994-95.]
RUSSA 409 Teaching Russian as a Foreign Language
Fall or spring. 1 credit.
S. Paperno.
[RUSSL 409 Russian Stylistics
Fall. 4 credits. Not offered 1994-95
S. Senderovich.]

RUSSA 413-414 Advanced Conversation and Stylistics
413, fall; 414, spring. 2 credits each term
L. Paperno, S. Paperno and V. Tsimberov.
[RUSSL 415 Postsymbolist Russian Poetry
4 credits. Not offered 1994-95.]
RUSSL 431 Contemporary Russian Prose Spring. 4 credits.

T R 2:55-4:10. M. Scammell.
[RUSSL 432 Pushkin \#
Spring. 4 credits. Not offered 1994-95. T R 11:40-12:55. G. Gibian.]
RUSSL 491 Reading Course: Russian Literature in the Original Language
Fall or spring. 1 credit. Staff.

RUSSL 492 Supervised Reading in Russian Literature
Fall or spring. $1-4$ credits each term. Hours to be arranged. Staff.
[RUSSL 498 Russian Symbolism
4 credits. Not offered 1994-95.]
[RUSSL 499 Research Modernism
4 credits. Not offered 1994-95.]
[RUSSL 600 Proseminar: Research Methodology in Russian Literature
Fall. 4 credits. Not offered 1994-95. P. Carden.]
[RUSSA 601 Old Church Slavonic
Fall. 4 credits. Not offered 1994-95. W. Browne.]
[RUSSA 602 Old Russian Texts
Spring. 4 credits. Not offered 1994-95. W. Browne.]
[RUSSL 603 Graduate Seminar: Neglected Masterpieces of Short Russian Prose
Spring. 4 credits. Not offered 1994-95. T R 2:55-4:10. G. Gibian.]
RUSSL 611 Supervised Reading and Research
Fall or spring. 2-4 credits. Staff.
[RUSSL 617 Russian Stylistics I
Not offered 1994-95.]
[RUSSL 618 Russian Stylistics II
Not offered 1994-95.]
[RUSSL 619 Seventeenth-Century Russian Literature
Fall. 4 credits. Not offered 1994-95. W 3:35-5:35. G. Shapiro.]
[RUSSL 620 Twentieth-Century Russian Poetry
Spring. 4 credits. Not offered 1994-95. N. Pollak.]
[RUSSL 621 Old Russian Literature
Spring. 4 credits. Not offered 1994-95. T 4:15-6:15. S. Senderovich.]
[RUSSL 622 Eighteenth-Century Russian Literature
Spring. 4 credits. Not offered 1994-95.
T 4:15-6:15. S. Senderovich.]
[RUSSL 623 Early Nineteenth-Century Literature
Not offered 1994-95.]
RUSSL 624 Russian Romanticism
Spring. 4 credits.
R 4:15-6:15. S. Senderovich.
[RUSSL 625 Russian Realism
Fall. 4 credits. Also open to advanced undergraduates with permission of instructor. Not offered 1994-95.

W 3:30-5:30. P. Carden.]
[RUSSL 626 The Tradition of Russian Poetry
Spring. 4 credits. Not offered 1994-95. F 2:30-4:30. N. Pollak.)
RUSSL 630 Gogol
4 credits. Taught in Russian. F 2:30-4:30. G. Shapiro.
[RUSSL 632 Russian Drama and Literature (also Theatre Arts 622)
Fall. 4 credits. Not offered 1994-95. T R 1:25-2:40. S. Senderovich.]
RUSSA 633-634 Russian for Russian Specialists
633, fall; 634, spring. 4 credits each term. L. Paperno and S. Paperno.
[RUSSL 635 Modern Russian Literary Criticism
Spring. 4 credits. Not offered 1994-95. W 3:30-5:30. P. Carden.]
[RUSSL 650 Russian Intellectual History 4 credits. Not offered 1994-95.]

## RUSSA 651-652 Comparative Slavic Linguistics

651, fall; 652, spring. 4 credits each term. W. Browne.
[RUSSL 669 Seminar: Dostoevsky
Fall. 4 credits. Not offered 1994-95. G. Gibian ]

RUSSL 671 Seminar in NineteenthCentury Russian Literature
Spring. 4 credits. W 3:35-5:35. P. Carden.
[RUSSL 672 Seminar in TwentiethCentury Russian Literature
Fall. 4 credits. Not offered 1994-95. M 4:30-6:30. N. Pollak.]
[RUSSL 673 The Russian Nabokov
Fall. 4 credits. Not offered 1994-95. Also open to advanced undergraduates.

R 4:15-6:15. M. Scammell.J
[RUSSL 674 Solzhenitsyn and Literature of the Gulag
Fall. 4 credits. Not offered 1994-95. M. Scammell.]

RUSSL 675 Russian Literature, 1917-1945
Fall. 4 credits.
R 4:15-6:15. M. Scammell
[RUSSL 676 Russian Literature, 1945-Present
Spring. 4 credits. Not offered 1994-95.
R 4:15-6:15. G. Gibian.]
[RUSSL 698 Russian Symbolism
4 credits. Not offered 1994-95.]
[RUSSL 699 Russian Modernism
4 credits. Not offered 1994-95]

## [SEBCR 131-132 Elementary Serbo-

 Croatian131, fall; 132, spring. 3 credits each term. Not offered 1994-95.
W. Browne.]

## SEBCR 133-134 Continuing SerboCroatian

133 , fall; 134 , spring. 3 credits each term. W. Browne.]
[SOC 360 State and Society in Comparative Perspective
3 credits. Not offered 1994-95]
[SOC 365 Comparative Perspectives on Socialist Societies and Economics 4 credits. Not offered 1994-95.]
[SOC 366 Transitions From State Socialism
Spring. 4 credits. Not offered 1994-95.
T R 11:40-12:55. D. Stark.]
SOC 510 Comparative Societal Analysis Fall. 4 credits.

SOC 583 Transitions to Market Economies in Eastern Europe (also Management NBA 583)
Spring. 4 credits.
[THETR 322 Russian Drama and Theatre (also Russian Literature 332)
4 credits. Not offered 1994-95.]
[THETR 335 Modern and Contemporary Theatre (also Comparative Literature 337)
Spring. 4 credits. Not offered 1994-95. J. Devenyi.]

THETR 378 Russian Films of the 1920s and French Films of the 1960s
Spring. 4 credits.
T R 1:25-4:25. D. Fredericksen.
[THETR 662 Russian Drama and Theatre (also Russian Literature 632)
4 credits. Not offered 1994-95.]
[UKRAN 131-132 Elementary Ukranian
131, fall; 132, spring. 3 credits each term. Not
offered 1994-95.
W. Browne.l

## Society for the Humanities

Dominick LaCapra, director
Fellows for 1994-95
Linda Alcoff (Syracuse University)
Martin Bernal (Cornell University)
Lois Brown (Cornell University)
Richard D. E. Burton (University of Sussex)
Leonid Chekin (Cornell University)
Maryse Condé (University of Maryland)
Nelly Furman (Cornell University)
Gail Holst-Warhaft (Cornell University)
Peter Kulchyski (Trent University)
Gary Okihiro (Cornell University)
Marc Perlman (Tufts University)
Bruce Robbins (Rutgers University)
Kathryn Shanley (Cornell Universify)
Michael Steinberg (Cornell University)
Lucette Valensi (Ecole des Hautes Etudes en Sciences Sociales)
Ruth Vanita (Delhi University)
Jill Watts (California State at San Marcos)
The Society annually awards fellowships for research in the humanities. The Fellows offer, in line with their research, informal seminars intended to be exploratory or interdisciplinary. These seminars are open to graduate students, suitably qualified undergraduates, and interested auditors. Students who want credit for a seminar should formally register in their own college. Persons other than those officially enrolled may attend as visitors with permission of the Fellow.
The theme for 1994/95 is Multicultural Perspectives in the Humanities.

## S HUM 402 Afrocentrism (also Africana 402 and Government 433) (2)

Fall. 4 credits. Limited to 17 students. M 2:30-4:25. M. Bernal.
The seminar will begin with a survey of African-American writings about African history from David Walker's Appeal in 1829 to W.E.B. Dubois's The Negro (1915) and Black Folk Then and Now (1941). We shall then read from the works of "Afrocentrist" writers of history such as Chancellor Williams, Yosef ben-Jocchanen, and Cheikh Anta Diop as well as those of the sympathetic scholars St. Clair Drake and Shomarka Keita. After examining the heuristic utility of these writings we shall furn to Afrocentrism as a social, political, and pedagogical movement reading the works of, and meeting in person or on videos, such figures as Molefi Ansante, Charles Finch, Asa Hilliard, and Leonard Jeffries. In this section, we shall be investigating the relationship of Afrocentrism to more directly political movements as well as the tensions between Afrocentrists and other Black intellectuals on the importance of the Nile Valley to AfricanAmericans. The last section will consider Afrocentrism as a "bogey," discussing selections from the works of Arthur Schlesinger, Dinesh d' Souza, Mary Lefkowitz, and others.

S HUM 403 Images of African-American Resistance (also Africana 403 and English 488)
Fall. 4 credits. By permission of instructor only. Limited to 17 students.

R 2:30-4:25. L. Brown.

In this course we will explore a number of writings and films for their interpretations of various nineteenth- and twentieth-century African-American struggles. We will discuss the re-readings and re-presentations of slave revolts, consider the politics of sexual empowerment, seek out the differences in individual and collective acts of rebellion and self-defense. We will also analyze the narrative strategies and postures that authors employ as they consider the necessities and dangers of separatism, heroism, emancipation, and violence. Primary materials may include poetry by James Monroe Whiffield, Countee Cullen, and Paul Laurence Dunbar, Toni Cade Bambara's The Salt Eaters. David Bradley's The Cbaneysville Incident, Octavia Butler's Kindred, Anne Moody's Coming of Age in Mississippi, Toni Morrison's Beloved, William Styron's Confessions of Nat Turner, David Walker's Walker's Appeal and Sherley Anne Williams' Dessa Rose.

## S HUM 404 History and Nationality in

 Russia and Eastern Europe (also History 450 and Russian Literature 404) "Fall. 3 credits. Limited to 17 students
T 12:20-2:15. L. S. Chekin.
Ethnicity and nationality appear as the main forces behind the recent dramatic changes on the map. The seminar addresses these issues in Belarus', Russia and Ukraine, mainly from a historical perspective (starting in the Middle Ages), but also in the context of rising ethnic and national consciousness throughout the world.

S HUM 405 Exoticism, Literatures, and Counter-Literatures (also Comparative Literature 435) ©
Fall. 1 credit. Limited to 17 students. All reading must be completed before first class Contact S Hum (5-4086) for reading list.
(Seminar will meet 4 times only, October 18, 20, 25, 27.)

TR 10:10-12:05. M. Condé
Africa and the Caribbean region have always been defined with regard to the viewpoint of the colonizers. Ever since Christopher Columbus described the islands as "marvellous," they have been considered to be of unparalleled beauty. Africa has not enjoyed the same reputation. It has been "the White man's grave" or the "Dark Continent." However contradictory it may seem, both discourses have the same function: to cover up the discourse of the indigenous peoples concerning their own reality. Using a few selected texts, the course will attempt to identify the conflicting discourses of the colonized and the colonizer as well as the languages in which they are formulated.

## S HUM 406 Reading the Pleasures of the

 Listener (also Music 406, French Literature 406)Fall. 4 credits. Limited to 17 students.
R $2: 30-4: 25$. N. Furman.
From the lure of the Sirens to the failed cries of Echo, the voice has been a means of expression and seduction, a sign of recognition and loss. From elocution to auditory reception, vocalized fragments testify to the subjectivities of both speaker and listener, and reveal the cultural inscription of gender, class, sexuality, and ethnicity. The purpose of this course will be to understand the voice as a cultural/perceptual phenomenon, and to note its affective registers in literature, film, and the stage. Readings will include essays by linguists, musicologists, psychoanalysts,
philosophers, film and literary critics, and opera fans, and the study of the vicissitudes of the story of Carmen as it moves from literary text to the operatic stage and onto the silver screen

## S HUM 407 The Politics of Grief: Greece, the Balkans, Ireland <br> Fall. 3 credits. Limited to 17 students.

M 12:20-2:15. G. Holst-Warhaft
The course will examine the relationship between traditional songs of mourning for the dead in these societies and the authority of the state, the church, and written forms of expression. Women traditionally perform these songs throughout the area and through them they wield a considerable degree of magico-religious, artistic, and political power This power may be shared with male figures of authority such as male oral poets, shamans, village elders, or priests, or it may come into sharp conflict with them. In the larger context of the state, especially one with a standing army, it will be seen that rhetoric of praise for the dead, composed by male poets, displaces and subsumes the rhetoric of grief.

## S HUM 408 "Multiculturalism" (also Africana 408 and Mistory 461)

Fall. 4 credits. Limited to 17 students. W 2:30-4:25. G. Okihiro.
Seminar on multiculturalism and its apparent polarities such as: Eurocentrism and Afrocentrism; unity and diversity; official and vernacular; integration and transformation; the neo-conservative challenge and radical critique. We shall also discuss ethnic studies and the university, including debates around "value-free" versus "politicized" research and pedagogy, and particularity versus
interdisciplinarity in the organization of knowledge

## S HUM 409 Listening across Cultures

 (also Music 409)Fall. 3 credits. Limited to 17 students. R 12:20-2:15. M. Perlman.
Is music a universal language? What does it mean, to "understand" an unfamiliar musical tradition? What, if anything, is wrong with musical misunderstanding? We will address these questions from philosophical and historical points of view, and will explore them through case studies of cross-cultural musical encounters: the eighteenth-century European discoveries of Chinese and Indian music; the use of Indonesian music by American composers; and the worldwide spread of reggae and Afro-pop.

## S HUM 410 Community as Metaphor: Orality in American Indian Cultures (also English 401)

Fall. 4 credits. Limited to 17 students W 2:30-4:25. K. Shanley.
Although this seminar will focus on American Indian oral traditions and literatures, we will also discuss American ethnopoetics, including a brief exploration of the expressive materials from other American cultural groupsAppalachian, African-American, etc. Readings of primary materials will range in form and subject from treaties and other contractual documents to contemporary poetry. Readings in secondary sources will include recent theoretical works on community, how it is constituted, defined, and perpetuated; we will also discuss American values regarding competitiveness. Central to our study will be the question of how language is experienced in the body and what social values therefore emerge with oral performance. What pulls
ogether these topics-oral literature biological function, community, competitiveness, and textual artifacts such as treaties or poetry-is our effort to understand how individuals and communities metaphorize their wholeness and interconnectedness. Students will be expected to participate in discussion and to work cooperatively in groups, in addition to doing the assigned written work

## S HUM 411 Culture and Subjectivity (also Comparative Literature 411 and History 483)

Fall. 4 credits. Limited to 17 students W 2:30-4:25. M. Steinberg.
This seminar will explore whether and how a history and theory of subjectivity can mediate between a modernist account of the subject and a postmodernist account of its fragmentation. The possibility of an open and coherent subjectivity will be discussed with reference to religion, gender, psychoanalysis, and the creative arts (especially music). Principal texts will be by George Eliot (Daniel Deronda), Felix Mendelssohn, Robert Schumann, Wittgenstein (Culture and Value), Benjamin (essays on language), Heidegger ("Origin of the Work of Art"), Charles Taylor (Sources of the Self), Foucault (History of Sexuality), James Glass (Sbattered Selves), and others.

## S HUM 412 The 1930s: Trickster-Heroes (also History 469)

Fall. 3 credits. Limited to 17 students T 2:30-4:25. J. Watts.
This course will explore the culture of the Great Depression through an examination of trickster-heroes. As Americans struggled to deal with the depression, they focused on heroes who tested and often beat the system-the tricksters. This class will explore real and imagined heroes and the definition of tricksterism from a multicultural and historical perspective.

## S HUM 413 Ethnicity in the Modern Middle East-Historical and Social Science Approaches (also NES 493) ©

Fall. 1 credit. Seminar will meet four times only (September 13, 15, 20, 22). Limited to 17 students.

T R 2:30-4:25. L. Valensi.
The goal of the seminar is the study of ethnic and religious groups in the Middle East in the nineteenth and twentieth centuries. Methodologically, the seminar will probe the merits and the limits of the different approaches utilized so far to understand pluralistic societies such as those of the Middle East:

1. Descriptive, objective approaches (naming, counting, mapping, and storytelling);
2. Focusing on interaction and conflicts in the shaping and reproduction of collective identities; 3. The study of conversion, "métissages," cosmopolitanism, and crossing the borders of religious and ethnic groups.

## S HUM 414 Philosophies of Race

Spring. 3 credits. Limited to 17 students. M 12:20-2:15. L. Alcoff.
Racialized constructions of identity presuppose questionable concepts of the self and of cultural identity and pose enormous philosophical and political questions such as: Should race be phased out as a meaningful category of identity? How should mixed-race persons be identified? What is the connection between racialized identities and racism? Is race a part of the core self or a peripheral feature? Does race have an effect on
knowledge? What are the relationships between ethnicity, nationality, and race? What are the best means to overcome legacies of oppression and domination? In this course we will analyze the concept of race as it is connected to concepts of the self, both as public persona and as lived interiority. We will look at the debate over whether race is a "natural kind" or a "social construction" and at the political implications of either accepting or denying the reality of race

## S HUM 415 Eurocentrism (also Government 467)

Spring. 4 credits. Limited to 17 students. M 2:30-4:25. M. Bernal.
The seminar will consider both "hard core" Eurocentrism, the thought and pedagogical tactics of those who believe that only Europeans could have created "Western Civilization," and the "soft core" variety held by those who maintain that only Europeans happen to have created its worthwhile qualities. It will begin with a historical survey of the emergence and development of the linked concepts of Europe and Christendom in the wake of the triumph of Islam. It will focus on the importance to these concepts of the "other" both in reality and as a projection of feared aspects of the "self." We shall discuss the writings and speeches of selfconscious imperialists and modern conservatives as well as the analytical works of Edward Said, Tzvetan Todorov, Samir Amin, and their critics. There will also be consideration of the work of such "New-Eurocentrists" as Ernest Gellner and Michael Mann. Finally, we shall look at attempts to transcend the arguments in the recent works of Henry Louis Gates and Cornel West.

## S HUM 416 Social Relations: American History and Female Sexuality

Spring. 4 credits. Limited to 17 students T 2:30-4:25. L. Brown
In this course we will study depictions of female sexuality in nineteenth- and twentieth century American literature. As we explore a range of white and African-American novels, we will examine the ways in which women's bodies are transformed into symbols of protest and incorporated into national debates such as those about slavery and suffrage. We will discuss the influence of race on notions of purity, chastity, virtue, romance, and sin and debate the ways in which rape, incest, motherhood, and marriage become allegories of American women's historical experiences and goals. In addition, we will explore the ways in which class, race, and political identity determine sexual tragedy or triumph and who becomes "other" based on their sexual legacy.

S HUM 417 Cultural Transformation and Conflict in the Caribbean from Slavery to the Present (also Comparative Literature 447 and French Literature 417) ©
Spring, 3 credits. Limited to 17 students
W 2:30-4:25. R. D. E. Burton.
Using historical, anthropological, sociological, and literary materials, this course is intended to introduce students to the main issues in contemporary Caribbean studies. Taking the study of slavery as its starting-point, it will examine the processes of cultural creation, transformation, and conflict in the Caribbean with particular emphasis on the following areas and issues: slavery and the culture of resistance; language in the Caribbean; AfroCaribbean religions (principally vodun and

Rastafarianism); male and female culture 'spheres' in the Caribbean; the place of 'East Indians' in the Caribbean; 'Africanist' and creolization' theories of Caribbean culture: theories of identity in the contemporary Caribbean (Négritude, Antillanité, Créolité, etc.); literature and identity in the Caribbean (Brathwaite, Walcott, Cesaire, Glissant). The course will focus on the Anglophone and Francophone Caribbean with reference, where appropriate, to the Hispanophone Caribbean

## S HUM 419 The Textual Sounds of Cultural Identities (also French Literature 492)

Spring. 4 credits. Limited to 17 students. R 2:30-4:25. N. Furman.
Inscripted in the gaps of a literary text, in the space between what is written and what is read, between what is voiced and what is heard, one can detect traces of trauma and the imprints of ethnic and cultural identities. The aim of this course will be to listen to the expressions of cultural identities in crisis and study their articulations in the works of French writers: Prosper Mérimée, Jules Vallès, Céline, Beckett, Natalie Sarraute, Marguerite Duras, and Patrick Modiano.

## S HUM 420 Critical Legal Theory and Aboriginal Rights

pring. 3 credits. Limited to 17 students W 2:30-4:25. P. Kulchyski.
This course will review the emerging debates in the field of critical legal theory and assess their relevance to the discourse on Aboriginal rights. Many post-structural scholarsDerrida, LaCapra, Cornell-have recently turned their attention to questions of law and justice. At the same time, the last few decades have witnessed the emergence of a fullfledged legal doctrine of Aboriginal rights in the Americas. This course will attempt to construct an articulation of these two disparate discourses. The first part of the class will be devoted to discussion of a set of theoretical texts, while the second part will examine legal decisions (and commentaries) from the UK, US, Australia, and Canada, primarily devoted to issues around Aboriginal rights

## S HUM 421 "Sculpted Bodies" (also History 471)

Spring. 4 credits. Limited to 17 students. T 2:30-4:25. G. Y. Okihiro
Seminar on European American representations of the Asian body-"raced," "gendered," "classed," "sexed"-in art, literature, history, science, pornography, and popular culture, and Asian-American contestations of those representations. Bodily constructions are dynamic sites of repression and resistance when contextualized within evolving social relations.

## S HUM 422 Cosmopolitanism: Theory and Practice

Spring. 3 credits. Limited to 17 students. T 12:20-2:15. B. Robbins.
Theories of nationalism have paid too little attention to the theory, construction, and history of what is not nationalism. This course will treat both sorts of theorizing together. While surveying recent thinking about the nation, it will also explore the social and historical situations, the rhetorical strategies, and the political stakes of writers whose imaginations and activities cross national boundaries. Topics to be discussed will include the U.S. debate over multicultural ism, the development of trans-national political solidarities, and the supposed "death of the intellectual" in the age of the academy.

S HUM 423 Biography as Homoerotic Fiction
Fall. 3 credits. Limited to 17 students.

## M 2:30-4:25. R. Vanita.

This course will examine how in the late nineteenth and early twentieth centuries, the genre of the "portrait" or fictionalized biography develops as a respectable way of talking about homosexuality. Such texts often allude to earlier canonical texts and use encoded tropes, constructing a tradition that legitimizes their preoccupations.

## South Asia Program

M. Katzenstein, acting director; R. Barker, R. Colle, E. Erickson, C. Fairbanks,
S. Feldman, J. Gair, D. Gold, D. Henderson,
R. Herring, D. Holmberg, J. Jasanoff,
S. Jasanoff, M. Katzenstein, V. Kayastha,
K. A. R. Kennedy, S. Kuruvilla, B. Lust,
B. G. MacDougall, M. Majumdar, K. March,
J. McRae, C. Minkowski, S. Mohanty,
A. Nussbaum, S. O'Connor, S. Oja,
P. Olpadwala, B. Perlus, T. Poleman,
M. Rodrigo, D. Sisler, S. Subramanian,
D. Sudan, N. Uphoff, M. Walter, S. White

The South Asia Program coordinates research, teaching, and special campus events relating to Bangladesh, India, Pakistan, Nepal, and Sri Lanka. The program faculty includes members from a variety of disciplines, including agricultural economics, agricultural engineering, anthropology, architecture, art, city and regional planning, communication, comparative religion, ecology and systematics, economics, English, government, history, history of art, human ecology, inclustrial and labor relations, intemational agriculture, linguistics, literature, rural sociology, and science, technology, and society. Undergraduates with a special interest in the region may major in Asian studies with a South Asia concentration, or complete a South Asia concentration with any other major. Graduate students may pursue the M.A. degree in Asian Studies with a concentration in South Asia. Languages offered are Bengali, Hindi, Nepali, Sinhala, Tamil, Urdu, Sanskrit, and Pali. Cornell is a class A member of the American Institute of Indian Studies (AIIS), and undergraduates as well as graduate students. are eligible for AIIS intensive language program fellowships in India. For courses available in South Asian studies and derails on the major, see the Department of Asian Studies listing in this volume.
Students who want further information on courses and research opportunities should direct questions to the program office, 170 Uris Hall.

## Southeast Asia Program

J. U. Wolff, director; B. R. Anderson, J. H. Badgley, W. B. Bailey, R. Barker, T. Chaloemtiarana, A. C. Cohn, G. Diffloth, M. F. Hatch, A. T. Kirsch, S. J. O'Connor, T. Shiraishi, J. T. Siegel, K. W. Taylor, E. Thorbecke, J. K. Wheatley, D. K. Wyatt

Southeast Asia studies at Cornell is included within the framework of the Department of Asian Studies. Seventeen full-time core faculty members in the colleges of Arts and Sciences and Agriculture and Life Sciences participate in an interdisciplinary program of teaching and research on the history, culture, and societies of the region stretching from Burma through the Philippines. An additional 18
lecturers and other faculty provide language and area instruction on Southeast Asia. Courses are offered in such fields as agricultural economics, anthropology, Asian studies, economics, finance, government, history, history of art, linguistics, music, and rural sociology. Instruction is also offered in a wide variety of Southeast Asian languages: Burmese, Cambodian, Cebuano (Bisayan), Indonesian, Javanese, Tagalog, Thai, and Vietnamese, for which Foreign Language Area Studies Fellowships are available to U.S. citizens. Intensive instruction in Indonesian is offered in the Full-Year Asian Language Concentration (FALCON) which covers the beginning and intermediate levels. An intensive advanced Indonesian language program is held from June through August in Indonesia each summer. The formal program of study at Comell is enriched by a diverse range of extracurricular activities, including an informal weekly brown bag seminar, the concerts of the Gamelan Ensemble, and a weekly Southeast Asia film series. The George McT. Kahin Center for Advanced Research on Southeast Asia is also the site for public lectures and other activities related to this area. The John M. Echols Collection on Southeast Asia, in Kroch Library, is the most comprehensive collection on this subject in America.
Undergraduates may major in Asian studies with a focus on Southeast Asia and its languages, or they may elect to take a concentration in Southeast Asia studies by completing 15 credits of course work. Students interested in exploring these opportunities should consult the director, Southeast Asia Program, 180 Uris Hall.

## Statistics Center

The Cornell Statistics Center coordinates a university-wide program in statistics and probability. Students interested in graduate study in probability and statistics should apply to the Field of Statistics or to one of the other graduate fields of study that offer related course work. A list of courses in probability and statistics recommended for graduate students in the Field of Statistics can be found in the description of the Comell Center for Statistics in the section "Interdisciplinary Centers, Programs, and Studies." Further information can be obtained from the director of the Statistics Center in Caldwell Hall.

## Women's Studies Program

S. McConnell-Ginet, director; L. Abel, K. Abrams, A. Adams, J. Allen, N. AssièLumumba, K-e. Barzman, D. Bathrick, S. Bem, L. Beneria, A. Berger, J. Bernstock, L. Brown, J. Brumberg, D. Castillo, B. Correll, I. DeVault (acting director, 1994-95), J. Farley, C. Famum, S. Feldman, F. Firebaugh,
J. Fortune, N. Furman, J. Ginsburg, S. Green, N. Hirschmann, D. Holmberg, 1. Hull, B. J. Isbell, M. Jacobus, J. Jennings, K. Jones, M. Katzenstein, C. Lazzaro, J. Locey, K. March, C. A. Martin, H. Mullen, M. B. Norton, L. Peirce, L. Philips, E. Povinelli, A. M. Smith, S. Samuels, R. Weil

## Introduction to the Program

Women's Studies is an interdisciplinary program that seeks to inscribe women's lives, culture, and history, in all their complex multiplicities. Transformative as well as additive, women's studies challenges us to re-
examine much of what we think we already know by providing an intellectual-and critical-feminist framework through which to view the many interconnections between gender, knowledge, and power. Thus, central to the curriculum in women's studies are such overarching notions as these:
(a) that definitions of gender--including those that privilege exclusive heterosexual-ity-are not natural or universal but are instead social constructions that vary across time and place, serve political ends, and have ideological underpinnings;
(b) that systems of gender inequality interact with other social inequalities, including those of class, race, ethnicity, sexual preference, and Western vs. non-Western cultures; and
(c) that even the most current knowledge derived from the humanities, social sciences, and natural sciences is not as impartial, objective, or neutral as has traditionally been thought but instead emerges out of particular historical and political contexts.

## Program Offerings

The Women's Studies Program offers an undergraduate major, an undergraduate concentration, and a graduate minor. Undergraduate students in the College of Arts and Sciences who want to major in women's studies can apply directly to the program. Undergraduate students in other colleges at Cornell will need to work out special arrangements and should speak to the Director of Undergraduate Studies (DUS) in Women's Studies.

## The Undergraduate Major

The questions posed by feminist inquiry cannot be answered from within any single discipline or even from a simple combination of two or more disciplines. For that reason, the women's studies major provides students with a basic groundwork in the interdisciplinary field of women's studies and then requires each student to construct an advanced and individually tailored program of study on a topic, in a discipline, or in a combination of disciplines of special interest to the student alone.
Rather than specifying a particular sequence of required courses for each and every student, the women's studies major gives students a starting point in women's studies, an active advisory structure to help them shape a curriculum, and an ongoing impetus to reflection about their entire program of undergraduate study.
In designing their major, students should keep in mind that there are not many graduate programs offering a degree in women's studies itself. Accordingly, undergraduates wishing to major in women's studies should talk at length with a faculty member about how to design a program of study that will best qualify them for entry into either a job or a postgraduate degree program when they leave Comell. To give one example of what needs to be considered in designing a major: Undergraduates who might want to do graduate study within a discipline will need to develop a certain level of disciplinary specialization at the undergraduate level. This can be done either by supplementing the women's studies major with a carefully selected cluster of courses in that discipline or by pursuing a double major.

## Requirements for a Women's Studies Major

1. Prerequisite courses: Before applying to the major, the student must complete any two Women's Studies courses with a grade of B- or better. Some suggested entry-level courses include Women's Studies 210, 218, 244, 251, 269, 273, and 277. These courses would count both as prerequisites and as part of the women's studies major. Freshman writing seminars, in contrast, would count as prerequisite courses but not as part of the major.
2. Required course work:
a. A minimum of 36 credits in women's studies is required for the major. No course in which the student has eamed less than a C - can count toward these 36 credits. Although there is no single women's studies course that is required of all students, every major must complete a program of study that is both graduated in difficulty and interdisciplinary in scope-a program, in other words, that reflects both the breadth and the depth of women's studies scholarship. This program of study must be developed in consultation with the student's adviser in women's studies and must include advanced seminars at the 300 level or above.
b. Students may count up to three courses outside women's studies toward the major if those courses are approved by the student's women's studies adviser as constituting a meaningful component of the student's women's studies curriculum. To facilitate the coordination of a women's studies major with other majors in the college, students may also count toward the major up to three women's studies courses that are simultaneously being counted toward a second major.
3. The Honors Program: To graduate with honors, the major in women's studies must complete a senior thesis under the supervision of a women's studies faculty member and defend that thesis orally before an honors committee. To be eligible for honors, students must have at least a cumulative grade point average of 3.0 in all coursework and a 3.3 average in all courses applying to their women's studies major. For more information about honors, see the DUS.

## The Concentration

Undergraduate students in any college at Cornell can concentrate in Women's Studies in conjunction with a major defined elsewhere in the university. The concentration consists of four courses in Women's Studies, no more than two of which can come from a single discipline. Freshman writing seminars cannot be included within the four required courses. Students wishing to concentrate in Women's Studies should see the DUS.

## I. Freshman Writing Seminars <br> [WOMNS 105 Feminine and Masculine Ideals in Japanese Culture (also Asian Studies 105)

Spring. 3 credits. Not offered 1994-95. Staff.
In its long history, Japanese culture has developed a large number of role models-
the aristocrat, poet-priest, warrior, entertainer, "salary man," and "education mama"-and idealized them in its literature and art. Using these ideals as its subject matter, the seminar will give students practice in reading texts closeiy, analyzing ideas, and writing various types of papers. Through studying Japanese concepts of femininity and masculinity, the students will not only explore a new culture but will also gain new perspectives on their own cultures.]

## WOMNS 106 Women and Writing (also English 105)

Fall and spring. 3 credits.
Hours to be arranged. Staff.
What is a woman? How does she confront her personal experience? Does she play a special role in history, in our definition of society, or in our understanding of language and literature? This course will explore the relationship between women and writing. We will discuss writings by and about women debate our attitudes toward feminism, and analyze the relevance of these questions to our own written work. Individual sections will emphasize different aspects of the relation between women and writing. Which section to choose should depend on your own interest in exploring how women appear in private or autobiographical writings, historical contexts, and/or literary works. Further information on specific sections is available in the freshman writing seminar office. Textual overlap among the sections is kept to a minimum so that students can take more than one Women and Writing seminar during their time at Cornell.
[WOMNS 113 Nudity/Nakedness: The Sexed Body in Western Art (also History of Art 112.03)
Spring. 3 credits. Not offered 1994-95 K. Barzman.

While the story of the fall frames "nakedness" with notions of guilt and shame, "nudity" is a term that lends legitimacy to the display of naked bodies in Western culture. Yet competing forces object to such display on grounds from obscenity to the exploitation of women. Today "the nude" is virtually synonymous with the female form signaling availability--a body fetishized, fragmented, commodified, consumed. How is the nude instated in the semiotic order in the West? Are there representations of naked women that categorically resist dominant associations of female nudity? What of the bodies of men? Is "pornography" in "the eye of the beholder" or are there representational practices that clearly divide "the pornographic" from "legitimate art?" Participants will base discussions and writing assignments on visual materials and critical texts.]

## [WOMNS 121 Language and Gender (also

 Linguistics 121)3 credits. Not offered 1994-95.
Sally McConnell-Ginet.
What does it mean to speak "like a woman" or "like a man," or "like a girl," or "like a boy?" Even ten-year-olds in our culture approach similar communicative tasks in gender-differentiated ways: girls often get others to do things by saying things like "let's get some coat-hangers" whereas their male peers are more likely to say something like "get me a coat hanger." How do race, social class, age, setting, and aims interact with gender in affecting communicative style? How do our ways of writing and talking reflect and perpetuate gender stereotypes or biases?

What is the role of sex and gender in language change? Readings, discussion, and writing assignments will explore connections between our uses of language and the cultural construction of femaleness, maleness, and sexuality.]

## WOMNS 123 Biology on Women and

 Women in Biology (also STS 123) Spring. 3 credits. Not offered 1994-95. P. Taylor, N. Weidman. This course will examine how biology has treated the subject of gender and how this treatment has influenced the way women do biology. In the first part of the course we will ask: how has the image of women changed in the course of nineteenth- and twentiethcentury biology. What have been the changing fortunes of the idea of difference between the sexes? How have they shaped or been shaped by women's changing political influence? In the second part of the course, we will turn to the practice of biology by women and ask: how do (fernale and male) biologists' notions of gender differences influence the way women do biology? Do women biologists work differently from men? Is there such a thing as a feminist biology?]
## WOMNS 145 Witchcrafts and Gender

 (also ANTHRO 145)Spring. 3 credits.
D. Holmberg.

This seminar will explore witchcraft with special attention to the question of gender. We will examine why women were historically more often accused of witchcraft than men in America and in many European societies. Further, we will take a careful look at complexes of witchcraft in non-western societies where both similar and very different patterns of witchcraft accusations take place. In conclusion, we will examine contemporary resurgences of witchcraft as a positive form of ritual practice especially by some women and at contemporary equivalents of the witchcraft crazes in instances like McCarthy's hunt for communists, contemporary panics about devil worship cults, and the process of the demonization of certain social groups Overall, the seminar will address the question of the relation to belief to social practice.

## [WOMNS 168.01 Black Women Writers: The Uses of Madness and Silence (also English 168)

Spring. 3 credits. Disc/sem. Not offered 1994-95.

## Harryette Mullen.

How are silence and madness used in texts by black women writers to explore their relationship to language, writing, and power? Why is madness a compelling metaphor for the complexities of race, class, gender, and cultural conflict? How does one interpret the silences in a text? How is silence itself foregrounded in a literary text? This seminar will focus on these and other questions raised by the novels, short stories, poetry, and drama of black women writers from Africa, the United States, and the Caribbean including Bessie Head, Toni Morrison, Adrienne Kennedy, Opal Palmer Adisa, Tsitsi Dangarembga, Marlene Philip, and Jamaica Kincaid.]

## II. Courses

## WOMNS 206 Gender and Society (also Rural Sociology 206]

Spring. 3 credits.
Staff.
This course analyzes the evolution and diversity of socially constructed gender hierarchies in the United States and internationally. The maintenance of gender inequalities in societal institutions such as the family, the economy, politics, and religion will be explored. A range of sociological theories and disciplinary perspectives are considered, including biological, psychological, and psychoanalytic perspectives. Course objectives will be achieved through lectures, readings, films, class discussions, and personal experiences.

## [WOMNS 210 Introduction to Feminist

 Theory4 credits. Not offered 1994-95. Staff.
This course introduces students to critical approaches in feminist scholarship to the cultural, socioeconomic, and political situation(s) of women. Particular attention will be paid to the conceptual challenges and dangers posed by attempts to study women without taking account of relations between race, class, and gender in ideological and social formations. Readings will draw on work in various disciplines and will include literary texts and visual images.]
WOMNS 214 Biological Basis of Sex Differences (also Biological Sciences 214 and Biology and Society 214)
Fall. 3 credits. Prerequisite: one year of introductory biology. Limited to non-biology majors and freshman and sophomore biology majors. S-U grades optional. Offered in alternate years.

## . E. Fortune

The structural and functional differences between the sexes are examined. Emphasis is placed on mechanisms of mammalian reproduction; where possible, special attention is given to studies of humans. Current evidence on the effects of gender on nonreproductive aspects of life (behavior, physical, and mental capabilities) is discussed The course is intended to provide students with a basic knowledge of reproductive endocrinology and with a basis for objective evaluation of sex differences in relation to contemporary life.

## [WOMNS 218 The Economics of Gender

 (also City and Regional Planning 218)Spring. 3 credits. Not offered 1994-95.
L. Beneria

The emphasis in this course will be on the economic aspects of women and work: What are the consequences of women's concentration in reproductive work? What economic role does domestic work play within the larger economy? What are the consequences of occupational segregation by gender? Why is the wage gap between men and women not disappearing? What is the role of discrimination? What is the condition of women in other countries? Throughout the course we will examine different analytical frameworks and distinguish between different feminist perspectives dealing with those questions.]
[WOMNS 220 Women of Africa and of the Diaspora in Liberation Movements (also Africana 220)
Fall. 3 credits. Not offered 1994-95.
N'Dri Assié-Lumumba.
This seminar deals with women of Africa and of the African Diaspora in liberation movements. Our studies will include the antislavery struggles in the Americas and the Caribbean, anticolonization and decolonization and decolonization movements, as well as the anti-apartheid struggles in Africa. These movements, and the women who led them, will be discussed in terms of the broader historical, socioeconomic,
political, and cultural contexts.]

## [WOMNS 227 Modern American Sex

 Roles in Historical Perspective (also History 227)4 credits. Limited to 20 students. Permission required. Intended primarily for sophomores Not offered 1994-95
M. B. Norton.

A reading and discussion course. The class will begin by examining sex roles in the United States in the 1990s, looking at a variety of sources like popular magazines and contemporary commentaries. We will then move backwards in time in an attempt to uncover the roots of current attitudes. The students will help to determine which topics the class will investigate in detail.]

WOMNS 238 The Historical Development of Women as Professionals, 1800 Present (also Human Development and Family Studies 258, American Studies 258, and History 238)

## Spring. 3 credits

J. Brumberg.

The historical evolution of the female professions in America (midwifery, nursing, teaching, librarianship, home economics, and social work) as well as women's struggles to gain access to medicine, law, the clergy, and the academy. Lectures, reading, films, and discussion are geared to identifying the cultural patterns that fostered the conception of gender-specific work and the particular historical circumstances that created these different work opportunities. The evolution of professionalism and the consequences of professionalism for women, family structure, and American society are also discussed.
[WOMNS 244 Language Use and Gender Relations (also Linguistics 244) Fall. 4 credits. Not offered 1994-95.
S. McConnell-Ginet.

This course explores connections between language (use) and gender/sex systems, addressing such questions as the following. How do sex and gender affect the ways we speak, the ways we interpret and evaluate speech? How do sociocultural differences in women's and men's roles affect their language use, their relation to language change? What is meant by sexist language? How does conversation structure the social worlds of women and men? Readings draw from work in linguistics, anthropology, philosophy, psychology, literature, and general women's studies and feminist theory.]
[WOMNS 251 Twentieth-Century Women Novelists (also English 251)

## Fall. 4 credits. Not offered 1994-95.

## M. Hite.

This course will be particularly concerned with how women write fiction and with some of the questions about women's experience, perspective, and language raised by recént
feminist criticism. We will read works by Virginia Woolf, Edith Wharton, Toni Morrison, Louise Erdrich, Maxine Hong Kingston, and others.]

## WOMNS 262 Politics of Sexuality (also

 Government 362)Fall. 4 credits.
A. M. Smith

This course will serve as an introduction to lesbian, bisexual, and gay studies from a political theory perspective. In the first part of the course, we will examine Michel Foucault's conception of sexuality as a social construction that emerges as a sociopolitical problem only within specific historical conditions. We will turn to the official regulation of sexuality and the historical research on sexual subcultures, which Foucault's work has inspired in the United States and Britain. In the final part of the course, we will discuss the current debates around activism and identity politics, with a specific emphasis on the links between sexuality and race.

## WOMNS 263 Interpreting Melodrama and

the Women's Film (also English 263) Spring, 1995. 4 credits. Students must be free to attend regular screenings of films and videos. Lab fee $\$ 25.00$. Enrollment reserved for Women's Studies and English majors. Limited to 20 students.
L. Bogel.

With some attention to melodrama's roots in nineteenth-century fiction and theatre and in twentieth-century women's fiction and popular Freudianism, we will work to define Hollywood's melodrama as both a genre and a way of viewing the world. Psychoanalytic and feminist analyses of melodrama will help us pose larger questions about gender and culture, about gendered spectatorship, about the relation of these films to American culture, about Hollywood's changing constructions of "woman," the "maternal," and the "feminine," and questions about desire, pleasure, fantasy, and ideology in relation to the melodramatic heroine. Required weekly, evening screenings of such films as Stella Dallas, Now, Voyager, Rebecca, Mildred Pierce, Tbe Women, Imitation of Life, Secret Beyond the Door, All This and Heaven, Too, So Big, and Gaslight. Regular critical readings, frequent viewing questions, two longer essays, no exam.
[WOMNS 264 Ethnic Literature: Bridges and Boundaries (also English 264)
Fall. 3 credits. Not offered 1994-95.
Harryette Mullen or Shelly Wong.
The American language that came, as William Carlos Williams noted, "from the mouths of Polish mothers," has also been shaped by the oral and written traditions of Native Americans, African Americans, Hispanic Americans, and Asian Americans whose literary production will be examined in this course. Works by writers in these traditions will be studied as sites marking the emergence of a contemporary American language and literature capable of representing the diverse and particular realities of a multicultural nation. This course will focus especially on how each ethnic tradition uses the contested territories of geography, language, gender and sexuality in texts that both refer to and imaginatively construct communities and traditions based on collective experience. Discussion will focus on how each text makes connections and distinctions between individuals as well as within and among communities bound together by shared linguistic, geographical, spiritual, and cultural traditions, and the
territorialization of bodies, especially women's bodies, as boundaries or bridges between races/ethnicities, in discursive constructions of ethnicity.]

WOMNS 269 Introduction to Feminist Political Thought (also Government 269)

Fall. 4 credits.
N. Hirschmann.

This course will provide a general introduction to feminist political thought, surveying various current issues and methodologies. The course will combine analysis of women in western political thought and the relationship of feminism to the discipline of political science; readings by contemporary feminist theorists; and consideration of what theory can contribute to practical issues such as battering, pornography, prostitution, racism, sexuality, and sexual harassment.

## WOMNS 273 Women in American Society, Past and Present (also History 273) \#

Fall. 4 credits.

> M. B. Norton.

A survey of women's experiences in America from the seventeenth century to the present. Among the topics to be discussed are women's familial roles, the changing nature of household work, racial and ethnic differences in women's experiences, the women's rights movement, employment of women outside the home, and contemporary feminism.

## [WOMNS 275 Women in the Work Force

 (also Sociology 275)Spring. 3 credits. Not offered 1994-95. E. Bell.

Women have always contributed their labor to production and reproduction. However, with industrial development and the movement of market production out of the home and into the public sphere, women's work was relegated to the private sphere of the family. Recently this has changed as women seek employment outside the home. In this course we will examine women's positions and the role women play in the labor force, with a focus on more developed societies. Specific topics will include sex differences in pay and sex segregation in the labor force, theoretical explanations from rational choice to Marxist feminism, the relationship betwen women's paid and unpaid labor, and the role of the state and government policy.]

## WOMNS 277 Social Construction of Gender (also Psychology 277)

 Spring. 3 credits. Limited to 400 students S. Bem.This course addresses the very broad question of how an individual's gender and sexuality are constructed. Although some attention is given to biological perspectives, the course emphasizes the social-psychological processes by which the culture transforms male and female newborns into "masculine" and "feminine" adults. In addition to being quite interdisciplinary, the course is also oriented to questioning the "naturalness" of not only masculinity and femininity themselves, but exclusive heterosexuality as well. Among some of the specialized topics discussed are psychological androgyny, equalitarian relationships, gender-liberated child-rearing, the male-centeredness of the work world, female sexuality, sexual harassment, and homophobia.

WOMNS 281 Gender and Society in the Muslim Middle East (also Near Eastern Studies 281 and Religious Studies 281) ©
Spring. 3 credits. Limited to 20 students. L. Peirce.

This course examines conceptions of gender in traditional Muslim society and the ways in which they have affected the experiences of Muslim women and men. Topics to be covered include the position of women in the religious law of Islam, female seclusion and the harem, sexuality, social hierarchies and family structure. Although attention will be given to gender issues in the contemporary Middle East, the course focuses on the historical roots of present-day social configurations.

## WOMNS 294 Feminist Literary Criticism

 (also English 294)Fall. 3 credits. Offered at 200-level for fall 1994.
M. Jacobus.

In this course we will explore the history and contemporary inflections of feminist literary criticism and theory, with an emphasis on close readings of major or classic articles, essays, books, and controversies. We will start by reading Virginia Woolf's A Room of One's Own and look at feminist re-readings of Woolf. We will explore notions of a female literary tradition and questions of canonicity, along with tensions between feminist materialist and psychoanalytic readings. We will look at theories about the role of the body and desire in women's writing drawn from French feminist theory and psychoanalytic feminist criticism. We will also consider questions involving ethnicity, including recent African-American feminist criticism, and recent gay and lesbian feminist criticism. Texts will include (among others) essays by Judith Butler, Donna Harraway, Julia Kristeva, Shoshana Felman, and Alice Walker, and novels by Maxine Hong Kingston (Woman Warrior), Radcliffe Hall (The Well of Loneliness), Nella Larsen (Quicksand), and Virginia Woolf (Mrs. Dalloway). The emphasis will be on relating the insights of feminist criticism and theory to literary texts so that students can develop their own feminist critical practice. Oral reports, short essays, two longer papers.
WOMNS 305 Emotion, Gender, and Culture (also Anthropology 305)

## Fall. 4 credits.

B. J. Isbell.

This course introduces students to the current anthropological perspective on the following topics: (1) cultural shaping of emotion and (2) acquisition and production of gender and sexuality. It is appropriate for students majoring in anthropology, psychology, cognitive studies, human development and family studies, and women's studies.

## [WOMNS 307 African-American Women

 in Slavery and Freedom (also History 303)Spring. 4 credits. Not offered 1994-95. M. Washington.

This course thematically explores the history of African-American women from a sociopolitical perspective. Topics include the images and depictions of Black women, how Black women have engaged in political struggle, race progress vs. feminism, the relationship between racism and sexism, and Black women in family life.]

WOMNS 321 Sex and Gender in CrossCultural Perspective (also Anthropology 321) ©

## Fall. 4 credits.

K. S. March

An introduction to the study of sex roles cross-culturally and to anthropological theories of sex and gender. The course examines the relative positioning of the sexes in social, political, economic, ideological, cultural, and biological aspects of culture; we emphasize the diversity in gender and prospects for change around the world. In addition to lectures and films or videos, participants will work in small discussion sections (maximum enrollment of eight) to prepare several practical field exercises, short papers and critical assessments of other course materials.

## [WOMNS 341 Ethical Theory (also Philosophy 341) <br> Spring. 4 credits. Not offered 1994-95. K. Jones.

Like much of contemporary feminist theory, feminist ethics began with the assumption that ethical theory was fully adequate to address feminist concerns. All that needed to be done was to take the resources of ethical theory and apply them to hitherto overlooked questions, such as abortion, affirmative action, justice in the family, and pomography. This project assumes, however, that the theories themselves are not gender biased. This claim has been challenged. In particular, it has been argued that traditional ethical theory overlooks the situatedness of agents and devalues emotions and relations to particular others. We will critically examine these claims and their challenge to ethical theories that take the principal moral concept to be the concept of "duty". In addition, we will examine the view, argued for by Carol Gilligan, that women speak with a distinctive ethical voice-a voice of care, rather than justice. Gilligan's work raises the problem of what feminist ethics is: any move from "feminine" to "feminist" must be treated with great suspicion. It turns out that a wide variety of projects are currently being pursued under the general heading of feminist ethics and we will attempt to enlarge our understanding of what feminist ethics is and might become.]

## [WOMNS 345 Gender Inequality (also Sociology 345)

Fall. 4 credits. Not offered 1994-95. H. Walker,

This course is an introduction to the systematic study of gender inequality in contemporary society. While the issues we will examine are specific to the study of gender inequality, they are representative of more general concerns in the field of sociology, e.g., stratification, power, and conflict.]

## [womNs 348 The Female Literary Tradition: Wollstonecraft to Woolf (also English 348) \#

4 credits. Not offered 1994-95.
M. Jacobus.

A course designed to survey and investigate the nature of a British "female literary tradition" from the late eighteenth to the early twentieth centuries, read in the light of the rich and varied feminist criticism it has attracted. (Questions: What might constitute a female literary tradition? How is it transmitted, forgotten, recovered, or defined as "female" in the first place?) Starting with late eighteenth-century women novelists such as

Inchbald, Burney, and Radcliffe, we will move by way of Wollstonecraft's writing to Austen, Edgeworth, and Mary Shelley. Mid-nine-teenth-century authors will include writing by the Brontes, Gaskell, Barrett Browning, and George Eliot, as well as sensation novelists such as Braddon and Wood. We will look at some of the "new women" authors of the 1890s (Egerton, Schreiner) before turning to early twentieth-century novelists including Woolf, Radcliffe Hall, and H. D. The dual emphasis will be on an atypical or noncanonical selection of authors and texts, where possible, and on feminist literary criticism; a valuable (although not essential) prerequisite might be a 200 - or 300 -level course in major women novelists of the period covered, such as Austen, the Brontes, or Eliot, or in feminist literary theory.]

## WOMNS 353 Feminism: State and Public Policy (also Government 353)

Fall. 4 credits.
M. Katzenstein. Students seeking admission to this course must attend the first class.
The course examines the aims and strategies of the feminist movement in the United States and the response of both society and the state to feminist claims. It is, thus, a course about political protest and the capacity of American political institutions to promote and shape, as well as to counter social change. In examining the law and public policy on such issues as job discrimination, wife battery, rape, abortion, etc., the course explores the contradictions between, and the congruence of, the dual ideals of individual choice and group equality.

## [WOMNS 357 American Families in

 Historical Perspective |also History 359, American Studies 359 and Human Development and Family Studies 359)Spring. 3 credits. Prerequisite: Human Development and Family Studies 150 or one 200-level social science or history course. Students in endowed units must register for Women's Studies 357 or Sociology 359. Not offered 1994-95.
J. Brumberg.

An introduction to, and overview of, problems and issues in the historical literature on American families and the family life cycle. Reading and lectures will demonstrate the pattern of American family experience in past time, focusing on class, ethnicity, sex, and region as important variables. Analysis of the private world of the family in past time will deal with changing cultural conceptions of sexuality, sex roles, generational relationships, stages of life, and life events. Students will be required to do a major research paper on the history of their family, covering at least two generations and demonstrating their ability to integrate life-course development theory, data drawn from the social sciences, and historical circumstances.]

## WOMNS 362 Global Perspectives on

Gender
Spring. 4 credits.
N. Assie-Lumumba.

The course will examine how forms of gender inequality have been shaped by international forces and structured by differences in national histories. The class will be taught by a rotating set of two faculty members from different departments. Contingent on the particular faculty directing the course, the class will consider such issues as cross-cultural
perspectives on gender; the history of work and family life in different societies; the gendered division of labor in local, national, and international economies; the impact of colonialism; the organized efforts of women to define gender relations; the role of the state in constructing an engendered economy and polity.

## [WOMNS 363 Representations of Women in Anclent Greece and Rome (also Classics 363 and History 367)

Spring. 4 credits. Not offered 1994-95.
L. S. Abel, J. Ginsburg.

The task of this course is to analyze ancient Greek and Roman representations of women-some famous, some infamous, some nameless-within their historical and cultural contexts and the assumptions that underlie these representations. Using literary, historical, legal, and artistic sources (in translation) and examining the historiographical and methodological problems the use of such evidence poses, the class will assess the changing social conditions that relate to the roles, status, and images of women in antiquity. Among the topics considered are: myth and ideology, women's role in the family and society, views of the female body and female sexuality, the place of women in creative art.]

## [WOMNS 365 Directions in Feminist <br> Theory (also Government 362)

Spring. 4 credits. Not offered 1994-95 C. A. Martin.

This course is designed to explore critical debates in contemporary feminist theory with particular attention to the status of gender as an analytic and political category. We will investigate how different theoretical traditions and perspectives relate gender to structures of race, sexuality, and class.]

## [WOMNS 368 Marriage and Sexuality in the Middle Ages (also Mistory 368)

 4 credits. Not offered 1994-95.P. Hyams.

Few topics generate heat so readily as gender relations and sexuality. Behind the current controversies lie decisions made in the first Christian centuries, and firmed up in the course of the Middle Ages; these still affect all of us, believers and unbelievers alike. This course studies Western attempts to deal with the problem of sexuality up to about 1500. The class will first clarify the church's normative rules of law and theology. Armed with this framework, it will then turn to more specific topics, including homosexuality, prostitution, rape/abduction and sexuality in medieval literature. The goal is to be able to compare the ideal model with the reality, and thus to assess the product the medieval church passed on to Westem culture and ourselves. No formal prerequisite, though some prior knowledge of medieval European history is desirable.]

## WOMNS 374 Nineteenth-Century American Women Writers (also English 374)

Spring. 4 credits.
L. Brown.

In this cross-cultural examination of nine-teenth-century American women writers, we will contrast a variety of nineteenth-century works of fiction, political/feminist manifestos and slave narratives. We will investigate the ways in which these writers used their texts to construct culturally valuable and authentic selves. We will also consider tensions
between "sentimental" idealism and political pragmatism, passionless femininity, and autonomy. Readings will include Louisa May Alcott's Behind a Mask, Anna Julia Cooper's A Voice from the South, Frances Harper's Iola LeRoy, Harriet Beecher Stowe's The Minister's Wooing, and Harriet Wilson's Our Nig.

## [WOMNS 377 Gender in Early Modern

 Europe (also History 377)4 credits. Enrollment is limited to 30 . Not offered 1994-95.
R. Weil.

An inquiry into how masculinity and
femininity were defined in early modern Europe. Questions to be explored include: What purpose did gender distinctions serve in the particular society? To what extent were men and women able to shape and redefine the meaning of their gender? How was their ability to do so affected by such events as the Reformation and the French Revolution? Readings include both primary and secondary sources.]

WOMNS 381 Nineteenth-Century French Women Writers (also French Lit 381)
Fall. 4 credits. Course conducted in French. A. Berger.

While situating the works read within their specific historical and literary context, this course will attempt to address two sets of questions: 1) How does the inscription of literature as a Public Institution within a phallocentric cultural order affect women authors' status and writing strategies? 2) To what extent and at what levels does being a women inform or shape the text produced? In what ways is literary writing concemed with sexual difference? Writers will include Mme de Stael, George Sand, M. DesbordesValmore, Flora Tristan, and Rachilde.

## WOMNS 384 Women and Unions (also ILR 384)

## Fall. 4 credits.

I. DeVault.

This course will explore women's participation in the U.S. labor movement in the nineteenth and twentieth centuries. The class will cover issues such as women workers' relations with male-dominated union movements, the role of cross-class alliances of women in organizing women workers, interactions with radical parties and organizations, problems faced by women union leaders and activists, racial and ethnic differences in organizing, and the impact of societal stereotypes and expectations.

## [WOMNS 385 Sex, Morality, and the Law (also Anthropology 385)

Fall. 4 credits. Not offered 1994-95.
B. Povinelli.

This course examines contemporary issues and debates surrounding sexual identities, moralities and their legal standings in western and non-western contexts. The course moves from U.S. Senate hearings on censorship and the arts to New Guinean rituals of manhood to the fractious discourse on "the family"-pro and con. Through a cross-cultural perspective, this course seeks to examine the locations and representations of so-called normal, exotic, and perverse sexual practices and the role of prescriptive and proscriptive law in regulating social morality. The course asks such questions as: How is the separation between private and public spheres subverted by laws regulating sexual practices? How have various western and non-western societies perceived of and regulated the
relationships among sexuality, gender, social identity, and power and between public and private forms of sexuality? The course draws on ethnographic and literary sources, film, and theoretical essays. Geographic regions include: the Middle East, Africa, New Guinea, Aboriginal Australia, the U.S., England, and Germany.]

## WOMNS 403 Images of African-American Resistance (also Society for the Humanities 403)

Fall. 4 credits
L. Brown.

In this course we will examine the themes of African American rebellion and revolution in American literature. We will read historical fiction about Nat Turner, Gabriel Prosser, and other individual and collective acts of rebellion against slavery and segregation. We will also use pertinent films and non-fiction to contextualize our discussions about nine-teenth- and twentieth-century heroes, leadership, militancy, betrayal, separatism, and liberation. In addition, we will trace the evolution of African American protest and discuss the ways in which individuals involved in acts of rebellion define racial justice, emancipation and violence. We will also explore the ways in which specific gender-related experiences and gender stereotypes prompt or inhibit certain types of resistance and violence.

## WOMNS 404 Women Artists (also History of Art 466)

Fall. 4 credits. Prerequisite: Permission of instructor. Auditing not permitted. Not offered 1994-95.
J. Bernstock

This seminar will be devoted to a study of the work of women artists from antiquity to the present. The works of the most important women artists from each period will be studied in relation to the changing roles of women in society.]

## WOMNS 406 The Culture of Lives (also Anthropology 406) ©

Spring. 4 credits.
K. March.

This seminar examines the insights provided by cliverse personal narratives into both the particularities of individual lives and into the wider social and cultural forms within which those lives unfold. We look at the place of life histories in the historical development of anthropology as a discipline, in terms of both the theoretical and methodological concerns they raise. We focus upon the contemporary resurgence of interest in personal narratives as windows onto both the social or cultural construction of the person as well as heavily upon women's lives and their representations to contrast men's and women's accounts and to underscore the special significance of women's narratives in anthropology
[WOMNS 408 Gender Symbolism (also Anthropology 408) ©
4 credits. Not offered 1994-95

## K. March.

This seminar looks at how cultural meaning is constructed about biological sex differences We begin from the presumption that sex difference and gender are culturally defined as a system of categories and meanings interacting with people's cognitive, intellectual, and affective experience of their worlds The seminar has two primary conceptual objectives: (1) to analyze the relations among gender symbols and (2) to explore the
relations between these symbols and the social worlds of the people who believe in them.]

## WOMNS 413 Women Around Freud (also German Studies 413 and Comp Lit 412)

Spring. 4 credits.
C. A. Martin.

This course is designed: 1) to expose students to the lives and work of women intellectuals in turn-of-the-century and early twentiethcentury Austria and Germany who influenced and were influenced by Freud and psychoanalysis; 2) to consider the work of women intellectuals whose interests converged with theories diverged from psychoanalytic thinking; 3) to explore definitions of "intellectuals" and the status of women as intellectuals both at the beginning of the century and in 1994. Our readings and discussions will include the work of Lou Andreas-Salome, Anna Freud, Helene Deutsch, Karen Homey, Sabina Spielrein, Joan Riviere, Melanie Klein, Rosa Mayreder, Grete Meisel-Hess, Hedwig Dohm, and Ellen Key
[WOMNS 416 Person, Gender, and Song (also Anthropology 417) 4 credits. Not offered 1994-95. K. March.

At stake in the anthropological endeavor to represent others' worlds cannot be our capacity for communion, but rather an epistemological puzzle: how do we come to (systemize) knowledge of other realities? On the premises that we come not to know persons (directly), but among other things (through) their words, that words are contextually produced, that some contexts are more highly stylized into recognized cultural genres than others, and that a common and powerful genre is song, this seminar will look at several cases of traditional song and its relation to personal realities, with specific attention to the imaging, communicating, evaluating, and remembering of gender identities.]
wOMNS 417 The Politics of Grief: Greece, the Balkans, Ireland (also Society for the Humanities 407)

## Fall. 3 credits

G. Holst-Warhaft.

The course will examine the relationship between traditional songs of mourning for the dead in these societies and the authority of the state, the church, and of written forms of expression. Women traditionally perform these songs throughout the area and through them, they wield a considerable degree of magico-religious, artistic, and political power. This power may be shared with male figures of authority such as male oral poets, shamans, village elders, or priests, or it may come into sharp conflict with them. In the larger context of the state, especially one with a standing army, it will be seen that rhetoric of praise for the dead, composed by male poets, displaces and subsumes the rhetoric of grief.

## [WOMNS 425 Gender Relations, Gender Ideologies, and Social Change (also Rural Sociology 425)

Fall. 3 credits Not offered 1994-95.
S. Feldman.

This course offers a comparative analysis of rural women's work in agriculture, domestic and household production, and forms of wage work and self-employment in both Third World and industrialized countries. Drawing on feminist and sociological theory and
methods, the course examines gender ideologies, work-family linkages, responses to technological innovation, the transformation of the labor process, and the international division of labor as processes that restructure gender relations and challenge existing proscriptions of women's behavior.]
[WOMNS 426 Undergraduate Seminar in Early American History (also History 426) \#

4 credits. Not offered 1994-95. M. B. Norton.]

WOMNS 431 Scenes of Female Enlightenment (also English 431) Spring. 4 credits.
M. Jacobus.

In this course we will explore the ways in which Enlightenment thinking about women and women's own concern with their rights and education during the late eighteenth century intersects with an inquiry into femininity itself. How did the focus on sentimentality limit, shape, or enable emancipatory feminist discourse? Starting with Rousseau's Nouvelle Eloise and Emile, we will trace the influence of Rousseau on a variety of eighteenth-century sentimental and educational writers, including Saint-Pierre (Paul and Vinginia), Edgeworth (Belinda), and Wollstonecraft (Vindication of the Rights of Women). If available, we will also read selections from women educationists of the period, such as Mrs. Macaulay and Hannah More. Alongside novels of feminist protest by Wollstonecraft (The Wrongs of Woman) and Mary Hays (Memoirs of Emma Courtenay), we will explore other mother-daughter novels of the 1790 s by Inchbald (A Simple Story) and Opie (Adeline Mowbray). As well as reading Diderot's The Nun and de Sade's Justineworks of the French Enlightenment and libertine Revolution, respectively-we will read Radcliffe's Romance of the Forest and Mysteries of Udolpho as the site of the gothic construction of female "enlightenment." Selected novels by Austen (Persuasion and Mansfield Park) and Burney (The Wanderer) will extend the course into the early nine-teenth-century novel for a retrospective view of the feminist "Enlightenment" of the Revolutionary period.

## [WOMNS 433 The Female Dramatic

Tradition (also Theatre Arts 433)
Spring. 4 credits. Not offered 1994-95
J. E. Gainor.

Is there a "female dramaturgy?" What is the female tradition in the theatre? The course will explore these questions through an investigation of texts by women dramatists, including Hrotsvitha, Aphra Behn, and Caryl Churchill, as well as theory by such critics as Sue Ellen Case and Jill Dolan.]

WOMNS 435 The Sociology of Reproduction (also Sociology 434) Spring. 4 credits.
E. Bell.

Women's biological potential to bear children and their childbearing experiences are socially constructed. The social context of women's reproductive capacity is one area in which women themselves are socially defined, and therefore within this realm exists the potential to control women through the control of reproduction and childbirth. We will examine the social construction and control of reproduction using both empirical findings and theoretical arguments. Specific topics include: historical trends in fertility; the
medicalization and medical control of conception and childbirth; biological versus social definitions of women as mothers; the role of state policy; and theoretical explanations of reproduction and gender stratification.

## WOMNS 436 Reading the Pleasures of the Listener (also Society for the Humanities 406)

Fall. 4 credits. Limited to 17 students. N. Furman.

From the lure of the Sirens to the failed cries of Echo, the voice has been a means of expression and seduction, a sign of recognition and loss. From elocution to auditory reception, vocalized fragments testify to the subjectivities of both speaker and listener and reveal the cultural inscription of gender, class, sexuality, and ethnicity. The purpose of this course will be to understand the voice as a cultural perceptual phenomenon, and to note its affective registers in literature, film, and the stage. Readings will include essays by linguists, musicologists, psychoanalysts, philosophers, film and literary critics, and opera fans, and the study of the vicissitudes of the story of Carmen as it moves from literary text, to the operatic stage and onto the silver screen.
[WOMNS 438 Female Adolescence in Historical Perspective, 1815-1960 (also HDFS 417 and History 458)
Fall. 3 credits. Limited to 25 students. Permission of instructor required. Not offered 1994-95.
J. Brumberg.

The changing nature of female adolescence in the United States is explored using nineteenthcentury primary sources available in the Department of Manuscripts and University Archives. Olin Library multidisciplinary readings and discussions are designed to uncover the nature of women's childhood, patterns of authority within the family, cultural attitudes toward sexuality, female friendships, courtship patterns, and rites of passage into adulthood.]

## WOMNS 444 Historical Issues of Cender and Science (also STS 444)

## Spring. 4 credits

M. Rossiter.

This course is a one-semester survey of women's role in science and engineering from antiquity to the 1990s with special emphasis on the United States in the twentieth century. Readings will include biographies and autobiographies of prominent women scientists, educational writings, and other primary sources as well as recent historical and sociological studies. By the end of the semester we should have attained a broad view of the problems that have faced women entering science and engineering in the past and those that still remain.
There are no formal prerequisites for the course, although some knowledge of women's history and the history of science would be helpful. The course welcomes the participation of students from scientific and nonscientific backgrounds alike

## [WOMNS 445 Nineteenth-Century Women Novelists (also English 445)

Spring. 4 credits. Not offered 1994-95 D. Mermin.

Works by Jane Austen, Elizabeth Gaskell, and Charlotte Bronte will be studied with particular attention to the development of a women's tradition in fiction, women writers' conceptions of themselves and their work,
and their social and cultural situation. We will look at letters, diaries, and biographies (including Gaskell's Life of Charlotte Brontē) as well as several novels.]

## WOMNS 450/650 The Lenses of Gender (also Psychology 450 and 650)

Fall. 4 credits. Prerequisite: Permission of instructor. Limited to 18 seniors and graduate students. No preregistration; interested students should attend first class session Graduate students sign up for Psychology/ Women's Studies 650.
S. Bem.

This seminar analyzes the ideological, institutional, and psychological mechanisms that are responsible for the social reproduction of male power in Western-and especially American-culture. It is interdisciplinary, covering material from biology, history, anthropology, law, sociology, psychology, psychiatry, philosophy, and feminist theory. Part one analyzes three important organizing principles or "cultural lenses" that have come to be embedded in the social institutions and the cultural discourses of Western culture: (a) biological essentialism; (b) androcentrism; and (c) gender polarization (including the stigmatizing of homosexuality). Part two analyzes how the individuals living Within the context of these lenses are transformed from being male or female newborns to being "masculine" and "feminine" adults-how, in other words, the culture's gender lenses are subtly transferred from the practices of the culture to the psyche of the individual. Part three considers possibilities for social and personal change.

## [WOMNS 451 Women in Italian Renaissance Art (also Art History 450) "

Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1994-95.
C. Lazzaro.

This seminar examines representations of the Madonna and Child from the fourteenth and fifteenth centuries, the narrative scenes painted on marriage chests and other domestic furniture, biblical and historical heroines such as Judith and Lucretia, portraits of patrician women and courtesans, and violence to women in a political context. It will investigate the contemporary ideas about motherhood, beauty, sexuality, social presentation, and gender roles in society that inform these representations. We will discuss the existing critical frameworks for interpreting them in feminist art history and theory (particularly in Renaissance studies). We will be concerned especially with how visual images are encoded with meaning, what kind of relationship can be established with their historical context, and how they convey social constructs and ideology.]
[WOMNS 455/655 Sexuality, Society, and the State in the Near East (also History $437 / 657$ and NES 456/657)
Spring. 4 credits. Permission of instructor required. Limited to 15 students. Not offered 1994-95.

## L. Peirce

A seminar focusing on the ways in which social practice and the needs of the state have interacted to shape norms of sexual behavior and categories of gender and sexual identity. Topics we will examine include sexuality and gender as components in Islamic monarchy; the ways in which society has resisted the state's attempts to define and control sexuality; and the role of sexuality and gender roles in
current political and social debates in the Near East. Special attention will be paid to the role of the legal process in mediating the contending forces of the state and society.]
WOMNS 456 Social Relations: American History and Female Sexuality (also Society for the Humanities 416)
Spring. 4 credits.
L. Brown.

In this course we will study depictions of female sexuality in nineteenth- and twentiethcentury American literature. As we explore a range of white and African American novels, we will examine the ways in which women's bodies are transformed into symbols of protest and incorporated into national debates such as those about slavery and suffrage. We will discuss the influence of race on notions of purity, chastity, virtue, romance, and sin and debate the ways in which rape, incest, motherhood, and marriage become allegories of American women's historical experiences and goals. In addition, we will explore the ways in which class, race, and political identity determine sexual tragedy or triumph and who becomes "other" based on their sexual legacy.

## WOMNS 459 Educational Innovations in Africa and the African Diaspora (also Africana 459)

Fall. 4 credits.
N. Assie-Lumumba.

This course deals with theories and concepts of planned change for social development and their application to educational innovations geared to promoting equal opportunity based on gender, race, and class in Africa and the African Diaspora. The first part of the course will be concerned with the stages of innovations from their inception to their implementation, resistance, diffusion and impact of different social categories. The second part of the course will deal with concrete cases of educational innovations such as the creation of educational institutions and change in curriculum development and medium of instruction. Historical and contemporary cases of educational innovations will be presented and analyzed. The case studies include the development of Africana Studies as a discipline, the creation and expansion of historically black institutions such as Lincoln University in Pennsylvania, Tuskegee Institute in Alabama, Spelman College in Georgia, and the Westside Preparatory School in Chicago The African cases to be studied include education for self-reliance in Tanzania, African languages as a medium of instruction in Nigeria and Mali, and television as a medium of instruction in Côte d'lvoire. Gender will be a main focus in the analysis of the agents and beneficiaries of the innovations

## [WOMNS 463 The Politics of

 Contemporary Feminist Theory (also Government 463)Fall. 4 credits. Prerequisite: GOVT 369/ WOMNS 269 or permission of instructor. Not offered 1994-95.
N. Hirschmann.

For years the women's movement based its claim to equality on the assertion that men and women are the same. Recently, however, feminist theorists have argued that there are deep, fundamental differences between the sexes: for instances, do women and men view morality differently? What effect does reproduction have on female consciousness? Does women's work produce a particular epistemology, or "way of knowing"? How do
gender, race, class, sexual orientation, etc., influence each other? Drawing on works from political science, psychology, sociology, literary criticism, and philosophy, we will examine a variety of contemporary methods and approaches to feminism, paying particular attention to the issue of "difference" and how claims of difference affect women's claims to equality. In the process, we will examine the "politics" of feminist theory, and what feminism has to offer political science as a discipline.]

## WOMNS 464 Gender and Politics in the Roman World (also Classics 463 and History 463)

Fall. 4 credits
J. Ginsburg.

An undergraduate seminar examining the relationship between gender and politics in the late Roman Republic and early Empire. Among the questions this course will address are: was politics the exclusive domain of men in Roman society (as is generally assumed) or does a broader definition of politics and an understanding of the various forms political activity in ancient Rome might take allow a place for women in Roman political life? what role does gender have in Roman political discourse and ideology? why do issues such as family, marriage, and sexuality become subjects of political debate and legislation?

## WOMNS 466 Feminism and Gender Discrimination (also Government 466)

Spring. 4 credits. Permission of instructor required. No preregistration.
K. Abrams.

This course will introduce students to the major schools of feminist legal theory including equality theory, difference theory, dominance theory, and anti-essentialism. It will then use these theories as a framework for examining several areas in which the law has attempted to address gender-specific injuries. These will include the workplace (sexual harassment, regulation of fertility, work/family conflict), the family (abortion, surrogacy), and violence against women (rape, spousal abuse, pornography). The course will emphasize analysis and critique of present political and legal responses and formulation of alternative responses. Some previous exposure to legal materials (case law statutes) is useful, but not required.

## WOMNS 470.02 Studies in the Novel

 (also English 470.02)Fall and spring. 4 credits. Limited to 15 students, juniors and seniors only
M. Hite

This seminar will consider six major novelsMrs. Dalloway, To the Lighthouse, Orlando The Waves, The Years (along with Woolf's unfinished novel/essay The Pargiters), and Between the Acts-as well as A Room of One's Oun. Tbree Guineas, and a selection of the shorter essays. We will also look at relevant materials from the diaries and occasionally from the letters. Class members will give at least two presentations over the course of the semester and will be expected to participate regularly in discussions. Some short in-class writings, two major papers (10-15 pages).
[WOMNS 474 Black Women Writers: Theory in the Flesh (also English 464)

Spring. 4 credits. Not offered 1994-95 H. Mullen

Black women, while challenging feminism to acknowledge and explore difference among women, have also created a literature in which differences among black women, particularly differences of color and class, are meticulously observed and critically articulated. As collaborators in the creation of AfroAmerican culture, black women have also written perceptively about the precise inflections of gender that make differences in the experience of black women and black men. This course will focus on textual representations of color, class, and cultural differences within Afro-American communi ties, especially as these differences influence constructions of female identity in the texts of black women writers, including Nella Larsen, Gwendolyn Brooks, Toni Morrison, Alice Walker, Toni Cade Bambara, Paule Marshall, Adrienne Kennedy, Gayl Jones, Terry McMillan, and Andrea Lee.]

## WOMNS 478 Family and Society in Africa (also Africana 478)

Fall. 4 credits
N. Assié-Lumumba

The family as a social institution is structured according to socioeconomic, historical, political, and cultural specificities. In this course, the topics to be discussed will include the concepts of nuclear and extended family, the place and role of different age-groups and generations in the family, marriage and related issues, such as dowry, divorce, parenthood, childrearing, sex roles, and class differences The course will also deal with the impact of industrialization and of westernization on the structure of the family in Third World countries. Examples will be drawn from urban and rural communities in industrial/ western and agrarian/non-western societies.

## WOMNS 479 Women and Gender Issues in Africa (also Africana 479)

Spring. 4 credits
There are two contrasting views of the status and role of women in Africa. One view portrays African women as dominated and exploited by men. According to another view, women have a favorable social position in Africa: indigeneous ideologies consider women to be the foundation of society; they are economically active and independent and they have an identity independent of men. In this seminar, we will discuss the status and role of women in Africa historically as well as in the contemporary period. Among the topics to be covered are: women in nonwesternized/precolonial societies; the impact of colonial policies on the status of women; gender and access to schooling; women's participation in the economy and politics; the attitudes of African women towards feminism and the NGO and United Nations Nairobi Conferences on women

## [WOMNS 481 Latin American Women Writers (also Spanish 492 and Comparative Literature 482) 상

 4 credits. Taught in English. Not offered 1994-95D. Castillo.

This course will provide a sampler of novels and short stories by and about Latin American women. We will look at the question of selfconstruction and issues such as the social and political concerns involved in a specifically

Latin American feminine identity. All works will be read in translation (Romance Studies students should read originals of the two works from the Spanish). Authors may include writers like Luisa Valenzuela (Argentina) and Rigoberta Menchú (Guatemala), Helena Parente Cunha and Clarice Lispector (Brazil), Helena María Viramontes and Gloria Anzaldúa (U.S.A.), and Simone Schwarz-Bart (Guadalupe).]

WOMNS 490 English Honors Seminar: Mary Wollstonecraft and Mary Shelly (also English 491)
Fall. 4 credits. Prerequisite: Permission of instructor.
M. Jacobus.

In this seminar we will focus on the writings and the autobiographical constructions of two famous women who were mother and daughter. We will read Mary Wollstonecraft's major writings of the 1780 s and 1790 s, beginning with her novel, Mary, and Tboughts on the Education of Daughters, before taking on her first Vindication (of the Rights of Men) and the feminist Vindication of the Rights of Woman. We will also read her political writings about the French Revolution, her travel book, Letters written during a short residence in Sweden, Norway, and Denmark, and her unfinished novel, The Wrongs of Woman, as well as selections from her letters and Godwin's Memoir of the Author of the Rights of Woman. In the second part of the course, we will read Mary Shelley's writings, starting with her early History of a Six Week Tour and Frankenstein; or the Modern Prometheus. We will also read some of her later novels, including Valperga, The last Man, and Perkin Warbeck, as well as her incest novel, Mathilda, along with selections from her letters and Journals: Alongside the primary texts, the seminar will include readings that situate both Mary Wollstonecraft and Mary Shelley in relation to feminist theory and criticism as well as the Romantic movement. You will be expected to contribute an oral report, short papers, and final longer paper.

## WOMNS 491 Virginia Woolf (also English 491)

Spring. 4 credits.
M. Hite.

This seminar will consider six major novelsMrs. Dalloway, To the Lighthouse, Orlando, The Waves, The Years (along with Woolf's unfinished novel/essay The Pargiters), and Between the Acts-along with A Room of One's Own, Tbree Guineas, and a selection of the shorter essays. We will also look at relevant material from the diaries and occasionally from the letters. Participants will give at least two presentations over the course of the semester and will be expected to participate regularly in discussions. Some short in-class writings, two major papers ( $10-15$ pages).
[WOMNS 492 George Eliot (also English 491)

Fall. 4 credits. Not offered 1994-95. D. Mermin

We will read several of Eliot's major novels, from Adam Bede to Daniel Deronda, along with essays and letters, and try to gain as full a sense as possible of the works, the career, and the literary, intellectual, social, and cultural situation of the foremost Victorian woman novelist.]
[WOMNS 493 French Feminisms (also French 493)
Fall. 4 credits. Not offered 1994-95. N. Furman.

This course will examine the political, theoretical, and literary concerns of contemporary French writers who have addressed "la question de la femme/la question du féminin." Readings will include representative texts by Simone de Beauvoir, Monique Wittig, Julia Kristeva, Jacques Lacan, Luce Irigaray, Jacques Derrida, and Hëlene Cixous. Taught in English.]

## WOMNS 499 Directed Study

Fall or spring. Variable credit. Prerequisites: one course in women's studies and permis sion of a faculty member of the Women's Studies Program Board.

Hours to be arranged. Staff
[WOMNS 530 Womanist Writing in Africa and the Caribbean (also Africana 530)

Fall. 4 credits. Not offered 1994-95 A. Adams.

Theoretical essays on the nature, relevance and articulation of feminist thought from African and Caribbean writers will complement literary texts. Gender issues, as manifested both at home and in emigrant situations abroad, will bee examined in texts by such writers as Sistren, Conde, Dangarembga, Aidoo, Wamer-Vieyra, Ba, Emecheta, Kincaid, and W. Mandela. (Francophone works may be read in the original by individuals who so desire.)]
WOMNS 594 Feminist Theory and the History of Art (also Art H 594)
Spring. 4 credits. Permission of instructor required.

Karen-edis Barzman
Seminar participants will examine the impact of feminist theory on art historical practice Based on critical analysis of texts from the early 1970s to the present, we will consider the range of methods employed by feminists in the field; the political practices and discursive traditions to which the methods belong (liberal feminist, radical feminist, Marxist, semiotic, psychoanalytic, traditional art histories; and the interpretive problems they present in light of social theory and the politics of gender in the mid ' 90 s .

## WOMNS 600 Special Topics in Feminist Theory: An Interdisciplinary

 Graduate Course in Women's Studies (also Anthropology 600, German Studies 600, and Comp. Lit. 600) Fall. 4 credits. This course is open to graduate students and undergraduate seniors who have obtained permission of instructor.C. A. Martin/H. Povinelli.

The purpose of this course is to expose graduate students to interdisciplinary approaches in Women's Studies and feminist theory to a variety of topics or questions. While many of our graduate courses train students in highly specialized areas of feminist theory, this course aims to teach students how to find common intellectual ground around a single topic from interdisciplinary perspectives without sacrificing the complexity of any disciplinary approach. The course is designed for graduate minors in Women's Studies and students with a specialized interest in feminist theory. Although it is not required, the course is strongly recommended for students obtaining a graduate minor in Women's Studies.
[WOMNS 608 African-American Women (also History 608)
4 credits. Not offered 1994-95.
M. Washington.

This seminar focuses on nineteenth-century African-American women in the United States and the Caribbean. Emphasis will be on interpretive examination of black women within a gender network, in the black community, and in the larger society. The course format is topical and includes abolition, women's rights, slavery, sexuality, education. and race uplift. Course requirements are (1) attendance and active participation and (2) completion of a $25-30$ page paper based on primary research on some aspect of the history of nineteenth-century African-American women.]

## WOMNS 613 The Political Economy of Gender and Work (also City and Regional Planning 613)

## Fall. 3 credits

L. Beneria

This course focuses on different approaches to the analysis of gender and work, combining economic and feminist theory. Topics include: the significance of economic rationalization and the rhetoric of economics from a feminist perspective, household theory. gender and the labor market, wage differentials, discrimination, labor market policies, gender and technology, economic restructuring and women's work, family and reproductive policies. The empirical material in the course concentrates mostly, but not exclusively, on the United States.

## [WOMNS 614 Gender and International

 Development (also City and Regional Planning 614)Spring. 3 credits. Not offered 1994-95.
L. Beneria.

This course has four main objectives. The first is to provide an analysis of the location of women in processes of development and to understand the centrality of gender in each case. The second is to examine theoretical and conceprual frameworks for the analysis, including an understanding of gender divisions and their interaction with other forms of inequality such as class, race, and ethnicity. The third is to reflect upon the linkages between the global economy and the gendered macro and micro processes of development. The fourth is to provide a basis for research, practical action, and policy formulation and for evaluating directions and strategies for social change.]

## WOMNS 618 Feminist Jurisprudence

(also GOVT 618 and Law 646)

## Spring. 4 credits

K. Abrams

This course will examine the role of law, and more generally, the role of the state, in perpetuating and remedying women's oppression. We will study several paradigmatic feminist legal theories, including equality, difference, dominance, and various anti-essentialist theories (e.g., intersectional, post-structuralist). Among the questions we will consider: How does the law help to construct gender? In what way does the law interact with cultural images and assumptions clealing with women, thus perpetuating women's oppression? To what extent can a set of institutions implicated in women's oppression be used to remedy it? Can a legal system predicated on the literal assumptions of a unitary, pre-political, autonomous self accommodate feminist accounts of social
construction, constrained "choice" or decentered subjects? What methods have feminists used to argue in and about the law and do these methods themselves have the potential to transform legal thinking? Although we will consider a number of practical applications (spousal abuse, pornography, fertility, and the workplace), the course will be more theoretical in its orientation than Government 466. Among the theorists studied will be Richard Wasserstrom, Christine Littleton, Robin West, Joan Williams Catharine MacKinnon, Partricia Williams
Martha Mahoney, Angela Harris, William
Eskridge, Janet Halley, Zillah Eisenstein, Vicki Schultz, and Katherine Bartlett

## [WOMNS 621 Lesbian, Gay, and Bi-sexual Studies

Fall. 4 credits. Not offered 1994-95 C. A. Martin.

The purpose of this seminar is twofold: (1) to explore recent work in the field of lesbian and gay studies with particular emphasis on cultural theory; and (2) to provide graduate students with the opportunity to pursue their individual research projects in a collaborative setting. The first part of the semester will be devoted to a discussion of critical debates and texts in this emerging field, and the second half to students' presentations of their work]

## WOMNS 626 Graduate Seminar in the History of American Women (also History 626)

Spring. 4 credits. Limited to graduate students.
M. B. Norton.

A reading and research seminar intended for graduate students. Major works in American women's history will be carefully scrutinized, and each student will prepare a lengthy research paper.
wOMNS 631 Gender and Culture (also Anthropology 621)
Fall. 4 credits.
K. March.

Extended consideration of the anthropological issues surrounding sex and gender introduced in ANTHR/WOMNS 321. The discussion seminar portion of this course will emphasize contemporary theories of gender within anthropology and build specifically toward the formulation of important research problems in the field. Graduate students only.

## [WOMNS 633 Women Writers in the Middle Ages (also English 633)

Fall. 4 credits. Not offered 1994-95. A. Galloway This course will study women writers of the Middle Ages, while examining some of the methodologies-medieval and modern-for assessing these women's works and lives. The first weeks will be spent reading Marie de France, a selection of poems "praising" and "blaming" women and marriage, surveying medieval "theories about femininity"including misogyny of the more obvious and perennial varieties-and putting beside these selected modern essays. The balance of the course will concentrate on the works and contexts of women writers in the later Middle Ages, especially Margery Kempe, Julian of Norwich. Catherine of Siena, and Christine of Pisan, interlacing study of these with some excerpts from male writers in the same general traditions. Study of the later writers will include emphasizing the ways that the women writers interacted with their male intellectual peers and with their literary,
religious, and philosophical traditions; we will seek to define within these living and intellectual contexts the kinds of authority and vision these women developed. Time permitting, some women writers of the sixteenth century may be included.]

## WOMNS 636 Comparative History of Women and Work (also ILR 636)

Spring. 4 credits. Disc/sem.
Ileen DeVault.
This seminar will explore the similarities and differences among different cultures assumptions about the work of women as well as women's experiences in varying work circumstances throughout history. Comparative examples will be taken from the United States, Europe, and the Third World.

## WOMNS 660 Cender in NineteenthCentury America (also English 661)

 4 credits. Not offered 1994-95. S. Samuels.A study of the relation between historical experience and literary texts. We will examine from the perspectives of both historical and literary analysis the rise of women writers, the novel's preoccupation with conflicts between men and women, the cultural uses of feminism and antifeminism and the impact of the new woman. Bringing traditional literary texts-novels and poetryinto dialogue with "nonliterary" writings like journalism, political treatise, social reform manifestos, and etiquette books, we will draw on the methods and theories of cultural history and literary criticism to ask how gender relations and the history of women bear on the plots, discourses, and images of literary texts. A tentative reading list would include Susannah Rowson's Charlotte Temple, Lydia Maria Child's The Mother's Book, Catherine Beecher's A Treatise on Domesticity, Nathaniel Hawthorne's The Blithedale Romance, Harriet Beecher Stowe's Uncle Tom's Cabin, Herman Melville's Pierre, poems by Emily Dickinson and Walt Whitman.

## WOMNS 670 Feminist Political Theory (Graduate Seminar) (also Government 671)

Spring. 4 credits. Open to undergraduates who have taken GOV/WS 463 or other courses in feminist theory and who have the permission of the instructor
N. Hirschmann.

This graduate seminar will examine contemporary feminist theory from the perspective of political theory. We will study the work of feminist theorists who work specifically within the discipline of political science, as well as the specifically political dimensions of work not generally considered political theory. Though particular readings and topics will change from year to year in response to the most recent literature, in general the course will focus on questions of epistemology and methodology as a way to explore a variety of issues of relevance to feminism as an academic, intellectual, and political enterprise

## [WOMNS 671 Feminist Methods (also

 Rural Sociology 771|Spring. 4 credits. Not offered 1994-95. S. Feldman.

Employing a sociology of knowledge perspective and comparative approach within the social science, this course will review and analyze contemporary themes in the feminist epistemological critique of sociological methods. The course will begin by identifying what constitutes mainstream explanations
within the social sciences, introduce early feminist challenges to androcentric paradigms, move to examine the philosophical and postmodern challenge, and then outline issues critical to "doing fieldwork." In the latter section, we will examine studies that address issues of class, race, ethnicity, and constructions of otherness.]

## WOMNS 672 The Theory and Policy of Feminiat Issues (also Government 672)

Fall. 4 credits. Limited to 20 students. M. Katzenstein and N. Hirschmann This course will explore the intersections of theory and policy in feminist scholarship through the lense of several issues of key importance in contemporary feminist politics. The course takes as its foundation the premise that most feminist issues need to be approached from a multidisciplinary perspective to be understood fully, and that feminist theory and policy are integrally related to one another. Focusing on such issues as domestic violence, pornography, welfare, and the military, we will approach each of these issues from a variety of theoretical and empirical perspectives in order to understand both the political and theoretical underpinnings of existing policy as well as the political and theoretical implications of various feminist prescriptions and suggestions for policy change.

## WOMNS 680 Twentieth-Century Women's

 Poetry (also English 680)Spring. 4 credits.
P. Janowitz.

This will be a reading and discussion seminar on poets of the twentieth century who are women, in order to explore not only the poetry but the stance of the poet in regard to gender. For example: Elizabeth Bishop did not wish to be regarded as a "Woman Poet." What are some of the particular problems encountered by women poets of this century? We will consider, by means of essays, biographic, and critical works, the processesmental, emotional, social, and intellectual-by which these women attempted to shape a poetic esthetic. Students will be required to select two texts from the syllabus and to lead seminar discussions of these works; in addition, they will write a final paper in which at least one of the readings is related either to aspects of technique or esthetic philosophy Suggested readings for the course include selections from the writings of such poets as Millay, H.D., Bogan, Brooks, Moore, Rich, Plath, Levertov, or others to be decided on among seminar participants.
[WOMNS 690 Feminist Criticism (also German Studies 690)
Fall. 4 credits. Open to qualified undergraduates with permission of instructor. Reading knowledge of German recommended but not required. Not offered 1994-95.
C. A. Martin.

This course is designed to explore developments in feminist literary theory with particular attention to the field of German literature. We will consider competing critical strategies and their political implications by working through different readings of specific literary texts and by raising questions about the implications for feminism of competing critical strategies in the general field of literary theory; the relations between feminism and established critical schools; the tension in feminist Germanistik between critical attention to the "male canon" and the construction of a
female literary tradition; the impact on German feminism(s) of their translations of French and American work; the impact and treatment of the Nazi period; the effects of the East-West divide on development in Germany; the impact on feminist literature and criticism of Third World women in Germany; and approaches in Germany to imperialism and racism.]

## WOMNS 692 Hispanic Feminisms (also Romance Studies 690)

Spring. 4 credits. Taught in Spanish. Not offered 1994-95.

## D. Castillo

This seminar is designed to explore the interrelationship of feminist literary theory and the narrative production of the Hispanic world. In this inquiry, we will be developing feminist critical methodologies (based on readings of essays by thinkers such as Castellanos, and Glantz) and defining strategies or possibilities for feminist criticism(s). Finally, we will study the ways in which feminist analyses of literature alter our readings of texts by men (Isaacs, Cortâzar, Onetti, García Lorca) as well as by women (Pardo Bazản, Tusquets, Valenzuela, Garro), and how they change our conception of criticism and the task of the critic.]

## WOMNS 699 Toplcs in Women's Studies

Fall or spring. Variable credits.
Staff.
Independent reading course for graduate students on topics not covered in regularly scheduled courses. Students develop a course of readings in consultation with a faculty member in the field of Women's Studies who has agreed to supervise the course work.

## WOMNS 705 Feminist Literary Theory

 (also English 705)4 credits. Not offered 1994-95. M. Jacobus.]

## WOMNS 733 Literary Anti-Feminism

 (also English 733)4 credits. Not offered 1994-95.
L. Brown.]

## Writing Program

See "John S. Knight Writing Program."

## FACULTY ROSTER

Abrams, Kathryn, J. D., Yale Law. Assoc. Prof., Ethics and Public Life
Abrams, Meyer H., Ph.D., Harvard U. Class of 1916. Professor of English Emeritus, English
Abruna, Hector D., Ph.D., U. of North Carolina at Chapel Hill. Prof., Chemistry
Adams, Anne, Ph.D., U. of Michigan. Assoc. Prof., Africana Studies and Research Center
Adams, Barry B., Ph.D., U. of North Carolina. Prof., English
Agawu, V. Kofi, Ph.D., Stanford U. Assoc. Prof., Music
Ahl, Frederick M., Ph.D., U. of Texas at Austin. Prof., Classics
Albrecht, Andreas C., Ph.D., U. of Washington Prof., Chemistry
Alexander, James P., Ph.D., U. of Chicago. Assoc. Prof., Physics/LNST
Allmendinger, Richard W., Ph.D., Stanford U. Assoc. Prof., Geological Sciences/INSTOC\# Altschuler, Glenn C., Ph.D., Cornell U. Prof., American Studjes

Ambegaokar, Vinay, Ph.D., Carnegie Inst. of Technology. Prof., Physics/LASSP*
Ammons, Archie R., B.S., Wake Forest Coll. Goldwin Smith Professor of Poetry, English
Anderson, Benedict R., Ph.D., Cornell U.
Aaron L. Binenkorb Professor of Interna-
tional Studies, Government
Archer, Richard J., M.A., U. of Missouri at Kansas City. Asst. Prof., Theatre Arts
Arroyo, Ciriaco M., Ph.D., U. of Munich (Germany). Emerson Hinchliff Professor of Spanish Literature, Romance Studies/ Comparative Literature
Ascher, Robert, Ph.D., U. of California at Los Angeles. Prof., Anthropology
Ashcroft, Neil W., Ph.D., Cambridge U. (England). Horace White Professor of Physics, Physics/LASSP*
Assié-Lumumba, N'dri, Ph.D., U. of Chicago. Asst. Prof., Africana Studies/Women's Studies
Attoh, Kodjopa, lPh.D., Northwestern U. Assoc. Prof., Geological Sciences
Austin, William W., Ph.D., Harvard U. Given Foundation Professor of Musicology Emeritus, Music
Bacharach, Samuel B., Ph.D., U. of Wisconsin. Assoc. Prof. Industrial and Labor Relations/ Sociology
Baird, Barbara, Ph.D., Comell U. Prof., Chemistry
Barazangi, Muawia, Ph.D., Columbia U. Prof., Geological Sciences/INSTOC\#
Barbasch, Dan, Ph.D., U. of Illinois. Prof., Mathematics
Barzman, Karen-Edis, Ph.D., Johns Hopkins U. Asst. Prof., History of Art
Bassett, William A., Ph.D., Columbia U. Prof., Geological Sciences
Basu, Kaushik, Ph.D., London School of Economics (England). Prof., Fconomics
Bathrick, David, Ph.D., U. of Chicago. Prof., German Literature and Theatre Arts
Bauer, Simon H., Ph.D., U. of Chicago. Prof. Emeritus, Chemistry
Baugh, Daniel A., Ph.D., Cambridge U. (England). Prof., History
Begley, Tadhg P., Ph.D., California Inst. of Technology. Assoc. Prof., Chemistry
Bell, Eleanor O., Ph.D., U. of California at Berkeley. Asst. Prof., Sociology
Bem, Daryl J., Ph.D., U. of Michigan. Prof., Psychology
Bem, Sandra L., Ph.D., U. of Michigan. Prof., Psychology/Women's Studies
Beneria, Lourdes, Ph.D., Columbia U. Prof., City and Regional Planning/Women's Studies
Bensel, Richard, Ph.D., Comell U. Prof., Government
Bereaud, Jacques, Doctorat d'Univ., U. of Lille (France). Prof., Romance Studies
Berger, Anne, Ph.D., Paris VII (France). Assoc. Prof., Romance Studies
Berkelman, Karl, Ph.D., Cornell U. Prof., Physics/LNST
Bernal, Martin G., Ph.D., Cambridge U. (England). Prof., Government/Near Eastern Studies
Bernstock, Judith, Ph.D., Columbia U. Assoc. Prof., History of Art
Bestor, Theodore C., Ph.D., Stanford U. Assoc. Prof., Anthropology
Bethe, Hans, Ph.D., U. of Munich (Germany). John Wendell Anderson Professor of Physics Emeritus, Physics
Biggerstaff, Knight, Ph.D., Harvard U. Prof. Emeritus, History
Billera Louis J., Ph.D., City U. of New York. Prof., Mathematics/Operations Research and Industrial Engineering

Bilson, Malcolm, D.M.A., U. of Illinois. Frederic J. Whiton Professor of Music, Music
Bird, John M., Ph.I., Rensselaer Polytechnic Inst. Prof., Geological Sciences
Birman, Kenneth P., Ph.D., U. of California at Berkeley. Assoc. Prof., Computer Science
Bishop, Jonathan P., Ph.D., Harvard U. Prof., English
Bittman, Dina, Ph.D., U. of Wisconsin at Madison. Asst. Prof., Computer Science
Blackall, Jean F., Ph.D., Harvard U. Prof. Emerita, English
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Industrial and
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Law School

Graduate School of Management

## Nutritional

Sciences

Officer
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Physical Education and Athletios

Summer Session

Veterinary
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[^1]:    H ADM 415 Managerial Leadership in the 1990s
    Spring. 1 credit. Elective. (Formerly H Adm 515)

    An entire weekend in February 1995
    K. Blanchard.

[^2]:    ILRHR 657 Employer Training: Economic and International Perspectives
    3 credits.
    J. Bishop.

[^3]:    G. Waite.

[^4]:    See the list of courses with overlapping content at the end of the introduction.

[^5]:    *See the list of courses with overlapping content at the end of the introduction.

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