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REFERENCE
CORNELL
UNIVERSITY



Courses of Study

1998-1999

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 break: instruction suspended
 Instruction resumes
 Pre-course enrollment for spring
 Family Weekend
 Homecoming
 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 Period Begins

Three-week classes begin
 Winter session period ends

Spring Semester

Residence halls open for continuing students
 Residence halls open for new students
 Registration—course exchange
 Instruction begins
 Physical education classes begin
 Spring break: 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

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

1998-99

Friday, August 21
 Friday, August 21
 Friday, August 21
 Tuesday–Wednesday, August 25–26
 Thursday, August 27
 Monday, September 7
 Saturday, October 10
 Wednesday, October 14
 TBA
 October 30–November 1
 September 19

 Wednesday, November 25
 Monday, November 30
 Saturday, December 5
 Sunday–Wednesday, December 6–9
 Thursday, December 10
 Friday, December 18
 Saturday, December 19

 Monday, December 28
 Monday, January 4
 Friday, January 22

Sunday, January 17
 Monday, January 18
 Thursday–Friday, January 21–22
 Monday, January 25
 Monday, February 8
 Saturday, March 20
 Monday, March 29
 TBA
 Saturday, May 8
 Sunday–Wednesday, May 9–12
 Thursday, May 13
 Friday, May 21

 Saturday, May 22
 Sunday–Saturday, May 23–29
 Sunday, May 30

Wednesday, June 2
 Monday, June 14
 Monday, June 28

1999-00

Friday, August 20
 Friday, August 20
 Friday, August 20
 Tuesday–Wednesday, August 24–25
 Thursday, August 26
 Monday, September 6
 Saturday, October 9
 Wednesday, October 13
 TBA
 October 29–31
 November 5–7

 Wednesday, November 24
 Monday, November 29
 Saturday, December 4
 Sunday–Wednesday, December 5–8
 Thursday, December 9
 Friday, December 17
 Saturday, December 18

 Monday, December 27
 Monday, January 3
 Friday, January 21

Sunday, January 16
 Monday, January 17
 Thursday–Friday, January 20–21
 Monday, January 24
 Monday, February 7
 Saturday, March 18
 Monday, March 27
 TBA
 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
 Monday, June 12
 Monday, June 26

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 Cornell 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 and Technology Services at Cornell University.

CORNELL

U N I V E R S I T Y

Courses of Study

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Cornell University
(USPS 132-860)

Volume 90 of the series "Cornell University" consists of ten catalogs, of which this is number seven, dated August 3, 1998. Issued once in January, once in February, once in March, once in May, once in June, once in July, three times in August, and once in November. Published by Media Services, Cornell University, Comstock Hall, Ithaca, NY 14853-0901. Periodicals postage paid at Ithaca, New York.

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It is the policy of Cornell University actively to support equality of educational and employment opportunity. No person shall be denied admission to any educational program or activity or be denied employment on the basis of any legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, sexual orientation, age, or handicap. The university is committed to the maintenance of affirmative action programs that will assure the continuation of such equality of opportunity. Sexual harassment is an act of discrimination and, as such, will not be tolerated. Inquiries concerning the application of Title IX may be referred to Cornell's Title IX coordinator (assistant director, gender equity) at the Office of Equal Opportunity, Cornell University, 234 Day Hall, Ithaca, New York 14853-2801 (telephone: 607 255-3976; TDD: 607 255-7665).

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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For Cornell University directory information or general information, call 607-255-2000 or 607-254-INFO. The Web page for 1998-99 Courses of Study has been made available at <http://www.cornell.edu/Academic/Courses98/Courses98.html>

To obtain a copy of this catalog, please follow these guidelines:

If you are a prospective undergraduate student, please contact the Undergraduate Admissions Office, Cornell University, 410 Thurston Ave., Ithaca, NY 14853-2488, 607-255-5241.

If you are a prospective graduate student, please contact the Graduate School, Cornell University, B2 Caldwell Hall, Ithaca, NY 14853, 607-255-4884.

If you are a currently enrolled student, please contact your college registrar.

All others please contact the Office of the Vice President for Student and Academic Services, Cornell University, 311 Day Hall, Ithaca, NY 14853-2801, 607-255-7595, Internet: dsy1@cornell.edu

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

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 Ithaca, NY 14853-0901

Fax: 607-255-9873
 e-mail: jaa3@cornell.edu

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
		@	geographic breadth
		#	historical breadth

Courses with names and descriptions enclosed in brackets—[]—are not offered fall 1998 and spring 1999.

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, on the World Wide Web, 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:

Undergraduate admissions. Information pertinent to prospective applicants is available from the Undergraduate Admissions Office, 410 Thurston Avenue, Ithaca, NY 14850-2488, 607-255-5241.

Graduate School. Information pertaining to admission to the Graduate School may be obtained by contacting the Graduate School, B2 Caldwell Hall, Ithaca, NY 14853-2602, 607-255-4884.

Law School. Admission information for the Law School is available from the Law School, Myron Taylor Hall, Ithaca, NY 14853-4901, 607-255-5141.

Samuel Curtis Johnson Graduate School of Management. Information is available from the Office of Admissions, Sage Hall, Ithaca, NY 14853-4201, 607-255-4526.

College of Veterinary Medicine. Admission information is available from the Admissions Office, Schurman Hall, Cornell University, Ithaca, NY 14853-6401, 607-253-7000.

Medical College and Graduate School of Medical Sciences. Information regarding admissions is available from the Office of Admissions, 1300 York Avenue, New York, NY 10021, 212-746-1067.

CUINFO ON THE WORLD WIDE WEB

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*, published each semester by the Office of the University Registrar. You may access CUINFO through the World Wide Web. The URL is: <http://www.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 undergraduate- 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 alphabetical 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. A copy of the most recent reaffirmation of Cornell's accreditation can be found at <http://www.ipr.cornell.edu/Accreditation/Status>. Requests to review additional documentation supporting Cornell's accreditation should be addressed to the Michael Matier, Office of Planning and Budget, Cornell University, 440 Day Hall, Ithaca, NY 14853-2801, mwm5@cornell.edu.

Advanced Placement

CREDIT FOR ADVANCED PLACEMENT

Definition and Purpose of Advanced Placement Credit

Advanced placement credit is college credit that students earn 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.

Sources of Advanced Placement Credit

Advanced placement credit may be earned from one of the following:

- Achieving the requisite score on a departmental examination at Cornell (usually given during orientation week) or from the Advanced Placement Examinations from the College Entrance Examination Board (CEEB). The requisite scores, which vary by subject, are determined by the relevant departments at Cornell and are listed on page 7.
- 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 (see below).

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 Entrance Examination Board in Princeton, New Jersey, to qualify for credit as in paragraph *a* above.

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. 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.

Advanced placement examinations. Entering freshmen should have their scores from CEEB Advanced Placement Examinations sent to their college or school office (see below, "Forwarding of scores and transcripts").

Departmental advanced standing examinations. 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 departmental examinations are shown on page 7.

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
55 Goldwin Smith Hall

College of Engineering
170 Olin Hall

School of Hotel Administration
138 Statler Hall

College of Human Ecology
N101 Van Rensselaer Hall

School of Industrial and Labor Relations
101 Ives Hall

DETERMINATION OF CREDIT AND PLACEMENT

The table on page 7 provides information on how credit and placement are determined for most subjects. Supplementary information for subjects requiring additional explanation is provided below.

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 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, 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 Biological Sciences 101-104 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 in 131 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. Questions may also be directed to Dr. Stanley Marcus, associate director of undergraduate studies, in 138 Baker Laboratory. 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, 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 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

Summary of Credit and Placement

<i>Subject</i>	<i>Score</i>	<i>Advanced Placement Credit</i>	<i>Placement</i>
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	5	4 credits	Department determines placement.
Computer science	4,5	4 credits	Placement out of C.S. 100.
Economics, micro	4,5	3 credits	Placement out of Economics 101.
Economics, macro	4,5	3 credits	Placement out of Economics 102.
English	4,5	3 credits	
French language	4,5	3 credits	Department of Modern Languages determines placement. Students may earn additional credit by taking CASE examination.†
French literature	4,5	3 credits (and proficiency)	Department of Romance Studies determines placement.
German	4,5	3 credits (and proficiency)	Department of German Studies determines placement in literature courses. Department of Modern Languages determines placement in language courses. Students may earn additional credit by taking CASE examination.†
Government and politics, U.S.	4,5	3 credits	Placement out of Government 111.
Government and politics, comparative	4,5	3 credits	Placement out of Government 131.
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 language	4,5	3 credits	Department of Modern Languages determines placement. Students may earn additional credit by taking CASE examination.†
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)	4,5	8 credits	Placement out of 111, 112. Permission to take 221, 223, 293, or 213.
	2 or 3	4 credits	Placement out of 111. No advanced placement credit for students who take 111. Permission to take 112, 122, or 192.
Mathematics AB (excluding engineering students)	3,4,5	4 credits	Placement out of 111. Permission to take 112, 122, 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	5	8 credits	Placement out of Physics 101–102. Students with a score of 4 or 5 on Mathematics BC may choose placement out of Physics 112 or 207 (4 credits).
Physics B	4	8 credits	Placement out of Physics 101–102.
	3	4 credits	Placement out of Physics 101.
Physics C—Mechanics	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/Magnetism	5	4 credits	Placement out of Physics 213.
Psychology	4,5	3 credits	Placement out of Psychology 101.
Sociology	Department determines credit and placement.		
Spanish language	4,5	3 credits	Department of Modern Languages determines placement. Students may earn additional credit by taking CASE examination.†
Spanish literature	4,5	3 credits (and proficiency)	Department of Romance Studies determines placement.
Statistics	4,5	3 credits	Placement out of Biometry 200, ILRST 210 or Mathematics 171.
Turkish	Department of Near Eastern Studies determines credit and placement based on departmental examination.		

†Cornell Advanced Standing Examination. Contact the Department of Modern Languages, 203 Morrill Hall.

departmental placement test. To take the departmental examination, students must sign up beforehand in the Undergraduate Office, 303 Upson Hall.

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 SAT II examination in English composition, 700 or better on the CEEB SAT II examination 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.

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 third-semester course (Mathematics 213, 221, 223 or 293), but students entering Mathematics 293 may have to make up some material on partial differentiation. Students with a 2 or 3 on the BC examination or a 3, 4 or 5 on the AB examination may take the appropriate second-semester course (Mathematics 112, 122, or 192). However, students who receive the borderline passing scores of 2 on the BC examination or 3 on the AB examination are strongly advised to take 112 rather than the more demanding courses 122 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.

The placement examination in mathematics is offered at Cornell 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) 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. See "Placement Tests and Advanced Placement credit" under "Foreign Language Requirements" in the Arts and Sciences section of this catalog. 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 of the CEEB, three credits are granted, and they are eligible to take Cornell's Advanced Standing Examination (CASE). Outstanding performance on this examination can result in a maximum of six credits.
- 2) Students who achieve a minimum score of 65 on the Cornell language placement test given during orientation week are eligible to take Cornell's Advanced Standing Examination (CASE). Outstanding performance on this examination can result in a maximum of six credits.
- 3) 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 Cornell record.
- 4) 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 on the Web at <http://dml.cornell.edu/html/place/testschedule.html>, and from the Department of Modern Languages. For more information, see the College of Arts and Sciences section on language course placement, or contact the Department of Modern Languages, 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, 104 Lincoln Hall (telephone: 607/255-4097).

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 departmental examination (which may be taken during orientation week or at other times as arranged). For information about the departmental examination, students should consult the director of undergraduate studies, Professor J. T. Rogers, 101 Clark Hall, or the department chair.

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 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—Mechanics: Students earning a score of 4 or 5 may receive four credits for Physics 112 or 207, or placement into Physics 116 with no AP credit.

Physics C—Electricity and Magnetism: Students earning a score of 5 may receive four credits for Physics 213.

A student planning a major in Physics or Applied and Engineering Physics and who is eligible for AP credit should 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 J. T. Rogers, 101 Clark Hall, or from the Department of Physics, 109 Clark Hall.

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 Entrance Examination 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	A, B, or C	4 credits
Mathematics	A or B	8 credits (Math 111 and 112)
	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 are encouraged to enroll in Physics 116.

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	Marks	Credit
Anthropology		subject to departmental review
Biology	7	8 credits
	6	6 credits
Chemistry	6 or 7	4 credits (Chem 207)
Economics	6 or 7	6 credits
English Literature	7	6 credits
	6	3 credits
Geography		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 third-semester math courses)

Music		subject to departmental review
Philosophy	7	3 credits
Physical Science	6 or 7	8 credits (4 credits, Chemistry 103; 4 credits, Physics 101)
Physics	6 or 7	4 credits (Phys 101, 112, or 207)

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.

Cornell 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 Cornell takes place partway through the preceding semester. Dates are announced in advance and are posted in school and college offices. Students are 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.

New students and transfer students may be sent course enrollment instructions by their college offices before they arrive on campus. Procedures vary from college to college.

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. Professional schools, Continuing Education and Summer Sessions, and the Department of Physical Education and Athletics have different course enrollment and add-drop policies. See the chart below for their course add/drop/change fees.

Late Course Enrollment and Late Add/Drop/Change Fees

Academic Unit	Late Course Enrollment Fee	Late Course Add/Drop/Change Fee
Continuing Education and Summer Sessions	†	†
Johnson Graduate School of Management	\$100	\$100
Law School	No fee	No fee
Physical education	\$30	\$20*
Veterinary medicine	\$30*	\$30*

*Consult the college office for special considerations and requirements.

†Consult 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. In addition, 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 Cornell 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 (ITD).

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 1998-99

Endowed Divisions

Undergraduate

Architecture, Art, and Planning	
Arts and Sciences	
Engineering	
Hotel Administration	\$22,780

Graduate

Graduate School (with major chair in an endowed division)	22,780
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Professional

Law School	24,100
Management	24,300

Statutory Divisions

Undergraduate

Agriculture and Life Sciences	
Human Ecology	
Industrial and Labor Relations	
New York resident*	9,720
Nonresident*	18,760

Graduate

Graduate School (with major chair in agriculture, human ecology, or industrial and labor relations)	\$11,400
Graduate School—Veterinary Medicine	12,000

Professional

Veterinary Medicine	
New York resident*	14,500
Nonresident*	19,600

Summer Session (1998)

Per credit	570 (estimated)
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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 charges may be changed at any time without 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 \$65 application fee when submitting an application for admission. The graduate application fee is \$65. Application to the Johnson Graduate School of Management costs \$90 (domestic), \$120 (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

Fall 1998 and Spring 1999

Previously Matriculated Students

Percent	Fall 1998	Spring 1999
No charge	8/25-8/30	1/21-1/26
10% charge	8/31	1/27
20% charge	9/1-9/7	1/28-2/3
30% charge	9/8-9/14	2/4-2/10
40% charge	9/15-9/21	2/11-2/17
60% charge	9/22-9/28	2/18-2/24
80% charge	9/29-10/5	2/25-3/3
100% charge	10/6/98	3/4/99

First-Time Matriculated Students

Percent	Fall 1998	Spring 1999
No charge	8/25-8/30	1/21-1/26
10% charge	8/31	1/27
20% charge	9/1-9/14	1/28-2/10
30% charge	9/15-9/21	2/11-2/17
40% charge	9/22-10/5	2/18-3/3
50% charge	10/6-10/12	3/4-3/10
60% charge	10/13-10/26	3/11-3/24
100% charge	10/27/98	3/25/99

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 registration 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 have 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). E-Mail: UCO_Bursar@cornell.edu

*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 August 29 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. Because of policy restrictions, the plan is nonrefundable after the deadline (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 30.

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.

A payment plan option is available. Deadline for application is September 30. To obtain additional information about the Cornell University health plan and the payment plan option, please contact the insurance carrier directly at 1-800-859-8475. E-mail: SICU@cornell.edu

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

Monday/Wednesday

	Start Times	End Times
50 MIN	08:00 AM	08:50 AM
75 MIN	08:40 AM	09:55 AM
50 MIN	09:05 AM	09:55 AM
50 MIN	10:10 AM	11:00 AM
50 MIN	11:15 AM	12:05 PM
50 MIN	12:20 PM	01:10 PM
50 MIN	01:25 PM	02:15 PM
50 MIN	02:30 PM	03:20 PM
75 MIN	02:55 PM	04:10 PM
50 MIN	03:35 PM	04:25 PM
50 MIN	07:30 PM	08:20 PM
50 MIN	08:35 PM	09:25 PM

Tuesday/Thursday

50 MIN	08:00 AM	08:50 AM
75 MIN	08:40 AM	09:55 AM
50 MIN	09:05 AM	09:55 AM
50 MIN	10:10 AM	11:00 AM
75 MIN	10:10 AM	11:25 AM
50 MIN	11:15 AM	12:05 PM
75 MIN	11:40 AM	12:55 PM
50 MIN	12:20 PM	01:10 PM
50 MIN	01:25 PM	02:15 PM
75 MIN	01:25 PM	02:40 PM
50 MIN	02:30 PM	03:20 PM
75 MIN	02:55 PM	04:10 PM
50 MIN	03:35 PM	04:25 PM

NO EVENING CLASSES

Friday

50 MIN	08:00 AM	08:50 AM
50 MIN	09:05 AM	09:55 AM
50 MIN	10:10 AM	11:00 AM
50 MIN	11:15 AM	12:05 PM
50 MIN	12:20 PM	01:10 PM

50 MIN	01:25 PM	02:15 PM
50 MIN	02:30 PM	03:20 PM
50 MIN	03:35 PM	04:25 PM

NO EVENING CLASSES

Laboratories and similar exercises

1 HR 55 MIN	08:00 AM	09:55 AM
	10:10 AM	12:05 PM
	12:20 PM	02:15 PM
	02:30 PM	04:25 PM
	07:30 PM	09:25 PM
2 HR 25 MIN	07:30 AM	09:55 AM
	10:10 AM	12:35 PM
	02:00 PM	04:25 PM
	07:30 PM	09:55 PM
3 HR	08:00 AM	11:00 AM
	10:10 AM	01:10 PM
	01:25 PM	04:25 PM
	07:30 PM	10:30 PM

No classes or laboratory exercises are to be held between the hours of 4:25 p.m. and 7:30 p.m. Monday through Thursday, after 4:25 p.m. on Friday, after 12:20 p.m. on Saturday, and all day Sunday.

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 rosters for each term.

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, theatrical, employment, etc.).

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 each semester. 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 should 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 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 quality-point equivalents attached. These are the quality-point equivalents:

A+ =4.3	B+ =3.3	C+ =2.3	D+ =1.3
A =4.0	B =3.0	C =2.0	D =1.0
A- =3.7	B- =2.7	C- =1.7	D- =0.7
F =0.0			

This is how a term average is computed:

Course	Grade	Points	Quality Credits	Product
Chemistry 103	B+	3.3	x 3	= 9.9
English 151	C-	1.7	x 3	= 5.1
DEA 145	B	3.0	x 4	= 12.0
CEH 100	B	3.0	x 3	= 9.0
DEA 111	C	2.0	x 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 D+, 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 School. (a) Seminars and Thesis Research courses are usually graded S/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 basis only. All other required core courses must be taken for a letter grade. (b) Elective courses for veterinary students may be offered on a S-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 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. There is a \$2.00 fee per transcript.

University Requirements for Graduation

The *university* has only two requirements for graduation that must be fulfilled: the swim test and physical education courses. 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

Classes

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 Cornell.

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

The University Faculty Committee on Physical Education has established a basic swimming and water safety competency requirement for all entering freshman undergraduate students. Normally, the test is given for women in the Helen Newman pool and for men in the Teagle pool as part of their orientation process. The test consists of a feet-first entry into the deep end of the pool and a continuous 75-yard swim using front, back, and optional strokes. Any student who cannot

pass the swim test is required to include the course Basic Swimming and Water Safety in his or her program of physical education before electives can be chosen. Students will receive a grade of incomplete in Physical Education until they have passed the swim test or fulfilled the requirement by satisfactory attendance in two terms of Basic Swimming and Water Safety. Students unable to meet the swim requirement because of medical, psychological, or religious reasons must petition the University Faculty Committee on Physical Education for a waiver of the requirement. When a waiver is granted by the Faculty Committee on Physical Education, an alternate requirement is imposed. The alternate requirement substitutes a course in either Advanced First Aid (Emergency Response) or Wellness and Fitness for the original 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*;
- 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. Students may rescind their no release request at any time in writing to the office of the university registrar.

***"Cornell University Policy on Access to and Release of Student Education Records" is available on the World Wide Web at URL: <http://WWW.UNIVCO.CORNELL.EDU/policy/ASI.html>.

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
- Courses elected
- Grades earned
- 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* on the World Wide Web at URL: <http://WWW.UNIVCO.CORNELL.EDU/policy/ASI.html>.

Academic Integrity

Absolute integrity is expected of every Cornell 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, 120 Day Hall (255-2945). The guidelines are also available at the World Wide Web address www.osp.cornell.edu

USE OF ANIMALS FOR COURSES

Guidelines for Faculty and Students With Respect to the Use of Animals in Instruction

Background: On December 8, 1987, the Cornell University Institutional Animal Care and Use Committee approved a series of guidelines recommended to them by the University Animal Welfare Committee. These guidelines were prepared by a subcommittee of faculty members, after they had the opportunity to evaluate the use of animals in undergraduate teaching (and student concerns for the same) from a representative sample of instructors.

Guidelines

1. For demonstrating certain principles and procedures the use of animals in teaching is recognized as an invaluable, often essential, pedagogical device.
2. For courses in which vertebrate animals are to be used in dissection, surgery or in other experimental procedures, the course description that appears in the Announcement "Courses of Study" should alert students to this fact.
3. A detailed description of the intended use of vertebrate animals should be available to students upon request to the instructor in each course.
4. Faculty members are encouraged to explain their reasons and need for using vertebrate animals and should indicate to students the availability of the procedures described in item 8 below.
5. Students are encouraged to discuss their concerns about the instructional use of vertebrate animals with the instructor in the course.
6. When consistent with pedagogical objectives, faculty members are encouraged to consider adopting alternative methods and procedures that do not involve the use of live animals.
7. When students object on ethical or other valid grounds, to participating in an exercise using vertebrate animals, instructors are encouraged to provide alternative means when consistent with

pedagogical objectives, for learning the same material.

8. 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 (253-3520).

Interdisciplinary Centers, Programs, and Studies

ANDREW D. WHITE PROFESSORS-AT-LARGE

726 University Avenue (255-0832).

The program has its origins in Cornell'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 six-year term and are full members of the faculty when in residence.

Term Ending in 1999

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

Term Ending in 2000

Berry, Michael, physicist

Term Ending in 2001

Pingree, David, historian of science

Term Ending in 2002

Chartier, Roger, cultural historian
Ernst, Richard R., physical chemist
Goodall, Jane, primatologist
Tobias, Phillip V., paleoanthropologist

Term Ending in 2003

Morrison, Toni, novelist
Rabinovich, Itamar, historian of the Middle East, diplomat

Term Ending in 2004

Bal, Mieke, cultural analyst
Cleese, John, writer and actor
MacDonald, David W., zoologist
Silajdzic, Haris, diplomat

CENTER FOR APPLIED MATHEMATICS

657 Frank H. T. Rhodes 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, 657 Frank H. T. Rhodes Hall.

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 Mathematics and Applied Mathematics

- Math 413-414 Introduction to Analysis
- Math 433-434 Introduction to Algebra
- Math 436 Applications of Abstract Algebra
- Math 611-612 Real and Complex Analysis
- Math 615-616 Mathematical Methods in Physics
- Math 621 Measure Theory and Lebesgue Integration
- Math 622 Applied Functional Analysis
- Math 631-632 Algebra
- Math 651 Introductory Algebraic Topology
- T&AM 612-613 Methods of Applied Mathematics
- T&AM 614-615 Topics in Applied Mathematics

Analysis (and Differential Equations)

- Math 427 Introduction to Ordinary Differential Equations
- MATH 428 Introduction to Partial Differential Equations
- Math 617 Dynamical Systems
- Math 618 Smooth Ergodic Theory
- Math 619-620 Partial Differential Equations
- Math 652 Differentiable Manifolds
- Math 711-712 Seminar in Analysis
- Math 713 Functional Analysis
- Math 715 Fourier Analysis
- Math 722 Riemann Surfaces
- Math 727-728 Seminar in Partial Differential Equations

Logic and Theory of Computing

- CS 618 Principles of Distributed Computing
- CS 671 Introduction to Automated Reasoning
- CS 677 Reasoning about Knowledge
- CS 682 Theory of Computing
- CS 715 Seminar in Programming Refinement Logics
- Math 486 Applied Logic I
- Math 681 Logic
- Math 781-782 Seminar in Logic
- Math 783 Model Theory
- Math 784 Recursion Theory
- Math 787 Set Theory
- Math 788 Topics in Applied Logic

Numerical Mathematics and Operations Research

- CS 522 Software for Scientific Computing
- CS 621 Matrix Computations
- CS 622 Numerical Optimization and Nonlinear Algebraic Equations
- CS 624 Numerical Methods for Differential Equations
- CS 664 Machine Vision
- CS 681 Analysis of Algorithms
- CS 721-722 Advanced Topics in Numerical Analysis
- CS 729 Seminar in Numerical Analysis
- EE 423 Computer Methods in Digital Signal Processing
- Math 425 Numerical Solution of Differential Equations
- Math 727-728 Seminar in Partial Differential Equations
- OR&IE 625 Scheduling Theory
- OR&IE 630-631 Mathematical Programming I and II
- OR&IE 632 Nonlinear Programming
- OR&IE 635 Interior-Point Methods for Mathematical Programming

Discrete Mathematics

- Math 441-442 Introduction to Combinatorics
- OR&IE 633 Graph Theory and Network Flows
- OR&IE 634 Combinatorial Optimization
- 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 467-468 Communication Systems I and II
- EE 471/MAE 478 Feedback Control Systems
- EE 472 Digital Control
- EE 521 Theory of Linear Systems
- EE 522 Theory of Nonlinear Systems
- EE 525 Adaptive Filtering in Communication Systems
- EE 526 Advanced Signal Processing
- EE 561 Error Control Codes
- EE 562 Fundamental Information Theory
- EE 563 Communication Networks
- EE 564 Decision Making and Estimation
- EE 567 Digital Communication
- EE 577 Artificial Neural Networks
- MAE 677 Robust and Optimal Control

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 619 Econometrics I
- Econ 620 Econometrics II
- Econ 710 Stochastic Economics: Concepts and Techniques
- Econ 717-718 Mathematical Economics
- Econ 719-720 Advanced Topics in Econometrics

Mechanics and Dynamics

- Chem E 731 Advanced Fluid Mechanics and Heat Transfer
- Chem E 732 Diffusion and Mass Transfer
- Chem E 751 Mathematical Methods of Chemical Engineering Analysis
- Chem E 753 Applied Analysis of Nonlinear Systems: Studies in Stability and Bifurcation
- EE 681 (also A&EP 761) Kinetic Theory

- M&AE 601 Foundations of Fluid Dynamics and Aerodynamics
- M&AE 602 Fluid Dynamics at High Reynolds Numbers
- 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 Fluid Mechanics and Heat Transfer
- T&AM 570 Intermediate Dynamics
- T&AM 578 Nonlinear Dynamics and Chaos
- T&AM 579 Vibrations and Waves in Elastic Systems
- 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 671-672 Probability Theory
- Math 674-675 Introduction to Mathematical Statistics
- Math 777-778 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 670 Statistical Principles
- OR&IE 671 Intermediate Applied Statistics
- OR&IE 676 Statistical Analysis of Life Data
- STBTRY 408 Theory of Probability
- STBTRY 409 Theory of Statistics

Robotics and Vision

- CS 664 Machine Vision
- EE 547 Computer Vision
- EE 548 Digital Image Processing

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 Solid State Physics
- 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

Rice Hall (255-7535)

The Cornell Center for the Environment (CfE) is committed to research, teaching, and outreach focused on environmental issues,

with the goals of enhancing the quality of life, encouraging economic vitality, and promoting the conservation of natural resources for a sustainable future. The Center serves as a clearinghouse for environmental information; initiates environmental courses and curricula at both the graduate and undergraduate levels; facilitates interdisciplinary environmental research; and coordinates outreach programs that assist state, federal, and local government, private organizations, businesses, and individuals in assessing and solving environmental problems.

Programs of Study

Various departments, centers, and institutes across the campus are involved in teaching and research of potential interest to students wishing to pursue environmental studies. A brochure listing undergraduate environmental course offerings is available from the Center (telephone: 255-7535, [www: http://www.cfe.cornell.edu/coursebook/](http://www.cfe.cornell.edu/coursebook/), or email: cucfe@cornell.edu). Students with this interest most often study in one of the following areas:

- Agricultural and Biological Engineering
- Agricultural, Resource, and Managerial Economics
- Architecture
- Biology and Society
- City and Regional Planning
- Civil and Environmental Engineering
- Design and Environmental Analysis
- Development Sociology
- Ecology and Evolutionary Biology
- Environmental Toxicology
- Natural Resources
- Plant Pathology
- Regional Science
- Rural Sociology
- Science and Technology Studies
- Soil, Crop, and Atmospheric Sciences

Program options for focusing on environmental issues are offered in a number of departments: (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 Atmospheric Sciences; (3) water resources primarily through the Department of Agricultural and Biological Engineering; (4) waste management 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.

The graduate field of environmental toxicology offers a multidisciplinary science program leading to a Ph.D. or M.S. degree. The three major areas of concentration in the program are: cellular and molecular toxicology; food and nutritional toxicology; and ecotoxicology and environmental chemistry. The graduate program prepares students for professional opportunities in academia, industry and private research institutes and governmental

agencies. Pages 28-29 list the courses and describes the program in more detail.

In response to a demand for individuals who can bridge the gap between the technical, social, and managerial aspects of environmental problems, a new multidisciplinary Master of Professional Studies (Agr.) degree program in environmental management was created. In this curriculum, students with undergraduate preparation in the fields of Natural Resources; Agricultural Economics; Soil, Crop, and Atmospheric Sciences; Agricultural and Biological Engineering; and Development Sociology are eligible to undertake a concentration in environmental management. Students in this program are expected to take courses that will enhance or build upon their undergraduate education and in addition enroll in a common core of courses in science and technology of environmental management; environmental systems and social systems; environmental and resource economics; environmental regulation; and an intensive field project. These core courses are intended to provide students with the knowledge, skills, and insights that will enable them to function effectively as managers at various levels in the private, public, and voluntary sectors.

An undergraduate program in the Science of Earth Systems, available to students in the Colleges of Agriculture and Life Sciences, Arts and Sciences, and Engineering, highlights the study of the Earth as one of the outstanding intellectual challenges in modern science and as the necessary foundation for the future management of our home planet. The curriculum coalesces Cornell's strengths across a broad range of earth and environmental sciences to provide students with a rigorous scientific foundation for the study of the Earth system. The program is described in more detail on pages 21-22.

Student employment opportunities are available through programs in the Center for the Environment. The core programs include the Water Resources Institute; the Institute for Comparative and Environmental Toxicology; the Cornell Waste Management Institute; and the Institute for Resource Information Systems. Other programs of the Center include the Cornell Institute for Research in Chemical Ecology; the Watershed Science and Management Initiative; the Cornell Program in Environmental Sciences for Educators and Youth; the Cornell Program on Breast Cancer and Environmental Risk Factors in New York State; the Work and Environment Initiative; the Ocean Resources and Ecosystems Program; and the Cornell Program on Environmental Conflict Management.

Students interested in the environment will also find many organizations, resources, and activities beyond the classroom setting at Cornell. The CFE sponsors guest lecturers and co-hosts conferences with a variety of departments across the campus. Providing a forum for the diversity of environmental interests and perspectives, the student-produced publication, *URSUS: The Cornell Forum for Environmental Issues*, seeks to promote the sharing of environmental information within and around the Cornell community. Other environmental organizations on campus include, but are not limited to, the Compost Club, Cornell Greens, Cornell Laboratory of Ornithology, Earthrise Committee (Ecology House), and Eco-Justice.

For additional information on programs and publications contact:

The Center for the Environment
Cornell University
Rice Hall
Ithaca, NY 14853
Telephone: 607-255-7535
Fax: 607-255-0238
Email: cucfe@cornell.edu
WWW: <http://www.cfe.cornell.edu>
Listserv: ENVIRONMENT-L@cornell.edu

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 four Title VI National Resource Centers (East Asia, Latin American Studies, South Asia and Southeast Asia, 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 graduate 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

The Mario Einaudi Center for International Studies
Cornell University
170 Uris Hall
Ithaca, NY 14853-7601
USA 607/255-6370
FAX 607/254-5000

The Einaudi Center Area Programs and Topical Studies Programs

Center Administration:

Ron Herring, director
David Lelyveld, executive director
170 Uris Hall
(607)255-6370

East Asia Program (formerly China-Japan Program):

Victor Koschmann, director
140 Uris Hall

Latin American Studies Program:

Debra Castillo, director
190 Uris Hall

South Asia Program:

Christopher Minkowski, director
170 Uris Hall

Southeast Asia Program:

Thak Chalomitirana, director
180 Uris Hall

Institute for African Development:

David Lewis, director
170 Uris Hall

Institute for European Studies:

—Slavic and East European Studies Program
—Western Societies Program
Jonas Pontusson, director
120 Uris Hall

International Agriculture:

Norman Uphoff, director
B31 Warren Hall

Berger International Legal Studies:

John Barceló, director
309 Myron Taylor Hall

International Political Economy:

Philip McMichael, director
436 Warren Hall

Population and Development Program:

Douglas Gurak, director
200 West Sibley Hall

Peace Studies Program:

Barry Strauss, director
Matthew Evangelista, acting director
130 Uris Hall

Program in International Nutrition:

Jere Haas, co-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, director
B31 Warren Hall

Gender and Global Change:

310 Triphammer Rd.

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
B31 Warren 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:

Matthew Evangelista, director
160 Uris Hall

Undergraduates interested in an international relations concentration should see Professor Evangelista or Mr. Christoph Kunkel.

Cornell Abroad:

Richard Gaulton, director
474 Uris Hall

International Students and Scholars:

Jerry Wilcox, director
B50 Caldwell Hall

COGNITIVE STUDIES

235 Uris Hall (255-6431) (cogst@cornell.edu)

Cognitive Studies focuses on the nature and representation of knowledge. It approaches the study of perception, action, language, and thinking from several perspectives—theory, experiment, and computation—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 draws primarily from the disciplines of computer science, linguistics, neuroscience, philosophy, and psychology. The field of cognitive studies is primarily represented by faculty in the following departments: Psychology, Linguistics, and Philosophy, as well as Modern Languages and Mathematics (College of Arts & Sciences), Computer Science (College of Arts & Sciences and College of Engineering), Human Development (College of Human Ecology), Neurobiology & Behavior (Division of Biological Sciences), Education (College of Agriculture and Life Sciences), and 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 cogst@cornell.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 individual, fosters interdisciplinary committees. It is the norm for students interested in cognitive studies to combine faculty members from such fields as Philosophy, Computer Science, Linguistics, or Psychology on common committees. For further information on the graduate Field of Cognitive Studies, contact Carol Rosen, director of graduate studies, 311 Morrill Hall, (255-0722; cgrl@cornell.edu), or Sue Wurster, Administrative Assistant, 235 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
WWW home page: <http://www.einaudi.cornell.edu/cuabroad>

Study abroad is an integral part of a Cornell education. We live in an increasingly global society in which knowledge, resources, and authority transcend national and regional boundaries. To help students develop the knowledge, skills, and attitudes necessary for global citizenship in the twenty-first century, Cornell Abroad offers a broad range of international study opportunities that reflect the fundamental educational goals and objectives of the university. Study abroad is a continuous experience with study on campus, enabling students to make regular progress toward the degree, at a cost that is generally no greater than for study on campus.

Qualified students study abroad through programs administered by Cornell and other American institutions, and by enrolling directly in foreign universities. Among the many study abroad programs available, students select programs with thoughtful planning and apply with the approval of their colleges and faculty advisers. In all cases, students must apply through Cornell Abroad, whose staff services the planning and application process.

LOCATIONS ABROAD

Cornell students majoring in a broad array of fields in all seven undergraduate colleges regularly study in approximately 40 countries. The following list includes programs chosen frequently by students with college approval; those locations preceded by an asterisk (*) are programs run directly by Cornell.

AFRICA

Botswana, Cameroon, Kenya, Madagascar, Tanzania, Uganda: School for International Training;

Ghana: University of Ghana (through the Council of International Educational Exchange, CIEE);

Kenya: Wildlife Management (School for Field Studies); Kenya Semester Program (St. Lawrence University);

ASIA

- China: Chinese University of Hong Kong; Inter-University Program for Chinese Language Studies at Tsinghua, Peking, and Nanjing Universities (CIEE); International Chinese Language Program at National Taiwan University;
- India: School for International Training;
- Indonesia: Institut Keguruan Dan Ilmu Pendidikan (IKIP) in Malang (CIEE);
- Japan: *Kyoto Center for Japanese Studies; various university programs;
- Korea: Yonsei University;
- Nepal: *Cornell-Nepal Study Program (Samyukta Adhyayan Karikam Nepal) at Tribhuvan University;
- Thailand: Khon Kaen University (CIEE);
- Vietnam: University of Hanoi (CIEE)

AUSTRALIA

- Australian National University, Canberra; University of Sydney; University of Melbourne; University of New South Wales, Sydney; University of New England, Armidale; University of Queensland, Brisbane; University of Wollongong; University of Western Australia, Perth; School for International Training; Sydney Internship (Boston University);

EUROPE

- Denmark: *Denmark's International Study Program (DiS);
- France: *EDUCO (Cornell and Duke in Paris) at Université de Paris VII, Paris I, Institut d'Études Politiques de Paris ("Sciences Po"); Critical Studies Program at the University of Paris (CIEE); Paris Internship (Boston University);
- Germany: various university-based study abroad programs including the Berlin Consortium for German Studies at the Free University of Berlin; Wayne State University in Munich and Freiburg;
- Greece: College Year in Athens;
- Ireland: University of Limerick; Trinity College and University College, Dublin;
- Italy: Cornell College of Art, Architecture and Planning Program in Rome; Bologna Cooperative Studies Program; Intercollegiate Center for Classical Studies in Rome; programs in Florence and other cities;
- Netherlands: Leiden University; University of Maastricht, Center for European Studies;
- Russia: St. Petersburg University (CIEE); Moscow International University and other universities (American Council of Teachers of Russian)
- Spain: *Cornell-Michigan-Penn program at the University of Seville;
- Sweden: *Swedish Child Care and Family Policy Internship at the University of Göteborg; Agricultural College of Sweden, Uppsala; The Swedish Program at the University of Stockholm;

United Kingdom: *Direct enrollment at: University of Bath; University of Birmingham; University of Bristol; Cambridge University; University of East Anglia; University of Edinburgh; University of Glasgow; University of Lancaster; University of Manchester; University of Nottingham; Oxford University; University of Reading; University of St. Andrews; University of Sussex; University 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, School of Oriental and African Studies, School of Slavonic and East European Studies.

Students studying at these 21 British universities enjoy admissions, advising, and counseling services, as well as an array of cultural activities, provided by the Cornell-Brown-Penn London Centre. Externally sponsored programs in the UK include the British American Drama Academy, the Boston and Rochester University internships, and the Marymount College Program at the London College of Fashion.

LATIN AMERICA, CENTRAL AMERICA, AND THE CARIBBEAN

- Argentina and Chile: various university-based study abroad programs through the University of Illinois or SUNY College at Plattsburgh;
- Belize, Brazil, Chile: School of International Training;
- Costa Rica: Organization for Tropical Studies (OTS) Undergraduate Semester Abroad in tropical biology; School for Field Study; Universidad Nacional (Heredia);
- Ecuador and Jamaica: Partnership for Service Learning;
- Honduras: Escuela Agrícola Panamericana (Zamorano);
- Mexico: Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM); Universidad de las Américas-Puebla (UDLA); Universidad Iberoamericana; School for Field Studies in Baja California;

MIDDLE EAST

- Egypt: American University in Cairo;
- Israel: Ben-Gurion University; Haifa University; Hebrew University of Jerusalem; Tel Aviv University;
- Morocco: School for International Training

Other Locations

Cornell students are by no means limited to the locations listed above. In recent years, they have also studied in Austria, Czech Republic, Dominican Republic, India, New Zealand, the Philippines, Poland, Portugal, Switzerland, Turkey, Venezuela, and elsewhere.

Who Studies Abroad

Students from all seven undergraduate colleges and from all major fields study abroad; they are generally expected to have a cumulative grade point average of 3.0 or above. More than 500 undergraduates studied

abroad last year. Because the colleges usually require that students complete at least sixty hours of undergraduate credit on the Ithaca campus, students who transfer to Cornell as juniors are usually unable to count student abroad credit toward their Cornell 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 programs—Cornell programs, as well as those administered externally by other institutions—are available at Cornell Abroad, 474 Uris Hall, where students are encouraged to consult the library of study abroad materials, ask questions of the staff, and meet with the associate director to gather information. The Cornell Abroad website is a good place to browse through program offerings and to explore links to universities worldwide. 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 written statement of academic purpose outlining goals for study abroad and the program of study that will be followed. Applications are signed by both college study abroad and faculty advisers. Arts and Sciences, Human Ecology, and Industrial and Labor Relations students submit applications to their college for forwarding to Cornell Abroad; Agriculture and Life Sciences, Architecture, Art and Planning, Engineering and Hotel Administration, students submit applications directly to Cornell Abroad. Cornell Abroad reviews all applications and forwards them to programs and universities as necessary. *All students who wish to receive academic credit for study abroad must apply through Cornell Abroad and their undergraduate college.*

The application *deadline* for study abroad in the spring 1999 semester is October 1, 1998, for all programs *except* Oxford and Cambridge, for which the deadline to study at those universities for the full year in 1999–00 is November 1. For study abroad during the fall semester and academic year, the deadline is February 15. Many universities and programs admit on a rolling basis after these dates. For some, earlier application may be advisable, and students planning to study abroad in the spring semester should consider initiating the application process during the preceding spring. In all cases, it is a good idea to check with Cornell Abroad.

Registration, Credit Transfer, and Grades

Students who apply through Cornell Abroad to programs approved by their colleges, as outlined above, remain registered at Cornell during study abroad. They are 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 to 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 grades received, and the total credits earned for each semester. *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 study abroad programs are increasingly available outside universities in non-English-speaking countries—for example, Belgium, Denmark, Egypt, France, Hong Kong, Indonesia, Italy, Japan, Korea, Netherlands, People's Republic of China, and Sweden. Cornell students who participate in such non-university enrollment programs in a non-English-speaking country with English-language course work are required to take at least one language course as part of their program of study and are strongly encouraged to take more. Students are advised to consult with their college study abroad advisers about relevant language preparation, and students in the College of Arts and Sciences should note that they are required to have studied the host country language, if taught at Cornell, prior to study abroad.

Housing Arrangements

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

Costs

Students studying abroad on Cornell programs in Copenhagen, Göteborg, Kyoto, Nepal, Paris, Seville, and the United Kingdom in 1998-99 pay a uniform study abroad tuition of \$14,200 per semester, which covers, tuition, housing, orientation, some field trips and excursions. Meals and airfare may also be included in particular Cornell programs.

Students studying abroad on all other programs in 1998-99 pay the tuitions and other costs charged by their programs, and a Cornell international program tuition of \$3,300 per semester or \$6,200 for the full academic year. The international program tuition covers the direct and indirect costs of study abroad to the university, including financial aid for all study abroad students.

Financial Aid

Students who are accepted for study abroad during the academic year or semester, having applied through Cornell Abroad, are eligible for financial aid, consistent with general university policy; this applies to all programs, whether run directly by Cornell or not.

Students who have transferred into Cornell with 60 or more credit hours are not likely to receive aid for study abroad assuming they would thereby need more than eight semesters to earn the undergraduate degree.

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, associate 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. Cornell 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 Cornell 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 circumstances and have tuition refund policies based on prorated formulas.

Sources of Information and Advice Concerning Study Abroad

Cornell Abroad (474 Uris Hall): Richard Gaulton Ph.D., director; Beatrice B. Szekely Ph.D., associate director; Elizabeth R. Okihiro, enrollment manager; Kathy Lynch, accounts coordinator. The Cornell Abroad library contains an extensive collection of written and computer accessed university catalogs and study abroad program brochures, files of 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 announced in the Cornell Daily Sun and on the Cornell Abroad World Wide Web home page at <http://www.einaudi.cornell.edu/cuabroad>

College Study Abroad Advisers

Agriculture and Life Sciences: Bonnie Shelley, assistant director of Counseling and Advising, 140 Roberts Hall; *Architecture, Art, and Planning:* Professor John Forester, associate dean, 129 Sibley; *Arts and Sciences:* Dr. Maria Terrell, assistant dean, 55 Goldwin Smith Hall; *Engineering:* Dan Maloney Hahn, 167 Olin Hall; *Hotel Administration:* Professor Richard Penner, 182D 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

471 Hollister Hall (255-4090)

Cornell-in-Washington is a 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 Cornell-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 Cornell Center, 2148 O Street, NW, Washington, D.C. 20037. The academic and administrative space is located on the first floor; twenty-seven residential units for students and faculty are on the upper floors.

The Cornell-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, 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 public policy and American culture.

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. 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 one-bedroom 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 471 Hollister 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 *Cornell 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 471 Hollister 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

473 Hollister Hall (255-8018)

The Cornell Institute for Public Affairs (CIPA) is a university-wide two-year graduate professional program leading to a Master of Public Administration degree. Its mission is to develop professionals who can be effective, ethical, and creative leaders in government and in the private sector's interface with government.

CIPA emphasizes the interactions between public and private interests for the benefit of all sectors of society. We use Cornell's cutting-edge strengths as a major research university to understand rapidly evolving public interests, technological opportunities, ecological constraints, individual aspirations, and political possibilities. Examples of Cornell's extraordinary breadth of policy-related specialties include science and technology; health, education, and social services administration; agricultural policy; nutrition; international development; environmental studies; peace studies; labor relations; city and regional planning; and ethics in public life. These areas of expertise provide a diverse base for the CIPA Fellows (our students) to pursue the study of public affairs. Thus, CIPA Fellows take courses and work with faculty from all of Cornell's colleges as well as the Cornell Law School, with whom a joint M.P.A./J.D. degree is offered, and the Johnson Graduate School of Management.

The CIPA program has been developed to offer both a sound foundation in the principles, tools, and techniques for a career and leadership in public affairs and the flexibility to accommodate and encourage the special policy-related interests of its students.

The curriculum is structured into three parts: four required core courses taken by all CIPA Fellows; area requirements focused on developing the wide variety of skills necessary for the public policy professional; and sectoral specialties, focused on the particular interest of the Fellow and leading to a thesis.

The Core Courses

These courses have been developed specially for CIPA Fellows to provide a common, hands-on experience in employing the latest analytical techniques to guide the formulation of programs, their supporting institutions, and their effective administration. They will also

provide strategies for implementing change in complex heterogeneous societies.

CIPA I: Quantitative Techniques for Policy Analysis and Program Management (CRP 720) This course is designed to give students the basic management tools essential for the contemporary career in public affairs. It includes hands-on practice with formal management techniques, including investment analysis and linear and dynamic programming.

CIPA II: Public Political Economy (ECON 639 or CEE 528) Techniques of economic analysis are used to understand the need for various public programs, to estimate the value of new programs and policies, to forge desirable institutional structures for service delivery, and to anticipate and evaluate outcomes.

CIPA III: Administration, Politics, and Public Affairs (GOVT 621) This course is focused on the processes and institutional context of public affairs and analyzes the political and administrative structure and dynamics of policy development and implementation.

CIPA IV: Social Policy (SOC 526) This course incorporates the study of analytic methods, especially the use of statistics and simulation models, to study the structure of public programs and to assess their consequences.

The Area Requirements

In addition to the four core courses, Fellows must also complete satisfactorily a series of foundation subject or area requirements that are essential to the training of public policy professionals. These areas are: methodologies, politics and policy, economics, math and statistics, finance, regulation, ethics, and public law.

The Sectoral Specialty

At least three courses taken by individual Fellows will be in their sectoral specialty or "concentration." These are widely divergent and depend on the unique interests and background of the individual student.

The CIPA Thesis

Each Fellow must complete a thesis that applies the conceptual tools, theories, and analytical techniques to a problem in the Fellow's area of sectoral expertise. As the culmination of each M.P.A. course of study, this thesis must be both critical and creative, reflecting the Fellow's ability to identify, analyze, and generate supportable solutions to important public policy questions.

Additional Requirements

All M.P.A. candidates must spend four semesters in residence to complete the degree.

The Faculty

In addition to our four core faculty members (Richard E. Schuler, director, economics and civil and environmental engineering; Steven Caldwell, sociology; Arch Dotson, government; and David Lewis, city and regional planning) who offer the four core courses and advise the Fellows in the development of their programs of study, more than one hundred faculty members from nearly all colleges at Cornell participate in the graduate field of public affairs and policy, and they are available to supervise the theses of individual

Fellows whose policy interests coincide with faculty expertise.

Special Programs

A combined four-year MPA/JD degree program is available. For selected Cornell undergraduates who are accepted by the end of their junior year, a combined five-year bachelors/MPA program can be arranged.

Application. Applicants are required to submit GRE general test scores. CIPA has a policy of rolling admissions. Students requesting aid, however, must submit applications by March 1 for consideration. For an application or more information, contact Cornell Institute for Public Affairs, 473 Hollister Hall (phone: 607-255-8018; fax: 607-255-5240; e-mail: cipa@cornell.edu; web site: www.cipa.cornell.edu).

Financial Support. As a professional program, the financial aid resources of CIPA are extremely limited. Students of unusual merit and documented need will be considered for support, but CIPA is unable to provide any one student full support. Therefore, applicants are encouraged to explore and exploit all available sources of external funding.

For an application or more information, contact Cornell Institute for Public Affairs, 473 Hollister Hall (phone: 607-255-8018; fax: 607-255-5240; e-mail: cipa@cornell.edu).

CORNELL PLANTATIONS

One Plantations Road (255-3020)
e-mail: cu_plantations@cornell.edu

A place of exceptional diversity and opportunities, Cornell Plantations comprises the university's botanical garden, arboretum, and natural areas. Its 3,000+ acres include the woodlands and gorges bordering campus, as well as specialized gardens and the 100+ acre arboretum that features a field flower meadow and trees and shrubs hardy in central New York State. Cornell 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 ornamental 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 Cornell 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. A one-credit seminar series (HORT 480) is offered each fall, and a three-credit course, HORT 485 Public Garden Management, is offered every other spring semester.

PROGRAM ON ETHICS AND PUBLIC LIFE

119 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 Cornell'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 to enrich existing departments with courses that are intellectually serious and practically fruitful at the same time. It offers a concentration in Law and Society (see separate listing under "Special Programs and Interdisciplinary Studies").

EPL Core Courses

PHIL 246 Ethics and the World Environment
PHIL 247 Ethics and Public Life
PHIL 294/GOVT 294 Global Thinking @
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 Normative Elements of International Relations

Related Courses

B&SOC 206/S&TS 206 Ethics and the Environment
CEH 356 Economics of Welfare Policy
CRP 549 Ethics and Practical Judgment in Planning Practice
ENGR 360/S&TS 360 Engineering Ethics
GOVT 474/PHIL 446 Topics in Social and Political Philosophy
HSS 658 Ethics, Public Policy, and American Society
ILRHR 366 Women at Work
ILRCB 401 My Brother's Keeper
ILRCB 482 Ethics at Work
ILRCB 488 Liberty and Justice For All
ILRCB 604 Theories of Equality and Their Application in the Workplace
LAW 655 International Human Rights
LAW 667 Law and Ethics of Lawyering
LAW 718 Ethnic Conflict and International Law
NBA 578 Business Ethics
NTRES 407 Religion, Ethics, and the Environment
NTRES 411 Seminar in Environmental Ethics
PHIL 145 Contemporary Moral Issues
PHIL 241 Ethics
PHIL 245 Ethics and Health Care
PHIL 246 Ethics and the Environment
PHIL 341 Ethical Theory
PHIL 344 History of Ethics: Ancient and Medieval *
PHIL 345 History of Ethics: Modern *
PHIL 346 Modern Political Philosophy

Henry Shue, director, 119 Stimson Hall, 255-8515; Henry Shue, Wyn and William Y. Hutchinson Professor of Ethics and Public Life; Kathryn Abrams, Professor of Law.

PROGRAM IN REAL ESTATE

114 West Sibley Hall (255-7110)

The two-year Master of Professional Studies (MPS) degree in Real Estate is an interdisciplinary degree program that combines courses from nearly every college at Cornell University. The degree is designed for aspiring real estate professionals who are in the initial or early stages of their careers. Two entities provide support for the degree program. The *Program in Real Estate* exists at Cornell University to serve as the integrating organizational unit for financial management and administration of academic real estate activities on and off campus. The *Field of Real Estate* is a committee of faculty members from several different colleges that is directly involved in the design and administration of the real estate curriculum.

The professional study of real estate is concerned with the finance, exchange, development, management, marketing, and many other aspects of the real estate business. Real estate professionals also bring an understanding of the long-range social, political, ethical, and environmental implications of decisions about real estate. The 62 credit hours of course work needed to earn the degree provide a comprehensive and lasting foundation for professional careers in real estate.

Core courses in financial management, economics, real estate finance and investment, market analysis, project development, housing

economics, regulation, and environmental issues will be required during the first year of study. During the second year, students take additional core courses and elective courses in their areas of concentration. Many concentration options are possible and may be structured from the hundreds of related courses taught at Cornell University (e.g., an international real estate concentration).

Admissions

Admissions procedures for the MPS (Real Estate) program are supervised by the Graduate School and Real Estate Field. Applicants to the program must have completed a bachelor's degree with a good academic record. They must achieve Graduate Management Admission Test (GMAT) or Graduate Record Examination (GRE) scores that are at the level required in other Cornell graduate professional degree programs; and at least two letters of recommendation from undergraduate college faculty members (and if appropriate, from employers) familiar with the student's academic and professional work must be submitted. There is no work experience requirement for admission. Foreign students, for whom English is a second language, will need to achieve acceptable TOEFL scores.

For more information, contact Professor Robert Abrams, director of the Program in Real Estate (607-255-7110) or Professor Matthew Drennan, director of graduate studies (607-257-7276) or E-mail real_estate@cornell.edu.

SCIENCE OF EARTH SYSTEMS: AN INTER-COLLEGE PROGRAM

During the past several decades, with the increasing concern about air and water pollution, nuclear waste disposal, the ozone hole, and global climate change, the scientific community has gained considerable insight into how the biosphere, hydrosphere, atmosphere, and lithosphere systems interact. It has become evident that we cannot understand and solve environmental problems by studying these individual systems in isolation. The interconnectedness of these systems is a fundamental attribute of the Earth system, and understanding their various interactions is crucial for understanding our environment.

A new major, Science of Earth Systems (SES), is now available for students in the Colleges of Agriculture and Life Sciences, and Arts and Sciences. The SES program of study emphasizes the rigorous and objective study of the Earth system as one of the outstanding intellectual challenges in modern science and as the necessary foundation for the future management of our home planet. Within this program, Cornell's strengths across a broad range of earth and environmental sciences have been coalesced to provide students with the tools to engage in what will be the primary challenge of the twenty-first century.

Students can enter the major in the College of Agriculture and Life Sciences and in the College of Arts and Sciences. In the College of Engineering, the SES program is one of two options in the Geological Sciences major. It is also an option in Agricultural and Biological Engineering.

The SES Curriculum

The SES curriculum emphasizes strong preparation in mathematics, physics, chemistry, and biology during the freshman and sophomore years. In addition, students take a two-credit SES Colloquium, which is designed to inform students about the field and to provide a sense of community for SES students and faculty from the several colleges. In the junior and senior years, students take a set of common SES core courses and an additional set of advanced disciplinary or interdisciplinary courses that build on the basic math and science sequences.

The SES program provides strong preparation for graduate school in any one of the Earth systems sciences and related engineering fields. The major can also serve as excellent preparation for an advanced degree in environmental law or policy, a teaching degree, or for employment in one of many environmentally oriented careers with the B.S. degree.

The requirements for the major are summarized as follows:

1. MATH 191, 192 (or MATH 111, 112)
2. Two calculus-based physics courses: (e.g., PHYS 207-208);
3. Two introductory chemistry courses: (e.g., CHEM 207-208);
4. Two biology courses: (e.g., BIO G 101/103-102/104 or BIO G 109-110);
5. Two additional courses in higher mathematics and/or basic sciences and/or GEOL 201;
6. Colloquium in the Science of Earth Systems (SES 101 or 102);
7. Four core courses in the Science of Earth Systems (SES 301, 302, 321, and 402) plus BIOES 261;
8. Three intermediate to advanced-level courses approved by the SES Curriculum Committee. These courses should build on the core sequence and include upper-level courses with prerequisites in the basic sciences and mathematics. The selection of these courses can be used to prepare for careers or graduate study in specific environmental science disciplines such as geology, hydrological sciences, biogeochemistry, ecology, oceanography, and atmospheric sciences. Effective combinations of these disciplines are also possible.

SES Course Descriptions

Note: Class meeting times are accurate at the time of publication. If changes are necessary, new information will be provided as soon as possible.

SES 101-102 Science of Earth Systems Colloquium (enroll in ABEN 120-121, GEOL 123-124, or SCAS 101-102)
101, fall; 102, spring. 2 credits each term. S-U grade only. 101 is not prerequisite for 102. One lecture, one recitation. T 1:25. Staff.

Weekly seminars, field trips, and hands-on learning experiences in current topics in the study of the earth system. Introduces the student to scientific issues relating to understanding our planet and managing the environment. (<http://www.scas.cit.cornell.edu/ses/>)

SES 301 Climate Dynamics (enroll in ASTRO 331 or SCAS 331)

Fall. 4 credits. Prerequisite: Math 112 or 192 or equivalent. Lects, M W F 1:25; rec, W 2:50. K. Cook, P. Gierasch.

The purpose of this course is to develop a physical understanding of the climate system. Processes that determine climate and contribute to its change are discussed, including comparisons with the climates of other planets. Applications to problems of climate change and variability include the astronomical theory of ice ages, greenhouse warming, the ozone hole, African drought, and Amazonian deforestation.

SES 302 Evolution of the Earth System (enroll in GEOL 302 or SCAS 332)

Spring. 4 credits. Prerequisites: Math 112 or 192 and Chem 207 or equivalent, or instructor's approval. Lects, M W F 11:15; recitation TBA. W. White, B. Isacks, W. Allmon, K. Cook.

The co-evolution of life and the earth system over three time scales: origin of the earth and life and earth's early history; plate tectonics, continental drift and climate changes during the past billion years; and mountain building, ice ages, and our own emergence during the past ten million years. Introduction to methods of interpreting the paleontological, geochemical, and tectonic information preserved in the rock record. (<http://www.geo.cornell.edu/geology/classes/ses302.html>)

SES 321 Biogeochemistry (enroll in GEOL 321 or NTRES 321)

Fall. 4 credits. Prerequisites: college-level biology and chemistry. Lects T R 12:20-2:15. L. Derry and J. Yavitt.

The cycling of elements at the earth's surface through biologically governed processes and fluxes. Topics include weathering and acid-base chemistry, nutrient limitation and recycling in terrestrial and marine systems, anthropogenic pollution, isotopic tracers, and mathematical modeling of element fluxes.

SES 402 Mechanics in the Earth and Environmental Sciences (enroll in ABEN 385)

Spring. 4 credits. Prerequisites: 4 semesters of calculus. Lects, M W F 11:15; rec, W 2:30-4:25. P. Baveye, J.-Y. Parlange, W. Brutsaert.

The study of the earth and the environment requires an understanding of transport and other physical processes within and at the surface of the earth. This course encourages the students to develop a broad working knowledge of mechanics and its application to the earth and environmental sciences, providing the background necessary to study the professional literature.

Advising

Students will be matched with an SES adviser according to the student's interests and the college in which the student is enrolled. The adviser will assist the student in selecting the four upper-level courses required by the SES Program. Several example curricula have been designed as guides for students in each of the colleges, to demonstrate how the college and SES Program requirements are met.

Entering the SES Program

Transfers into the program during the freshmen and sophomore years will be relatively straightforward for students who have already begun a calculus sequence and have taken courses in the basic sciences. Other interested students, either junior- or senior-level science and math students or those from other fields, should contact an SES adviser to explore the possibility of entering the SES program.

For more information on the SES program and classes, see the Web page (http://www.geo.cornell.edu/ses/SES_home.html) and contact:

College of Agriculture and Life Sciences:

K. H. Cook (Soil, Crop, and Atmospheric Sciences), R. W. Howarth (Ecology and Systematics), J. Parlange (Agricultural and Biological Engineering);

College of Arts and Sciences: T. Dawson or L. Hedin (Ecology and Systematics), P. Gierasch (Astronomy), B. L. Isacks or R. Kay (Geological Sciences);

College of Engineering: W. Brutsaert (Civil and Environmental Engineering), B. L. Isacks or R. Kay (Geological Sciences), M. Kelley (Electrical Engineering), J. Parlange (Agricultural and Biological Engineering).

DEPARTMENT OF STATISTICAL SCIENCE

612 Rhodes Hall (255-8066)

C. E. McCulloch (chair); M. Wells (director of graduate studies); S. Schwager (undergraduate coordinator, CALS only; Warren 424, 255-1644); N. Altman, T. Berger, J. Bunge, G. Casella, C. Castillo-Chavez, Z. Q. Chen, G. Churchill, M. Contreras, T. DiCiccio, R. Durrett, E. Dynkin, R. Farrell, T. Fine, A. Hadi, D. Heath, Y. Hong, J. T. G. Hwang, H. Kesten, N. Kiefer, S. Resnick, D. Ruppert, G. Samorodnitsky, Elizabeth Slate, B. Turnbull, V. Veeravalli, P. Velleman, T. Vogelsang.

The university-wide Department of Statistical Science at Cornell coordinates activities in statistics and probability at the undergraduate, graduate, and research levels.

Students interested in graduate study in statistics and probability can apply to the Graduate 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, students should contact the Director of Graduate Studies, 612 Rhodes Hall.

The department also offers an undergraduate program through the Department of Biometrics in the College of Agriculture and Life Sciences. Undergraduate concentrations and certificate programs are currently under development for other colleges. For information, contact the Undergraduate Coordinator, Professor Steven Schwager (424 Warren Hall, 255-1644). Statistics courses offered by the department listed below will fill distribution requirements in many of the colleges.

A free consulting service is offered through the Department of Biometrics in the College of Agriculture and Life Sciences. Statistical computing consulting is available through a

separate organization, The Office of Statistical Consulting, B21 Savage Hall, 255-1926.

The department is organized into four Units: Biometrics, Engineering Statistics, Mathematical Statistics and Probability, and Social Statistics. The areas covered include agricultural statistics; biostatistics; economic and social statistics; epidemiology; manufacturing statistics, quality control and reliability; probability theory; sampling theory; statistical computing; statistical design; statistical theory; and stochastic processes and their applications.

Course designations

The following course identifiers are used to designate the courses offered by the separate units: Biometrics Unit (CALS), STBTRY; Engineering Statistics Unit (ENGR), STENGR; Mathematical Statistics Unit (ARTS), STMATH; Social Statistics Unit (ILR), STSOC. To enroll in one of the courses see the listing for the appropriate college.

Descriptions of undergraduate and graduate courses are listed below.

Biometrics Unit

STBTRY 200 Statistics and the World We Live In (enroll in BTRY 200)

Spring. 3 credits.

Major concepts and approaches of statistics are presented at an introductory level. Three broad areas are covered: collecting data, organizing data, and drawing 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.

STBTRY 215 Introduction to Statistical Methods (enroll in BTRY 215)

Fall. 3 credits. Prerequisite: BTRY 200 or prior experience in data collection and interpretation.

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.

STBTRY 400 Biometry Seminar (enroll in BTRY 400)

Fall or spring. 1 credit. S-U grades only. Prerequisite: BTRY 409 or BTRY 602 or by permission of the instructor.

Students will attend weekly seminar, the Biometrics Unit Discussion Series. Can be taken concurrently with BTRY 600 only with permission of instructor. Students can only take course twice.

STBTRY 408 Theory of Probability (enroll in BTRY 408)

Fall. 4 credits. Prerequisite: MATH 112, 122 or 192, or permission of instructor.

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.

STBTRY 409 Theory of Statistics (enroll in BTRY 409)

Spring. 4 credits. Prerequisite: BTRY 408 or equivalent.

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.

STBTRY 494 Undergraduate Special Topics in Biometry and Statistics (enroll in BTRY 494)

Fall or spring. 1-3 credits. S-U grades optional.

A course of lectures selected by the faculty. Because topics usually change from year to year, this course may be repeated for credit.

STBTRY 495 Statistical Consulting (enroll in BTRY 495)

Spring. 2 credits. S-U grades only. Limited to undergraduates. Prerequisites or co-requisites: BTRY 409 and 602 or permission of instructor.

Participation in the Department of Biometrics consulting service: faculty-supervised statistical consulting with researchers from other disciplines. Discussion sessions for joint consideration of selected consultations encountered during previous weeks.

STBTRY 497 Undergraduate Individual Study in Biometry and Statistics (enroll in BTRY 497)

Fall or spring. 1-3 credits. S-U grades optional. Students must register with an Independent Study form (available in 140 Roberts Hall).

Consists of individual tutorial study selected by the faculty. Because topics usually change from year to year, this course may be repeated for credit.

STBTRY 499 Undergraduate Research (enroll in BTRY 499)

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).

STBTRY 600 Statistics Seminar (enroll in BTRY 600)

Fall or spring. 1 credit. S-U grades only. Prerequisite or corequisite: BTRY 409 or permission of instructor.

STBTRY 601 Statistical Methods I (enroll in BTRY 601)

Fall or summer. 4 credits. Limited to graduate students; others by permission of the instructor.

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.

STBTRY 602 Statistical Methods II (enroll in BTRY 602)

Spring. 4 credits. Limited to graduate students; others by permission of instructor. Prerequisite: BTRY 601 or equivalent.

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.

STBTRY 603 Statistical Methods III (enroll in BTRY 603)

Spring. 3 credits. Prerequisite: BTRY 601 and 602 or permission of instructor. Offered alternate years. Not offered spring 2000.

Categorical data analysis, including logistic regression, loglinear models, stratified tables, matched pairs analysis, polytomous response and ordinal data. Applications in biomedical and social sciences.

[STBTRY 604 Statistical Methods IV: Applied Design (enroll in BTRY 604)]

Spring. 3 credits. Prerequisites: BTRY 601 and 602 or permission of instructor. Offered alternate years. Not offered 1998-99, next offered spring 2000.

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.]

[STBTRY 607 Nonparametric and Distribution-Free Statistical Methods (enroll in BTRY 607)]

Spring, 1/3 of the term. 1 credit. S-U grades optional. Prerequisite: BTRY 601 or equivalent. Offered alternate years. Not offered 1998-99, next offered spring 2000.

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.]

STBTRY 639 Epidemiology Seminar (enroll in BTRY 639)

Spring. 1 credit, variable. S-U grades only. Permission of instructor.

This course will develop skills in the preparation and interpretation of epidemiological data by discussing current research topics and issues.

[STBTRY 662 Mathematical Ecology (enroll in BTRY 662)]

Fall. 3 credits. S-U grades optional. Prerequisites: a year of calculus and a course in statistics. Not offered 1998-99.

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.]

STBTRY 672 Topics in Environmental Statistics (enroll in OR&IE 672 or BTRY 672)

Fall and spring. 2 credits. S-U grades optional. Prerequisite: BTRY 601 or permission of the instructor.

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.

[STBTRY 682 Statistical Methods for Molecular Biology (enroll in BTRY 682)]

Spring. 2 credits. S-U only. Prerequisite: permission of instructor. Not offered 1998-99.

Statistical and mathematical topics of current interest in molecular biology: genetic mapping, physical mapping, DNA sequence analysis, phylogenetic inference, population modeling. Topics may vary. The course may be repeated for credit.]

STBTRY 694 Graduate Special Topics in Biometry and Statistics (enroll in BTRY 694)

Fall or spring. 1-3 credits. S-U grades optional. A course of lectures selected by the faculty. Because topics usually change from year to year, this course may be repeated for credit.

STBTRY 697 Individual Graduate Study in Biometry and Statistics (enroll in BTRY 697)

Fall, spring, or summer. 1-3 credits. S-U grades optional. Consists of individual tutorial study selected by the faculty. Since topics usually change from year to year, this course may be repeated for credit.

STBTRY 717 Linear and Generalized Linear Models (enroll in BTRY 717)

Spring. 3 credits. S-U grades optional. Prerequisites: BTRY 409, BTRY 417 and 602 or equivalents. Offered alternate years.

Statistical modelling and inference using linear models and generalized linear models. Estimation by least squares, maximum likelihood, quasi-likelihood, and generalized estimating equations. The use of link functions and generalized linear models to accommodate nonlinear models and non-normally distributed data. The use of random effects to accommodate correlation structures in both linear mixed models and generalized linear mixed models and to model longitudinal data. Some use of software packages and illustrative examples.

STBTRY 795 Statistical Consulting (enroll in BTRY 795)

Fall or spring. 2 credits. S-U grades only. Limited to graduate students. Participation in the Department of Biometrics consulting service; faculty supervised statistical consulting with researchers from other disciplines. Discussion sessions for joint consideration of selected consultations encountered by the services during

previous weeks. Since consultations usually change from semester to semester, the course may be repeated for credit.

STBTRY 798 Graduate Supervised Teaching (enroll in BTRY 798)

Fall and spring. 2-4 credits. S-U only. Permission of instructor and chair of special committee plus at least 2 advanced courses in statistics and biometry.

Students assist in teaching a course appropriate to their previous training. Students will meet with a discussion section, prepare course materials, and assist in grading. Credit hours will be determined in consultation with the instructor, depending on the level of teaching and the quality of work expected.

Engineering Statistics Unit

STENGR 270 Basic Engineering Probability and Statistics (enroll in ENGRD 270 or OR&IE 270)

Fall or spring. 3 credits. Prerequisite: first-year calculus.

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.

STENGR 310 Introduction to Probability and Random Signals (enroll in ELE E 310)

Spring. 4 credits. Prerequisite: Mathematics 294. This course may be used in place of Engr 270 to help satisfy the engineering distribution requirement.

Introduction to the theory of probability as a basis for modeling random phenomena and signals, calculating the response of systems, and making estimates, inferences, and decisions in the presence of chance and uncertainty. Applications will be given in such areas as communications, and device modeling, probability, characteristic functions; nonlinear transformations of data; expectation, correlation; and the central limit theorem.

STENGR 320 Optimization I (enroll in OR&IE 320)

Fall. 4 credits. Prerequisite: MATH 221 or 294.

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.

STENGR 321 Optimization II (enroll in OR&IE 321)

Spring. 4 credits. Prerequisite: OR&IE 320 or equivalent.

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.

STENGR 360 Engineering Probability and Statistics II (enroll in OR&IE 360)

Fall. 4 credits. Prerequisite: ENGRD 270 or equivalent.

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.

STENGR 361 Introductory Engineering Stochastic Processes I (enroll in OR&IE 361)

Spring. 4 credits. Prerequisite: OR&IE 360 or equivalent.

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.

STENGR 411 Random Signals in Communications and Signal Processing (enroll in ELE E 411)

Fall. 3 credits. Prerequisite: ELE E 301 and 310 or equivalent.

Introduction to models for random signals in discrete and continuous time, Markov chains, Poisson process, queuing processes, power spectral densities, Gaussian random process. Response of linear systems to random signals. Elements of estimation and inference as they arise in communications and digital signal processing systems.

STENGR 431 Discrete Models (enroll in OR&IE 431)

Fall. 4 credits. Prerequisite: OR&IE 320 and COM S 211 or permission of instructor.

Basic concepts of graphs, networks, and discrete optimization. Fundamental modes and applications, and algorithmic techniques for their analysis. Specific optimization models studied include flows in networks, the traveling sales man problem, and network design.

STENGR 435 Introduction to Game Theory (enroll in OR&IE 435)

Spring. 3 credits.

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.

STENGR 476 Applied Linear Statistical Models (enroll in OR&IE 476)

Spring. First half of term. 2 credits.

Prerequisite: OR&IE 270.

Multiple linear regression, diagnostics, model selection, inference, one and two factor analysis of variance. Theory and applications both treated. Use of MINITAB stressed.

STENGR 511 Error-Control Codes (enroll in ELE E 561)

Fall. 4 credits. Prerequisite: ELE E 301, 521, or equivalent.

A strong familiarity with linear algebra is assumed. 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. Hamming and Singleton bounds for error-

correcting codes. The construction and decoding of Bose-Ray) Chaudhuri-Hocquenghem (BCH) and Reed-Solomon (RS) codes. Computer methods for the study of the structure and algorithms for error-control are used.

STENGR 512 Fundamental Information Theory (enroll in ELE E 562)

Fall. 4 credits. Prerequisite: ELE E 310 or equivalent.

Fundamental results of information theory with application to storage, compression, and transmission of data. Entropy and other information measures. Block and variable length codes. Channel capacity and rate-distortion functions. Coding theorems and converses for classical and multiterminal configurations. Gaussian sources and channels.

STENGR 513 Communication Networks (enroll in ELE E 563)

Spring. 4 credits. Prerequisite: ELE E 411 or permission of instructor.

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: using various protocols, TDMA. Flow control and capacity assignment algorithms for wideband circuit-switched and ATM networks.

STENGR 514 Decision Making and Estimation (enroll in ELE E 564)

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 Neyman-Pearson decision theories; Bayes and maximum likelihood point estimation; Cramer-Rao bound efficient and consistent estimation; spectral estimation, and robust models for signal extraction.

STENGR 517 Artificial Neural Networks (enroll in ELE E 577)

Fall. 4 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 our primary analytical approach to design and analysis of neural networks. The course will cover mathematical and computer-based design capabilities of feed-forward nets (multilayer perceptrons) that can serve as pattern classifiers.

STENGR 520 Operations Research I: Optimization I (enroll in OR&IE 520)

Fall. 4 credits. Prerequisite: MATH 221 or 294.

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.

STENGR 523 Introductory Engineering Stochastic Process I (enroll in OR&IE 523)

Spring. 4 credits. Prerequisite: OR&IE 360 or equivalent.

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.

STENGR 560 Engineering Probability and Statistics II (enroll in OR&IE 360)

Fall. 4 credits. Prerequisite: ENGRD 270 or equivalent.

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.

STENGR 561 Queuing Theory and Its Applications (enroll in OR&IE 561)

Spring. 3 credits. Prerequisite: OR&IE 361 or permission of instructor.

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.

STENGR 562 Inventory Theory (enroll in OR&IE 562)

Spring. 4 credits. Prerequisite: OR&IE 321, 361, 416 or permission of instructor.

The first portion of this course is devoted to the analysis of several deterministic and probabilistic models for the control of single and multiple items at one of many locations. The second portion of this course is presented in an experimental learning format. The focus is on analyzing and designing an integrated production and distribution system for a global company. Applications are stressed throughout.

[STENGR 563 Applied Time-Series Analysis (enroll in OR&IE 563)]

Fall. 3 credits. Prerequisites: OR&IE 361 and OR&IE 270, or permission of instructor. Not offered 1998-99.

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 time-series package.]

STENGR 564 Introductory Engineering Stochastic Processes II (enroll in OR&IE 564)

Fall. 4 credits. Prerequisite: OR&IE 361 or equivalent. Lectures concurrent with OR&IE 462.

Stationary processes, martingales, random walks, and gambler's ruin problems, processes with stationary independent increments, Brownian motion and other cases, branching

processes, renewal and Markov-renewal processes, reliability theory, Markov decision processes, optimal stopping, statistical inference from stochastic models, and stochastic comparison methods for probability models. Applications to population growth, spread of epidemics, and other models.

[STENGR 575 Experimental Design (enroll in OR&IE 575)]

Spring. Second half of term (alternates with 576). 2 credits. Prerequisite: OR&IE 476. Not offered 1998-99.

Randomization, blocking, sample size determination, factorial designs, 2^k full and fractional factorials, response surfaces, Latin squares, split plots, Taguchi designs. Engineering applications. Computing in MINITAB or SAS.]

STENGR 576 Regression (enroll in OR&IE 576)

Spring. Second half of term (alternates with 575). 2 credits. Prerequisite: OR&IE 476.

Nonlinear regression, advanced diagnostics for multiple linear regression, collinearity, ridge regression, logistic regression, nonparametric estimation including spline and kernel methods, regression with correlated errors. Computing in MINITAB OR SAS.

STENGR 577 Quality Control (enroll in OR&IE 577)

Fall. 3 credits. Prerequisite: ENGRD 270.

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.

STENGR 580 Design and Analysis of Simulated Systems (enroll in OR&IE 580)

Fall. 4 credits. Prerequisites: programming experience and OR&IE 360/560, or permission of instructor. Note: OR&IE 360/560 may be taken concurrently.

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.

STENGR 630 Mathematical Programming I (enroll in OR&IE 630)

Fall. 4 credits. Prerequisites: advanced calculus and elementary linear algebra.

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.

STENGR 632 Nonlinear Programming (enroll in OR&IE 632)

Fall. 3 credits. Prerequisite: OR&IE 630.

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.

STENGR 650 Applied Stochastic Processes (enroll in OR&IE 650)

Fall. 4 credits. Prerequisite: a one-semester calculus-based probability course.

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.

STENGR 651 Probability (enroll in OR&IE 651)

Spring. 4 credits. Prerequisite: real analysis at the level of Math 413 and a previous one-semester course in calculus-based probability.

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.

STENGR 662 Advanced Stochastic Processes (enroll in OR&IE 662)

Spring. 3 credits. Prerequisite: OR&IE 651 or equivalent.

Brownian motion, martingales, Markov processes, and topics selected from: diffusions, stationary processes, point processes, weak convergence for stochastic processes, and applications to diffusion approximations, Levy processes, regenerative phenomena, random walks, and stochastic integrals.

STENGR 670 Statistical Principles (enroll in OR&IE 670)

Fall. 4 credits. Co-requisite: OR&IE 650 or equivalent.

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.

[STENGR 671 Intermediate Applied Statistics (enroll in OR&IE 671)]

Spring. 3 credits. Prerequisite: OR&IE 670 or equivalent. Not offered 1998-99.

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.]

STENGR 672 Selected Topics in Environmental Statistics (enroll in OR&IE 672 or BTRY 672)

Fall or spring. 2 credits. Prerequisite: ENGR 270 or equivalent.

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.

Mathematical Statistics and Probability Unit**STMATH 171 Statistical Theory and Application in the Real World (enroll in MATH 171)**

Fall, spring, or summer. 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 techniques. Topics include population and sample distributions, central limit theorem, and statistical theories of point estimation, confidence intervals, and testing hypotheses, the linear model, and the least squares 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).

STMATH 471 Basic Probability (enroll in MATH 471)

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.

STMATH 472 Statistics (enroll in MATH 472)

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 inference and the rationale underlying the choice of these procedures in various settings. These settings include problems of estimation, hypothesis testing, large sample theory.

[STMATH 474 Basic Stochastic Processes (enroll in MATH 474)]

Spring. 4 credits. Prerequisites: Mathematics 471 or equivalent and knowledge of linear algebra such as taught in Mathematics 221. Not offered 1998-99.

This is a second-semester undergraduate course on probability. It covers topics from renewal theory, martingales, discrete and continuous time Markov chains, Brownian motion and related diffusion processes, and applications to queueing theory and finance. Theoretical as well as applied aspects of the subject will be emphasized.]

STMATH 671-672 Probability Theory (enroll in MATH 671-672)

671 fall; 672 spring. 4 credits each.

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. Prerequisite for Mathematics 672; Mathematics 671.

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.

STMATH 674 Introduction to Mathematical Statistics (enroll in MATH 674)

Spring. 4 credits. Prerequisite: Mathematics 671 or permission of instructor.

Topics include an introduction to the theory of point estimation, consistency, efficiency, sufficiency, and the method of maximum likelihood. Convexity and basic concepts of decision theory are introduced. Concepts of sequential methods may be discussed.

STMATH 771-772 Seminar in Probability and Statistics (enroll in MATH 771-772)

771 fall; and 772 spring. 4 credits each.

STMATH 777-778 Stochastic Processes (enroll in MATH 777-778)

777 fall; and 778 spring. 4 credits each.

Social Statistics Unit**STSOC 210 Statistical Reasoning I (enroll in ILRST 210)**

Fall or spring. 3 credits. Attendance at weekly discussion section is required.

An introduction to the basic concepts of statistics and data analysis. Descriptive methods, normal theory models and inference procedures for univariate and bivariate data. Basic statistical designs, an introduction to probability and applications of the Binomial and Normal distributions. Estimation, confidence intervals and tests of significance for a single population mean and proportion, the difference in two population means and proportions, simple linear regression, correlation and two-way contingency tables. Students are instructed on the use of a statistics computer package at the beginning of the term and use it for weekly assignments.

STSOC 211 Statistical Reasoning II (enroll in ILRST 211)

Fall or spring. 3 credits. Prerequisite: ILR 210 or suitable introductory statistics course.

A second course in statistics. Applications of statistical data analysis techniques, particularly to the social sciences. Topics include: statistical inference; simple linear regression; multiple linear regression; logistic regression; and analysis of variance. Computer packages are used throughout the course.

STSOC 310 Statistical Sampling (enroll in ILRST 310)

Spring. 3 credits. Prerequisite: two terms of statistics.

Theory and application of statistical sampling, especially in regard to sample design, cost, estimation of population quantities, and error estimation. Assessment of nonsampling errors. Discussion of applications to social and biological sciences and to business problems. Course includes an applied project.

STSOC 311 Practical Matrix Algebra
(enroll in ILRST 311)

3 credits.

Matrix algebra is a necessary tool for statistics courses such as regression and multivariate analysis and for other "research methods" courses in various other disciplines. One goal of this course is to provide students in various fields of knowledge with a basic understanding of matrix algebra in a language they can easily understand. Topics include special types of matrices; matrix calculations; linear dependence and independence; vector geometry; matrix reduction (trace, determinant, norms); matrix inversion; linear transformation; eigenvalues; matrix decompositions; ellipsoids and distances; some applications of matrices.

STSOC 312 Applied Regression Methods
(enroll in ILRST 312)

Fall. 3 credits. Prerequisite: ILRST 112 and ILRST 211 or equivalent courses.

Matrix algebra necessary to analyze regression models is reviewed. Multiple linear regression, analysis of variance, nonlinear regression, and linear logistic regression models are covered. For these models, least squares and maximum likelihood estimation, hypothesis testing, model selection, and diagnostic procedures are considered. Illustrative examples are taken from the social sciences. Computer packages are used.

[STSOC 313 Design and Analysis of Experiments (enroll in ILRST 313)]

3 credits. Prerequisite: ILRST 211 or equivalent. Not offered 1998-99.

The statistical design and analysis of comparative experiments including completely randomized, factorials, randomized block, latin squares and split-unit designs including crossover and repeated measures. Application of statistical design to research problems. Analyses to compare treatment groups including ANOVA, ANCOVA, contrasts and multiple comparison procedures. Computer packages are used.]

[STSOC 314 Graphical Methods for Data Analysis (enroll in ILRST 314)]

3 credits. Prerequisite: ILRST 211 or equivalent. Not offered 1998-99.

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.]

[STSOC 410 Techniques of Multivariate Analysis (enroll in ILRST 410)]

3 credits. Prerequisite: ILRST 312 or equivalent. Not offered 1998-99.

Techniques of multivariate statistical analysis discussed and illustrated by examples from various fields. We emphasize application, but theory will not be ignored. Deviation from assumptions and the rationale for choices among techniques are discussed. Students are expected to learn how to thoroughly analyze real-life data sets using computer-packaged programs. Participants should have some knowledge of matrix notation. Topics include: multivariate normal distribution; sample geometry and multivariate distances;

inference about a mean vector; comparison of several multivariate means, variances, and covariances; detection of multivariate outliers; principal component analysis; factor analysis; canonical correlation analysis; discriminant analysis, and multivariate multiple regression.]

STSOC 411 Statistical Analysis of Qualitative Data (enroll in ILRST 411)

Spring 1999. 3 credits. Prerequisite: two statistics courses or permission of instructor.

An advanced undergraduate and beginning graduate course. Includes treatment of association between qualitative variates; contingency tables; log-linear models; binary ordinal, and multinomial regression models; limit dependent variables.

STSOC 499 Directed Studies (undergraduate) (enroll in ILRST 499)

For description, see the section, Collective Bargaining, Labor Law, and Labor History.

STSOC 510 Statistical Methods for the Social Sciences I (enroll in ILRST 510)

Fall. 3 credits.

A first course in statistics for graduate students in the social sciences. Descriptive statistics, probability and sampling distributions, estimation, hypothesis testing, simple linear regression and correlation. Students are instructed on the use of a statistics computer package at the beginning of the term and use it for weekly assignments.

STSOC 511 Statistical Methods for the Social Sciences II (enroll in ILRST 511)

Fall or spring. 3 credits. Prerequisite: ILRST 510 or equivalent introductory statistics course.

A second course in statistics that emphasizes applications to the social sciences. Topics include: simple linear regression; multiple linear regression (theory, model building, and model diagnostics); and the analysis of variance. Computer packages are used extensively.

[STSOC 610 Seminar in Modern Data Analysis (enroll in ILRST 610)]

3 credits. Prerequisite: two statistics courses or permission of instructor. Not offered 1998-99.

An advanced survey of modern data analysis methods. Topics include exploratory data analysis, data reexpression, philosophy of data analysis, robust methods, statistical graphics, 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, and some experience using a computer.]

[STSOC 611 Statistical Consulting (enroll in ILRST 611)]

3 credits. Prerequisite: linear algebra, knowledge of a programming language, and statistics at least through multiple regression. Not offered 1998-99.

A survey of new aspects of statistical computing. Topics include: 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 environ-

ments. 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.]

[STSOC 612 Statistical Classification Methods (enroll in ILRST 612)]

3 credits. Prerequisite: ILRST 312 or equivalent, or permission of instructor. Not offered 1998-99.

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; nearest neighbor methods, classification and regression trees (CART); neural networks for classification; and estimation of error of classification rules.]

STSOC 613 Bayesian and Conditional Inference (enroll in ILRST 613)

Spring. 3 credits. Prerequisites: graduate level courses equivalent to OR&IE 670 and OR&IE 651 or permission of instructor.

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.

STSOC 614 Structural Equations with Latent Variables (enroll in ILRST 614)

Fall. 3 credits. Prerequisites: ILRST 210, ILRST 211 or ILRST 510, ILRST 511 or equivalent.

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.

[STSOC 615 Expert Systems and Probabilistic Network Models (enroll in ILRST 615)]

3 credits. S-U only. Prerequisite: OR&IE 560 or an equivalent course in probability and statistics. Not offered in 1998-99.

This is an interdisciplinary course for students in applied mathematics, computer science, statistics, and other related fields of applications such as medical, engineering, and social sciences. Topics include: components of expert systems, rule-based expert systems, probability-based expert systems, uncertainty measures, dependency models, Bayesian and Markov networks, propagation of uncertainties, learning structure from data, and examples of applications. Students will use computer software to gain experience.]

STSOC 630 Econometrics II (enroll in ECON 620)

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.

STSOC 639 Econometrics I (enroll in Econ 619)

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, distributions 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.

[STSOC 711 Robust Regression Diagnostics (enroll in ILRST 711)]

3 credits. S-U or letter grade. Prerequisite: ILRST 312 or equivalent, or permission of instructor. Not offered 1998-99.

Regression models are simplifications of reality; we rarely expect the model to be exactly true. In many applications of regression, however, small changes in a model, a model assumption, or a data point, can have very large effects on the results. Regression analysis is viewed in this course as a cyclical process, which takes inputs and produces outputs in an iterative or cyclical way; a way in which the outputs can be used to diagnose, validate, criticize, and possibly alter the inputs. As such, this course is an attempt to narrow the gap between the theory and practice of regression analysis. In this course we discuss classical methods as well as a recently-developed general framework for assessing the sensitivity of the outputs to small changes in the input. Students are expected to be able to perform through analyses of real-life data using computer packages. Topics to be discussed include: role of variables in a regression equation, regression outliers and influential observations, robust regression, alternatives to least squares (e.g., LMS, LAV, IRLS), error-in-variables models, and generalized linear models.]

[STSOC 712 Theory of Sampling (enroll in ILRST 712)]

3 credits. Prerequisite: calculus and at least one semester of mathematical statistics. Not offered in 1998-99.

Sampling theory from the viewpoint of mathematical statistics. The first part of the course focuses on the classical or "design" approach; the second part on the more recent "model-based" approach. Attention is paid to recent process in the field.]

[STSOC 713 Counting Processes with Statistical Applications (enroll in ILRST 713)]

3 credits. Prerequisite: a course at the technical level of Math 572 and 574 or permission of instructor. Not offered in 1998-99.

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.]

[STSOC 714 Topics in Modern Statistical Distribution Theory (enroll in ILRST 714)]

3 credits. Prerequisite: courses equivalent to OR&IE 651 or Math 571, and BTRY 409 or OR&IE 670. Not offered in 1998-99.

Recent research has revealed vast territories 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.]

STSOC 715 Likelihood Inference (enroll in ILRST 715)

Fall. 3 credits. Prerequisite: graduate courses equivalent to OR&IE 670.

In most statistical models, exact distribution theory for testing hypotheses or constructing confidence intervals is either unavailable or computationally cumbersome. Inferences are routinely performed by using large-sample approximations to the distributions of test statistics. This course provides a survey of some recent higher-order asymptotic approximations for likelihood-based methods of inference.

[STSOC 716 Statistical Consulting (enroll in ILRST 716)]

Fall or spring. 2 credits. Prerequisites: limited to graduate students. S-U grades only. Not offered in 1998-99.

A course in practical consulting on "real-world" statistical problems. Under the supervision of the instructor(s), students will hear problems presented by clients (usually faculty and graduate students from other fields) and will collaborate in proposing a statistical model, analyzing data, and interpreting results. Statistical computing will be used as needed.]

STSOC 730 Advanced Topics in Econometrics II (enroll in ECON 720)

Spring. 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.

STSOC 731 Time Series Econometrics (enroll in ECON 721)

Fall. 4 credits. Prerequisites: Economics 519-520 or permission of instructor.

This course covers traditional and current time series techniques that are widely used in econometrics. Topics include the theory of stationary stochastic processes including univariate ARMA (p,q) models, spectral density analysis, and vector autoregressive models; parametric and semi-parametric estimation; current developments in distributional theory; estimation and testing in models with integrated regressors including, unit root tests, cointegration, and permanent vs. transitory components.

STSOC 739 Advanced Topics in Economics I (enroll in ECON 719)

Fall. 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.

STSOC 799 Directed Studies (Graduate) (enroll in ILRST 799)

For description, see section, Collective Bargaining, Labor Law, and Labor History

Related Courses in Other Departments

[BTRY 90 Introduction to Biomathematics Not offered 1998-99.]

BTRY 101 Introduction to Biometry I

BTRY 102 Introduction to Biometry II

BTRY 417 Matrix Algebra

BTRY 451 Mathematical Modeling of Populations

BTRY 498 Undergraduate Supervised Teaching

CEE 597 Risk Analysis and Management

CEH 307 Introduction to Econometrics

NS 641 Applied Regression

PROGRAM IN COMPARATIVE AND ENVIRONMENTAL TOXICOLOGY

213 Rice Hall (255-8008)

The Cornell Program in Comparative and Environmental Toxicology is a broadly based inter-college program 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 graduate Field of Environmental Toxicology provides training leading to the M.S. or Ph.D. degrees. There is both breadth and depth in many facets of 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. Concentrations include cellular and molecular toxicology; nutritional and food toxicology; ecotoxicology and environmental chemistry; and a minor concentration of risk assessment, management, and public policy. Research by the faculty associated with the program focuses on the interactions of drugs, pesticides, and other potentially hazardous environmental agents with a wide variety of living organisms (including humans) as well as 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 undergraduates who have permission of the instructor. The titles and numbers of these courses are listed below. Details of course content are provided 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 director of graduate studies, 213 Rice Hall, telephone: 255-8008, e-mail: envtox@cornell.edu.; www.cfe.cornell.edu/icet/.

- Tox 320 Principles of Toxicology (Vet. Micro 320, Biological Sciences 320)
- Tox 370 Pesticides and the Environment (Entomology 370)
- Tox 437 Oncogenic Cancer Viruses (Biological Sciences 437)
- Tox 490 Insect Toxicology and Insecticidal Chemistry (Entomology 690)
- Tox 607 Ecotoxicology (Natural Resources 607)
- Tox 610 Introductory Chemical and Environmental Toxicology (Natural Resources 610)
- Tox 611 Molecular Toxicology
- Tox 625 Nutritional Toxicology (Animal Science 625)
- Tox 680 Hazardous Waste Toxicology
- Tox 698 Current Topics in Environmental Toxicology (Nutritional Sciences 700, NatRes 698, Ag & Bio Eng 698)
- Tox 702 Seminar in Toxicology
- Tox 750 Cancer Cell Biology (Biological Sciences 750, Vet. Pathology 750)
- Tox 751 Professional Responsibilities of Toxicologists (Biological Sciences 751)
- Tox 899 Master's Thesis and Research
- Tox 999 Doctoral Thesis and Research

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 note the extensive offerings in Art, Architecture, Communications, Computer Science, History of Art, Design and Environmental Analysis, Theatre Arts, and the annual listings of offerings in the Society for the Humanities. Students interested in pursuing visual studies as an area of study should propose an "Independent Major in Visual Studies" following the same procedures as for any independent major in the school of Arts and Sciences. For additional information, contact Marilyn Rivchin (Theatre Arts).

Courses

Some of these courses may not be taught in 1998-99. For information about availability consult the appropriate departmental listings.

- An Introduction to Architecture (Architecture 132)
- Art and Politics in Twentieth-Century Latin America (History 424)
- Art and Visual Thinking (Textiles and Apparel 125)
- Asian American Images on Film (Asian American Studies 435)
- African Cinema (African Studies 435)
- Art, Design, and Visual Thinking (Textiles and Apparel 125)
- Blacks in Communication Media (Africana Studies 303)
- Chicanos and Film: Representations of La Raza (English 242)
- Color, Form, Space (Art 110)
- Contemporary French Culture Through Film (French 291)
- Computer Art (Art 171)
- Computer Graphics and Visualization (Architecture 374 and Computer Science 417)
- Computer Vision (Electrical Engineering 547)
- Design I and II (Design and Environmental Analysis 101-102)
- Ethics in Media (Communications 426)
- Fiction and Film in France (French Literature 499)
- Film and Performance (Theatre Arts 413)
- Filming Other Cultures (Anthropology 291 and 691 and Theatre Arts 291)
- Fundamentals of 16-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 and Theory of Documentary and Experimental Film (Theatre Arts 376)
- The History of the Book (English 450)
- Human Perception (Psychology 342)
- 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)
- Interactive Multimedia (Communications 439)
- Introduction to Film Analysis: Meaning and Value (Theatre Arts 274)
- Introduction to Mass Media (Communication 120)
- Introductory Photo I (Art 161 and Architecture 251)
- Japanese and Asian Film (Asian Studies 313 and Theatre Arts 313)
- Latin American and Latino Video (Romance Studies 402 and Theatre Arts 402)
- Literature to Cinema (Italian 390)
- Machine Vision (Computer Science 664)
- Media Arts Studio I (Architecture 391/Art 391/Theatre Arts 391)
- Media Arts Studio II (Architecture 392/Art 392/Theatre Arts 392)
- The Medieval Illuminated Book (History of Art 337)
- Modern Architecture on Film (Architecture 392)
- Modern Experimental Optics (Physics 330)
- 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)
- Social and Cultural Construction of Printed Pictures (History 381)
- Spanish Film (Spanish 399)
- Special Investigations in Visual Studies (Architecture 458)
- Studies in Film Analysis (English 263)
- Video: Art, Theory, Politics (English 395, Theatre Arts 395)
- Video Communication (Communication 348)
- Visual Anthropology (Anthropology 453)
- Visual Communication (Communication 230)
- Visual Culture and Social Theory (Art History 370, Comp. Lit. 368)
- Visual Ideology (Comp. Lit 660, 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 Arts and Sciences), engineering, hotel administration, Policy Analysis and Management (College of Human Ecology), industrial and labor relations, and sociology.

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, marketing, and consulting. Areas of specialization include business management and marketing, food industry management, agribusiness management, and farm business management and finance.

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 technology-oriented 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.

Policy Analysis and Management. 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 employee.

Sociology. The program provides disciplined understanding of society and social issues. The insights and analytical skills you will acquire are applicable to corporate, government, and nonprofit settings, and the department's focus on social organization and institutions will prepare you well for graduate or professional programs in business schools. (Also see the description of the Society and Economy Concentration in the Department of Sociology section of Arts and Sciences.)

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 Studies 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 MANAGEMENT COURSES

Accounting

- ARME 221 Financial Accounting
- ARME 323 Managerial Accounting
- ARME 327 Accounting for Entrepreneurs
- H Adm 120 Survey of 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

- ARME 412 Introduction to Mathematical Programming
- 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

- ARME 415 Price Analysis (also ECON 415)
- ARME 431 Food and Agricultural Policies
- ARME 450 Resource Economics (also ECON 450)

- ARME 451 Environmental Economics and Policy (also ECON 409)
- ARME 464 Economics of Agricultural Development (also ECON 464)
- CEE 321 Microeconomic Analysis
- PAM 370 Wealth and Income (is cross-listed with CEH 233)
- 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

- ARME 325 Personal Enterprise and Small Business Management
- ARME 425 Small Business Management Workshop
- JGSM NBA 300 Entrepreneurship and Enterprise

Finance

- ARME 324 Financial Management
- ARME 404 Advanced Agricultural Finance Seminar
- ARME 405 Farm Finance
- PAM 326 Personal Financial Management (is cross-listed with CEH 315)
- 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 226 Financial Management
- H Adm 322 Investment Management
- H Adm 326 Corporate Finance
- OR&IE 451 Economic Analysis of Engineering Systems

International Business

- ARME 100 Tradeoffs in Global Economic Issues: Is There A Free Lunch?
- ARME 430 International Trade Policy
- ARME 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

- ARME 250 Environmental Economics
- ARME 320 Business Law I
- ARME 321 Business Law II
- ARME 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

- ARME 220 Introduction to Business Management
 ARME 302 Farm Business Management
 ARME 328 Innovation and Dynamic Management (also H ADM 418)
 ARME 402 Seminar in Farm Business Planning and Managerial Problem Solving
 ARME 424 Strategic Management
 ARME 426 Cooperative Management and Strategies
 ARME 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

- ARME 240 Marketing
 ARME 340 Futures and Options Trading
 ARME 342 Marketing Management
 ARME 346 Dairy Markets and Policy
 ARME 347 Strategic Marketing for Horticultural Firms
 ARME 448 Food Merchandising
 PAM 223 Marketing and the Consumer (is cross-listed with CEH 233)
 H Adm 243 Principles of Marketing

Personnel and Human Resource Management

- ARME 326 Human Resource Management in Small Business
 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
 ILRPR 461 Human Resource Management (I&LR 200 Collective Bargaining)

Quantitative Decisions and Decision Science

- ARME 210 Introductory Statistics
 ARME 410 Business Statistics
 ARME 411 Introduction to Econometrics
 ARME 416 Demographic Analysis in Business and Government (also RSOC 331)
 ARME 417 Decision Models for Small and Large Businesses

- CEE 304 Uncertainty Analysis in Engineering
 CEE 323 Engineering Economics and Management
 Econ 320 Introduction to Econometrics
 Econ 520 Econometrics II
 PAM 340 Economics of Consumer Policy (is cross-listed with CEH 330)
 ENG 270 Basic Engineering Probability and Statistics

Real Estate

- ARME 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

Sociology

- SOC 110 Introduction to Economy and Society
 SOC 215 Organizations: An Introduction
 SOC 222 Social Policy and Organization in Health, Education, and Welfare
 SOC 245 Inequality in Industrial Societies
 SOC 275 Women at Work
 SOC 301 Evaluating Statistical Evidence
 SOC 303 Design and Measurement
 SOC 340 Health, Behavior, and Health Policy
 SOC 345 Gender Inequality
 SOC 351 Research Seminar on Organizations
 SOC 354 Law and Social Order
 SOC 366 Transitions from State Socialism
 SOC 370 Different Walks of Life: Sociology of Careers
 SOC 426 Social Policy

Transportation

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

PRELAW STUDY

Law schools do not prescribe any particular 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 subject 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 well-qualified students in other Cornell 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 biochemistry, 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.

Exceptionally qualified students in the Colleges of Agriculture and Life Sciences, Arts and Sciences, and Human Ecology may apply for acceptance to the Medical College through a double registration procedure arranged between Cornell University and Cornell University Medical College in New York City. This procedure allows registered students to save one year in pursuit of the bachelor's and M.D. degrees. This is not a traditional "seven year program"; separate application to the Medical College is required. Further information about this procedure 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 Cornell 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 Cornell, may vary at other veterinary colleges.

For information on additional preparation, including work experience and necessary examinations, students should consult the brochure, *Admissions Information*, obtained by writing to the Office of DVM Admissions, College of Veterinary Medicine, Cornell University, S1-006 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 Cornell 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.

