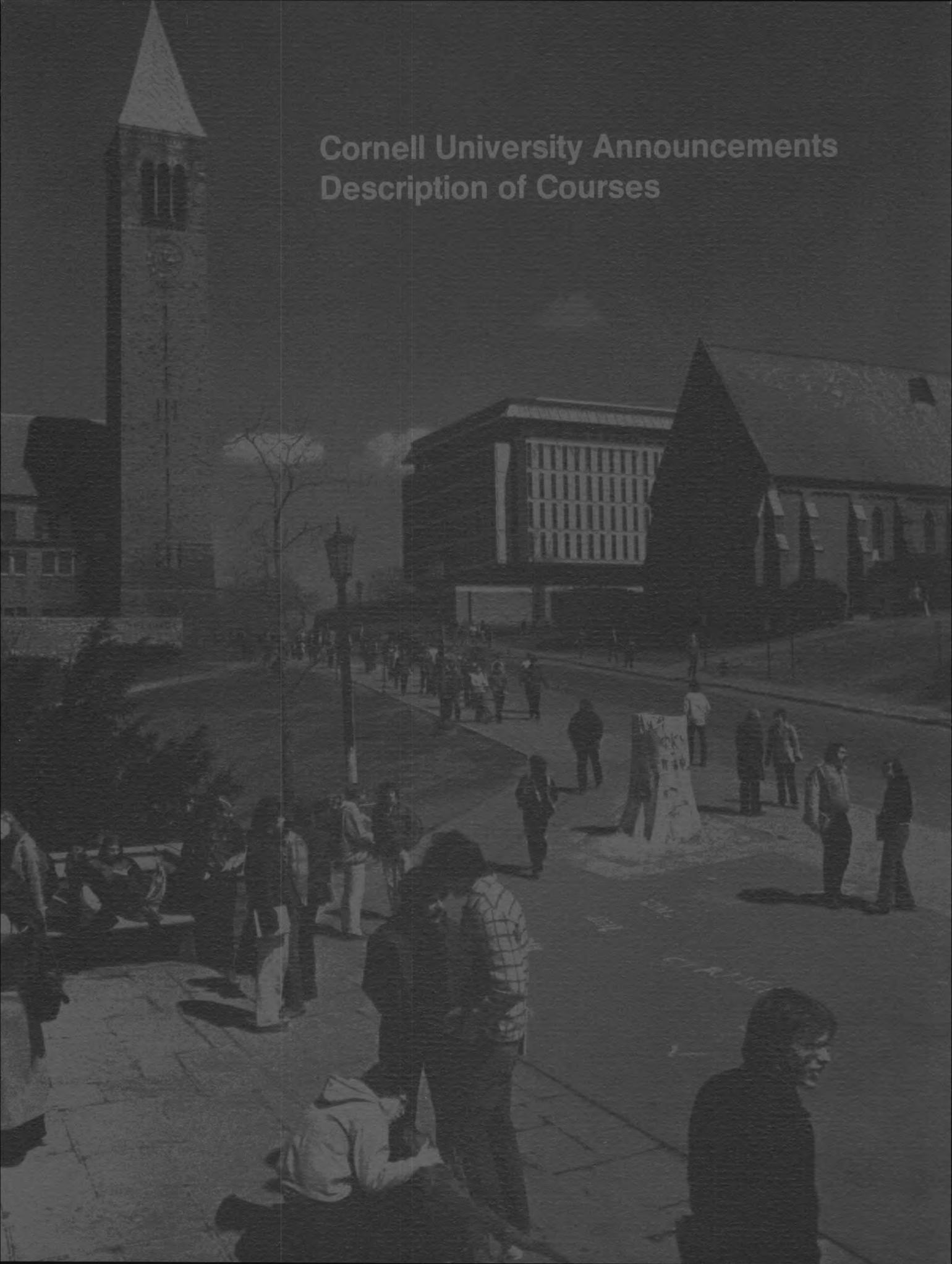
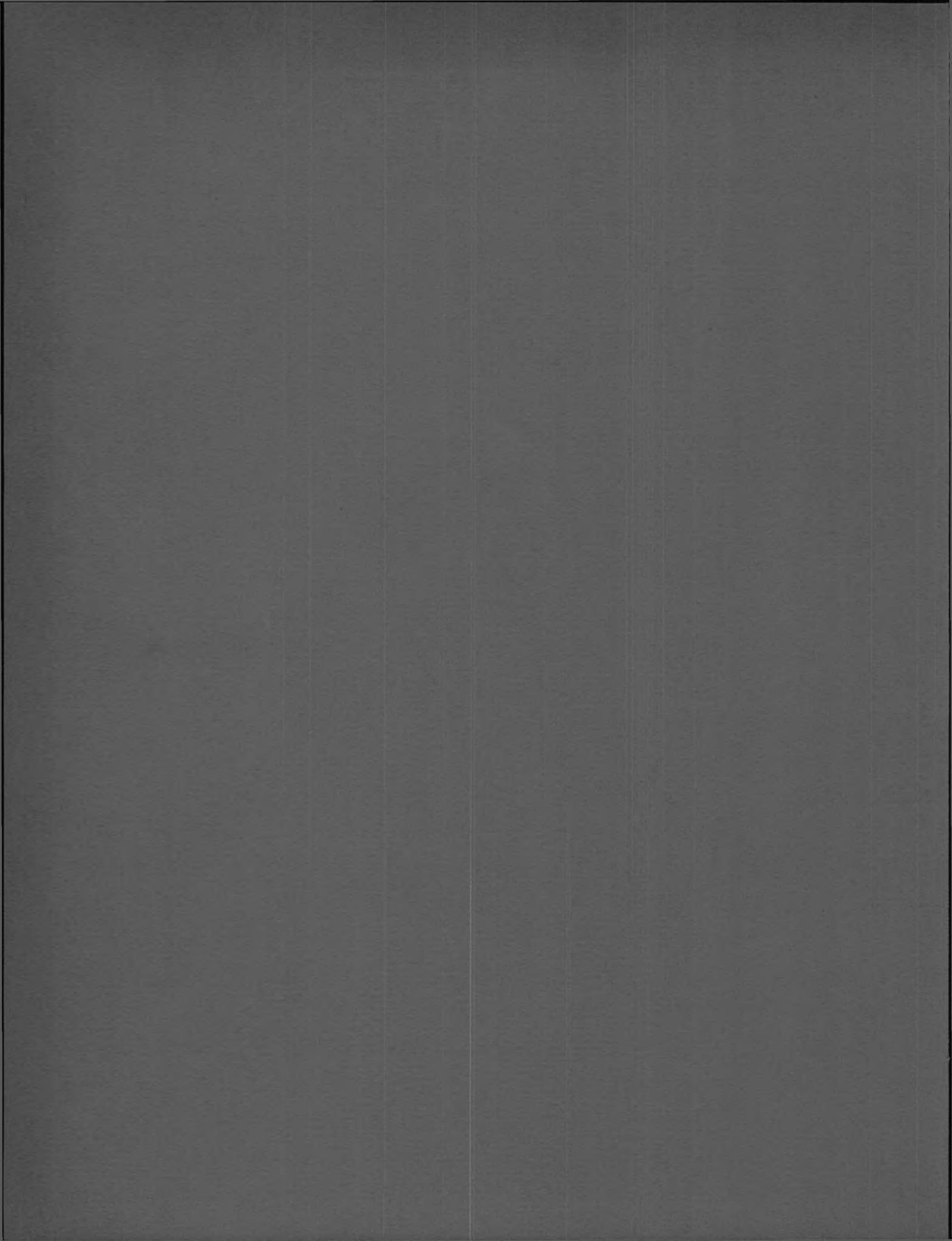


Cornell University Announcements Description of Courses





Cornell University

Description of Courses

1978-1979

Cornell University Announcements

Volume 70 of the Cornell University Announcements consists of sixteen catalogs, of which this is number 7, dated July 14, 1978. Publication dates: sixteen times a year (three times in August and September; twice in January, June, and July; and once in March, May, October, and December. Publisher: Cornell University, Sheldon Court, 420 College Avenue, Ithaca, New York 14853. Second-class postage paid at Ithaca, New York.

Cornell Academic Calendar

1978-79

Registration, new students	Thursday, August 31
Registration, continuing and rejoining students	Friday, September 1
Fall term instruction begins	Monday, September 4
Thanksgiving recess:	
Instruction suspended, 1:10 p.m.	Wednesday, November 22
Instruction resumed	Monday, November 27
Fall term instruction ends, 1:10 p.m.	Saturday, December 9
Final examinations begin	Friday, December 15
Final examinations end	Saturday, December 23
Registration, new and rejoining students	Thursday, January 18
Registration, continuing students	Friday, January 19
Spring term instruction begins	Monday, January 22
Spring recess:	
Instruction suspended, 1:10 p.m.	Saturday, March 17
Instruction resumed	Monday, March 26
Spring term instruction ends, 1:10 p.m.	Saturday, May 5
Final examinations begin	Monday, May 14
Final examinations end	Tuesday, May 22
Commencement Day	Monday, May 28

1979-80

Thursday, August 30
Friday, August 31
Monday, September 3
Wednesday, November 21
Monday, November 26
Saturday, December 8
Friday, December 14
Saturday, December 22
Thursday, January 17
Friday, January 18
Monday, January 21
Saturday, March 15
Monday, March 24
Saturday, May 3
Monday, May 12
Tuesday, May 20
Monday, May 26

The dates shown in the Academic Calendar are subject to change at any time by official action of Cornell University.

In this calendar, the University has scheduled classes on religious holidays. It is the intent of the University that students missing classes due to the observance of religious holidays be given ample opportunity to make up work.

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Cornell University

Founded in 1865, Cornell University is an independent Ivy League institution and the land-grant university of the state of New York. There are fourteen colleges and schools, of which four are state supported and ten privately endowed. Eleven of these divisions are located on the Ithaca campus and three—the Medical College, the Graduate School of Medical Sciences, and the School of Nursing—are located in New York City.

This volume describes courses and programs of those divisions on the Ithaca campus only. Those interested in the divisions located in New York City should write to the appropriate division requesting its *Announcement*.

Guide to Course Listings

This list of courses that follows is arranged into two broad groups.

Group 1

Those divisions that offer both undergraduate- and graduate-level courses:

Agriculture and Life Sciences	Hotel Administration
Architecture, Art, and Planning	Human Ecology
Arts and Sciences	Industrial and Labor Relations
Biological Sciences	Nutritional Sciences
Engineering	Officer Education

Group 2

The graduate professional divisions:

Business and Public Administration
Law
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. Those of the New York City divisions are not included as this volume encompasses only instruction offered at the Ithaca campus.

Course Numbering System

The course levels have been assigned as follows:

- 100-Level Course — introductory course, no prerequisites required, open to all qualified students.
- 200-Level Course — lower-division course, open to freshmen and sophomores, may require prerequisites.
- 300-Level Course — Upper-division course, open to juniors and seniors, prerequisites required.
- 400-Level Course — upper-division course, open to seniors and graduates, requires 200- and 300-level course prerequisites or equivalent.
- 500-Level Course — professional level (e.g. B&PA, Law, Vet.).
- 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.

Other Information

Information concerning admissions, requirements for graduation, grades and academic standing, and special arrangements such as advanced placement generally will be found either directly preceding the course listings for the school or college to which these details apply, or directly before the course listings of a particular department when the material is relevant only to this smaller unit. Whenever such materials about various requirements are not contained in this volume, students are advised to consult the individual *Announcement* of that division (as, for example, the *Announcement of the School of Hotel Administration*) for this information or to consult their advisers or college offices.

It is not possible to keep this single volume list of courses completely up-to-date. The most current information regarding courses, credit hours, sections, days, times, buildings, rooms, and registration procedures may be found in the *Course and Time Roster* and the *Course and Room Roster*, issued four times a year by the Office of the Registrar. Students are also advised to consult the individual college offices for up-to-date course information.

Information on academic requirements and other student faculty information will be available in the *Academic Information Announcement* to be published in the fall of 1978.

The courses and curricula described in this *Announcement*, and the teaching personnel listed herein, are subject to change at any time by official action of Cornell University.

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, age, or handicap. The University is committed to the maintenance of affirmative action programs which will assure the continuation of such equality of opportunity.

All academic courses of the University are open to students of all races, religions, ethnic origins, ages, sexes, and political persuasions. No requirement, prerequisite, device, rule, or other means shall be used by any employee of the University to encourage, establish, or maintain segregation on the basis of race, religion, ethnic origin, age, sex, or political persuasion in any academic course of the University.

Cornell University is committed to assisting those handicapped students who have special needs. A brochure describing services for the handicapped student may be obtained by writing to the Office of the Dean of Students, Cornell University, 103 Barnes Hall, Ithaca, New York 14853. Other questions or requests for special assistance may also be directed to that office.

Special Opportunity Programs

Cornell University administers a variety of special opportunity programs designed to provide financial assistance and other forms of assistance to (1) minority students and (2) low-income students meeting program guidelines. The emphasis of these special programs is to aid in increasing representation of students from minority groups present in New York State who historically have been underrepresented in higher education. However, participation is also available to those residing outside New York State. For details, prospective students should consult the *Guide for Candidates* which accompanies each undergraduate application or will be sent upon request by the Office of Admissions, 410 Thurston Avenue, Ithaca, New York 14853.

New York State College of Agriculture and Life Sciences

Introduction

Agriculture and Life Sciences programs offered at Cornell lead to the degrees of Bachelor of Science, Master of Science, and Doctor of Philosophy, as well as several professional degrees including the Master of Professional Studies, Doctor of Education, and Master of Arts in Teaching.

Descriptions of courses, including both undergraduate and graduate offerings, are given under the appropriate academic department. Information about academic programs, admissions, financial aid, placement, and career opportunities may be found in *Agriculture and Life Sciences at Cornell*, the *Announcement of General Information*, the *Announcement of The Graduate School*, and in the special program area announcements prepared by the College of Agriculture and Life Sciences.

The Program of Study

To qualify for the B.S. degree, students must fulfill requirements established by the Faculty of the College of Agriculture and Life Sciences and administered through the Office of Resident Instruction. Specifically, these are as follows:

Residence

Eight terms of residence are required. The last 30 credits must be earned in residence at the College of Agriculture and Life Sciences. A minimum of 120 semester credits is also required, of which at least 60 must be earned at Cornell. The student's cumulative and last-semester average must be 1.70 or above.

Courses

Course credits must fall within the following pattern:

Distribution—45 credits

Physical sciences—9 credits, including 6 credits of chemistry or physics or math.

Biological sciences—9 credits, including 6 credits of introductory biology.

Social sciences and humanities—9 credits in at least two subject areas.

Oral and written expression—9 credits, including 6 credits of written expression.

Statutory College Electives—55 hours minimum. At least 45 credits must be from courses taught in the College of Agriculture and Life Sciences.

Specialization within one of the following nine program areas should be planned in consultation with a faculty adviser:

Agricultural and Biological Engineering
Animal Science
Applied Economics and Business Management
Behavioral and Social Sciences
Biological Sciences
Environmental Studies
Food Science
Plant Sciences
General Studies in Agriculture and Life Sciences

Other Electives—20 credits maximum. These may be taken in any college at Cornell to complete the degree requirements.

Other Requirements

Work experience is required in some, but not all, program areas. Students should consult their advisers for information.

Two terms of **Physical Education** are required by University legislation.

Progress of each student toward meeting graduation requirements is recorded by the College Registrar on a Summary of Record form. It is the responsibility of the student and the faculty adviser to make certain that satisfactory progress is being made toward completion of the requirements.

Graduate Study

Graduate study is organized under graduate fields which generally coincide with the departments. Graduate degree requirements are described in the *Announcement of the Graduate School*. Courses offered for the graduate degrees are described under the appropriate academic departments in the College of Agriculture and Life Sciences.

Nondepartmental Courses

5 Basic Review Mathematics Fall or spring. 3 credits. (The credit is not counted toward the 120 hours required for the degree.)

Fall term: for entering students only; M W F 8 (two sections) or 12:20 (two sections). Spring term: may be elected by first-year students only; M W F 12:20. H. A. Geiselmann.

Intended to expose students to some of the concepts that are necessary for success in other mathematics and science courses. Basic concepts of algebra, analytic geometry, and trigonometry will be covered. Considerable emphasis will be placed on the analysis and reasoning involved in the solution of verbal problems requiring the use of mathematics.

7 College Reading and Study Skills Program

Fall or spring. Noncredit.

Classes start one week after the beginning of each term and continue for six weeks. Programs are open to all registered students. No formal registration necessary. Simply present yourself at one of the announced times. Course may also be taken as an auto-tutorial course. For information, telephone 256-3413. W. Pauk.

Principles and techniques for more effective reading and studying are explained, demonstrated, and practiced in class. The reading laboratory provides an opportunity for increasing one's rate of reading.

27 Introduction to Farm Techniques

Spring. Noncredit. Grade does not appear on transcript.

M T W Th F 2-5. Classes meet at various college farm facilities. Students attend one session each week. W. F. Miller.

Provides supervised instruction in the basic manual skills of farming. Skills covered include hand and machine milking, livestock handling, operation of tractors and field equipment, and general orientation to the practices and procedures of day-to-day farm operation. For registration and course information, contact the Office of Student and Alumni Services, 16 Roberts Hall.

115 Introductory College Mathematics Fall or spring. 4 credits.

M W F 8, 12:20; lab, T or Th 12:20.

H. A. Geiselmann.

Designed to give students with sound high school mathematics backgrounds a unified treatment of the basic concepts of college algebra, analytic geometry, and the elements of calculus.

Considerable emphasis will be placed upon the concept of function, graphing, problem solving, and methods of proof.

The Cornell University Computing Language (PL/C) will be taught and used to strengthen and integrate the mathematical topics covered in the course.

401-402 America and World Community (also Govt 401-402) 401, fall; 402, spring. 3 credits each term.

M W 7:30 p.m. One World Room, Anabel Taylor, N. E. Awa, R. A. Baer, H. Feldman, J. C. Mbata, R. J. McNeil, K. L. Robinson, and other professors to be announced.

The theme of "world community" will be examined in terms of the directions that the concept suggests, with special reference to the role of the United States in translating the concept to reality. The course seeks to examine the American experience against the background of world community from the point of view of the humanities, the social sciences, the natural sciences, and religious studies.

Agricultural Economics

O. D. Forker, chairman; D. J. Allee, R. D. Aplin, R. Barker, S. L. Barraclough, N. L. Bills, D. Blandford, R. N. Boisvert, C. A. Bratton, E. H. Brown, M. E. Brunk, J. B. Bugliari, D. L. Call, G. L. Casler, L. D. Chapman, H. E. Conklin, G. J. Connehan, J. Conrad, L. M. Day, W. G. Earle, D. U. Fisher, D. K. Freebairn, G. A. German, D. C. Goodrich, Jr., R. B. How, R. J. Kalter, W. A. Knoblauch, E. L. LaDue, W. H. Lesser, J. F. Metz, Jr., R. A. Milligan, T. D. Mount, T. T. Poleman, K. L. Robinson, D. G. Sisler, R. S. Smith, B. F. Stanton, R. P. Story, J. A. Sweeney, W. G. Tomek, G. B. White

Business Management

Attention is directed to courses in economics and mathematics in the College of Arts and Sciences and in administration in the Schools of Hotel Administration, Business and Public Administration, and Industrial and Labor Relations.

220 Introduction to Business Management

Fall. 3 credits.

Lec, M W F 10:10; disc, M 12:20-2:15, 2:30-4:25; T 10:10-12:05, 12:20-2:15, 2:30-4:25; W 8-9:55, 10:10-12:05, 12:20-2:15, 2:30-4:25. In weeks when discussions are held, there will be no Wednesday lecture. Discussions will be held instead of a Wednesday lecture in all but two weeks of the term. R. D. Aplin.

Course focuses on principles and tools useful in performing four major functions of management; planning, organizing, directing and leading, and controlling. Within this framework, consideration given to social, legal, and economic environments; forms of business ownership; financial statements; cost behavior; and a few key concepts and tools in financial management.

221 Accounting Spring. 3 credits. Not open to freshmen.

Lec, M F 10:10; lab, T W or Th 9:05-11, 12:20-2:15, or 2:30-4:25. J. Sweeney.

A comprehensive introduction to financial accounting concepts and techniques, intended to provide the student with a basic understanding of the accounting cycle and the elements of financial statement analysis and interpretation. Concepts rather than procedures emphasized.

320 Business Law Fall. 3 credits. Limited to upperclass students.

Lec, M W F 9:05. One preliminary exam will be given in the evening. J. B. Bugliari.

Consideration is given chiefly to legal problems of particular interest to persons who expect to engage

in business, with emphasis on the fields of personal property, contracts, agency, real property, and partnerships and corporations.

321 Business Law Fall. 4 credits. Limited to upperclass students with permission of the instructor.

Lec, M W F 9:05; disc, M 4. One preliminary exam will be given in the evening. J. B. Bugliari. The lecture portion same as 320. Discussion portion will deal with practical applications of the legal principles covered in the course and attempt also to give some deeper insight into the role and function of the lawyer and the judiciary in our society.

322 Taxation in Business and Personal Decision Making Spring. 3 credits. Suggested prerequisites: at least one course in accounting and a course in business law.

Lec, M W 2:30-4. Instructor to be appointed. Impact of taxation, both state and federal, on business and personal decision making. State and local real property, income and sales taxes, federal income, and estate and gift taxes affecting individuals and corporations. Tax management of unincorporated businesses and smaller corporate firms. Tax policy and mechanics of taxation.

323 Managerial Accounting and Economics Fall. 3 credits. Prerequisites: 221 and Econ 102 or equivalents.

Lec, T Th 10:10; disc, Th F 12:20-2:15; 1:25-3:20; 2:30-4:25. Two preliminary examinations will be given in the evening. J. Sweeney.

An introduction to cost accounting with emphasis on the application of accounting and economic concepts to managerial control and decision making. Major topics include: basic costing, standard costing, cost behavior, cost allocation, pricing, budgeting, linear programming, inventory control, transfer pricing and measuring divisional performance.

324 Financial Management Spring. 3 credits. Prerequisites: 221 and Econ 102 or equivalents.

Lec, M W F 9:05; disc, W 2:30-4:25; Th 8-9:55; 12:20-2:15; F 9:05-11, 12:20-2:15. In weeks when discussions are held, there will be no Friday lecture. Discussions will be held instead of Friday lecture in all but two weeks of the term. Two preliminary examinations will be given in the evening. Instructor to be appointed.

Designed to give knowledge and understanding of business finance. Major topics include capital investment decisions; techniques for handling risk, uncertainty, and inflation in decision making; sources and forms of financing; financial structure; cost of capital; working capital management; and special problems of financial management in the small firm.

420 Advanced Business Law Spring. 3 credits. Limited to upperclass students.

Lec, T Th 8:30-9:55. One preliminary exam will be given in the evening. J. B. Bugliari. Designed to provide a fairly detailed and comprehensive legal background. Selected areas covered in 320 will be further developed, and particular consideration will be given to the law pertaining to bailments, sales, secured transactions, bankruptcy, negotiable instruments, insurance, and trusts and estates.

421 Advanced Business Law Spring. 4 credits. Limited to upperclass students with permission of instructor.

Lec, T Th 8:30-9:55; disc, T 4. One preliminary exam will be given in the evening. J. B. Bugliari. The lecture portion of this course will cover the same material as 420. The discussion portion will deal with practical application of certain of the legal principles covered in the course, such as sales contracts, consumer protection, mortgage transactions, bankruptcy proceedings, negotiable paper, insurance, and drawing a will.

424 Managerial Decision Making Spring. 3 credits. Limited to seniors with advisers in agricultural economics.

T Th 10:10-11:40. Instructor to be appointed. An integrating course which examines business policy formulation and execution from the standpoint of the corporate manager. Designed as an advanced course for potential business managers and owners. Includes the concepts and function of strategy, the nature of a company's environment, and the role of leadership in achieving business goals.

425 Personal Financial Management Spring. 2 credits. Primarily for seniors.

Lec, M 12:20-2:15; discussion period to be arranged. Second hour of lecture will be omitted in weeks when discussions are held. R. S. Smith. Managing personal income to maximize financial goals and objectives. Discussion sessions will be devoted to problems and case studies in financial planning for students and young families. Discussion leaders will include representatives of financial institutions, including banks and insurance companies.

[426 Cooperative Management Fall. 3 credits. M W F 12:20. Not offered 1978-79.

Considers the economic theory and function of cooperatives. The legal status of cooperatives and special problems of cooperative planning, organization, and control will be discussed.]

Economics of Agricultural Development

464 Economics of Agricultural Development Spring. 4 credits. Prerequisites: 150 or Econ 101-102, or permission of instructor.

T Th 9:05 and T or W 1:25. D. K. Freebairn. Examination of the processes of economic development in the developing nations, and their interactions with United States policy. Rural development policy will receive primary attention with emphasis on developing nations with a dominant agriculture sector, and on the key role of agriculture in the overall economic transformation of these economies.

660 Food, Population, and Employment Fall. 5 credits.

M W 2:30-4, plus an individual weekly meeting with the instructor. T. T. Poleman. Examines the linkages between employment, food, and population growth in less-developed countries. Food economics and the world food situation are treated as cornerstones and examined in historical perspective. A major term paper is stressed. To ensure students an opportunity to work individually with instructor, enrollment is limited to 15.

[665 Seminar on Latin American Agricultural Policy Fall. 3 credits. Prerequisite: 464 or permission of instructor. Not offered 1978-79.

T 2:30-4:25. D. K. Freebairn. An examination of policies for the development of the agricultural sector in Latin America, including an identification of policy objectives and a review of the instruments of public policy implementation. Particular attention is paid to the interactions of agrarian structure, agricultural productivity, and rural welfare.]

666 Seminar in Agricultural Development Fall or spring. 3 credits.

Hours to be arranged. An analysis of current problems for development of the agricultural sector of low-income countries with emphasis on the implications of such problems to the definition of research. The seminar will normally be taught by a visiting professor who has had recent direct experience in low-income countries.

668 Seminar in the Economics of Agricultural Development Spring. 1 credit.

Hours to be arranged. Staff. A joint exploration by staff and graduate students in international development of current research topics. Each student participant will be expected to prepare a presentation based on his or her thesis research.

Farm Business Management and Finance

302 Farm Business Management Spring. 4 credits. Not open to freshmen. 302 is a prerequisite for 402.

Lec, M W 10:10; one discussion period, F 8, 9:05, 10:10, 11:15, or 12:20; lab, T W or Th 1:25-4:25. On days farms are visited, the laboratory period is 1:25-5:30. One all-day trip and four half-day trips are taken to visit farm businesses. G. J. Conneman.

Focus is on the intensive study of problems associated with planning, organizing, operating, and managing a farm business. Emphasis is placed on the tools of managerial analysis and decision making. Topics include management information systems, business analysis, economic principles, and budgeting; acquisition, organization, and management of capital, labor, land, and machinery.

402 Advanced Farm Business Management Spring. 3 credits. Prerequisite: 302 or equivalent.

Lec, M W 9:05; disc, W Th 1:25-3:20. G. L. Casler. Emphasis is placed on evaluating the profitability of alternative investments and enterprises. Principal topics include the effects of income taxes on investment decisions, capital investment analysis, linear programming, and financial risk and uncertainty. Experience in computer applications to farm business management will be provided.

405 Farm Finance Spring. 3 credits. Prerequisite: 302.

Lec, T Th 10:10; disc, T 1:25-3:20. E. L. LaDue. A study of financial arrangements for farmers and the credit institutions that serve them. Emphasis is on problems of capital management associated with organizing and operating a commercial farm. Alternative sources of capital are analyzed and consideration given to safe and profitable debt levels and selection of alternative investment opportunities.

406 Farm and Rural Real Estate Appraisal Fall. 3 credits. Prerequisites: 302 or equivalent and permission of instructor. Enrollment limited to 45 students.

Lec, T Th 10:10; lab, Th 1:25-4:25; on days farms are visited the laboratory period is 1:25-5:30; one all-day trip. G. J. Conneman. Focus is on the basic concepts and principles involved in appraisal. Emphasis is placed on the study of factors governing the price of farms and rural real estate and methods of valuation. Practice is provided in the appraisal of farms and other rural properties.

407 Advanced Agricultural Finance Seminar Spring. 2 credits. Limited to seniors with extensive course work in farm management and farm finance.

Open by application prior to previous March 1. Limited to 16 students. T 3:35-5:30. Staff. A special program in agricultural finance conducted with financial support from the Farm Credit System. Includes two days at Farm Credit Banks of Springfield, two weeks in Farm Credit Association offices, all-day field trip observing FHA financing during fall term, a four-day trip to financial institutions in New York City during intersession, and lecture-discussions in the spring term. Representatives from banking, agribusiness finance, and similar areas participate in spring term lecture-discussion sessions.

409 Farm Management Seminar Fall. 1 credit. Open to seniors and graduate students. M 1:25-2:15. B. F. Stanton and staff.

Presentation and interpretation of research in farm management and production economics. All participants will present one seminar and prepare a publishable evaluation of research results directed toward farmers and extension and business leaders.

608 Production Economics Fall. 3 credits. Prerequisite: Econ 311 or equivalent; Math 108 or Math 111 or equivalent suggested. Lec, M W F 12:20. G. B. White.

A comprehensive survey of production economic theory with emphasis on applications to agriculture and agribusiness. Topics covered include the derivation and use of production, cost, and supply functions. Some time is spent on the application of production theory to special problem areas.

Marketing and Food Industry Management

240 Marketing Spring. 3 credits. Lec, M W F 11:15; disc, M 2:30-4:25; T 12:20-2:15; 2:30-4:25; W 2:30-4:25; Th 12:20-2:15; 2:30-4:25; or F 10:10-12:05. In weeks discussions are held, there will be no Friday lecture. D. C. Goodrich.

An introductory study of the food marketing system and the society it serves, including the goals and practices of farmers and marketers (in such areas as buying and selling, grading, transportation, packaging, and advertising), price-making institutions (such as commodity futures markets), the behavior and purchasing practices of consumers, and the interrelationships among these groups.

342 Marketing Management Fall. 3 credits. Prerequisites: 240, Econ 101-102. Lec, M W 10:10; disc, F 10:10. D. C. Goodrich. Designed to deal with principles and practices in the management of the marketing function. Emphasizes the revenue aspects of marketing by considering sales forecasting and strategies of the firm in product and brand selection, pricing, packaging, promotion, and channel selection. Identification and generation of economic data necessary for firm marketing decisions will be considered.

[346 Pricing Milk and Dairy Products Fall. 3 credits. Not offered 1978-79. Lec, M W F 11:15; disc, F 12:20. R. P. Story. A review of the structural characteristics of the dairy industry and an analysis of the pricing systems for market milk. Particular attention will be given to government programs, including marketing orders, price supports, and import policies.]

347 Marketing Horticultural Products. Fall. 3 credits. Prerequisite: 240 or equivalent. T Th 8:30-9:55. R. B. How. The study of markets, marketing channels, and marketing services for fruits, vegetables, and horticultural commodities. Evaluation of marketing alternatives facing growers, shippers, wholesalers, and retailers of horticultural products. The role of public agencies in market information and regulation. The potential for group action to improve marketing operations.

441 Food Distribution Fall. 4 credits. Limited to juniors and seniors. M W F 10:10 and W 2-4. G. A. German. A study of the structure and the competitive nature of the food industry. Attention is given to an analysis of the gross margin, expenses, and earnings of food retailers. Government regulations with regard to mergers and buying and selling activities are examined. Food industry specialists frequently join the discussion session.

443 Food Industry Management Spring. 4 credits. Limited to juniors and seniors. M W F 10:10 and W 2-4. Instructor to be appointed.

A case-study approach is used to examine the application of management principles and concepts to operating problems of food retailers. Areas included are site selection, buying, merchandising, personnel administration, private label products, and financing expansion programs. Leading food industry specialists frequently join the discussion session.

448 Food Merchandising Spring. 2 credits. Prerequisite: permission of instructor. Lec, Th 2:30-4:25. G. A. German. Merchandising principles and practices as they apply to food industry situations. The various elements of merchandising will be examined including buying, pricing, advertising, display, store layout, profit planning and control, and merchandising strategy.

449 Field Study of Marketing Institutions Spring. 2 credits. Registration by permission. M 12:20. G. A. German. Economic functions performed by various types of specialized marketing agencies, with emphasis on their physical operating patterns. Observations are made of the organization and operation of businesses in the food industry. Five days of spring vacation are spent in Boston visiting food distribution firms and marketing institutions. This trip will cost approximately \$125.

740 Marketing Research Spring. 2 credits. Prerequisite: permission of instructor. Lec, Th 12:20-2:15. M. E. Brunk. Objectives of marketing research, organization and management of research, organization and management of research agencies, problem identification, selecting and planning projects, designing, and use of research by management.

[741 Agricultural Markets and Prices Fall. 3 credits. Prerequisites: 710 and 712 suggested. Not open to undergraduates. Not offered 1978-79. T Th 12:20-2:15. W. G. Tomek. A theoretical and empirical study of agricultural commodity markets. Topics include the demand for and supply of farm products; marketing margin, spatial, temporal, and cash-futures relationships; efficiency concepts; and imperfect competition in agricultural markets.]

742 Agricultural Marketing and Public Policy Spring. 3 credits. Open only to graduate students. Prerequisites: 710, 711 and a course in Industrial Organization suggested. T Th 12:20-2:15. W. H. Lesser. A development of the concepts and methodology for applying and analyzing the effects of public policy directives on the improvement of performance in the U.S. food marketing system. Topics include a survey of industrial organization principles, anti-trust and other legal controls, coordination systems in agriculture, cooperative theory and performance, price information and price discovery methods and consumer oriented issues. An application of these techniques to commodity marketing and the analysis of marketing problems in developing economies is also covered.

743 Export Marketing Fall. 2 credits. Graduate students only. Lec, Th 2:30-4:25. M. E. Brunk. History and development of commercial United States exports of agricultural commodities and the mechanics and procedures of exporting. Alternatives in sales contracts, shipping, insurance, financing business structure, researching markets, and promotion. Trading experiences of specific commodity specialists. Overnight field trip to New York City required. (Estimated cost of trip: \$35.)

Public Policy

Attention is directed to course offerings in the Departments of City and Regional Planning, Consumer Economics and Public Policy, Economics, Government, and Natural Resources, and the Schools of Civil and Environmental Engineering and Business and Public Administration.

150 The Economics of Agricultural Geography Fall. 3 credits.

Lec, M W F 11:15; D. G. Sisler. The economics and geography of world agriculture, providing a basis for understanding past development and future changes. Elementary economic principles, historical development, physical geography, and population growth are studied in their relation to agricultural development and the economic problems of farmers. Where possible, current domestic and foreign agricultural issues are used to illustrate principles.

151 Selected Topics in the Economics of Agricultural Geography Fall. 4 credits. Enrollment limited to students majoring in agricultural economics (students' advisers must be within the department).

Lec, M W F 11:15; disc, T 12:20-1:50; 2:30-4; W 2:30-4; Th 12:20-1:50; 2:30-4. D. G. Sisler. The lecture portion of this course will cover the same material as 150. The discussion portion will have a geographic focus with particular emphasis on how economics and human institutions interact with the natural resource base. Topics covered will include agricultural technology and rural poverty, urban-rural conflicts, the humid tropics, economic development and population problems, and agriculture in China and the Soviet Union.

250 Introduction to Resource Economics Spring. 3 credits.

Lec, M W F 11:15. D. Chapman. An introduction to the economic concepts and methods used in analyzing natural resource problems. These include the costs of production, pricing policies, demand and consumption, nonmarket costs and benefits, and relationships between private and public sectors. Also relevant are the effects of national economic policy on resource use, the economic definition of social welfare, and the problems of finite and renewable resources. Emphasis is placed upon application to specific resource problems such as energy production and use.

332 Economics of the Public Sector Fall. 3 credits. Prerequisite: Econ 102 or equivalent. Lec, M W F 11:15; disc, W 7:30-9 p.m.; Th 12:20-1:50; F 12:20-1:50; 2:30-4. Friday lecture will not be held in weeks discussions are held. Instructor to be appointed.

Application of economic concepts to evaluation of the structure and performance of the private and public sectors of the economy. Emphasis on microeconomic analysis of public finance and resource allocation. Principal topics: market failure, income distribution, taxation, evaluation of public expenditures, articulation of public interest, and current public policy issues.

333 Economics of the Public Sector, Advanced Discussion Fall. 1 credit. S-U grades optional. Prerequisite: 352 or Econ 311; corequisite: 332. Disc, Th 2:30-4:25. Instructor to be appointed. Will treat topics introduced in lecture at a more advanced level. Discussions will deal with theoretical and practical aspects of public finance.

350 Resource Economics Fall. 3 credits. Suggested prerequisite: Nt Res 201 and an introductory economics course or permission of instructor.

Lec, T Th 10:10; disc, T 1:25-3:20 and as arranged. D. J. Allee, H. E. Conklin.

8 Agricultural Economics

The application of economic and political science concepts to the use of natural resources with varying attention to water, land, forests, and fisheries. Attention will be given to regional growth, the impact of urban growth, and public decision making in the resources and environmental management area.

351 Farm and Food Policies Fall. 3 credits. S-U grades optional.

Lec, T Th 9:05; disc, Th 11:15 or 1:25; F 10:10.
K. L. Robinson.

The course deals broadly with farm and food policies, including price-support and storage programs, the potential role of food aid, agricultural trade policies, domestic food subsidies, and rural poverty.

352 Agricultural Prices Spring. 3 credits.

Suggested prerequisite: Econ 101-102.

M W F 11:15. K. L. Robinson.

An analysis of supply and demand characteristics of farm commodities; institutional aspects of pricing farm and food products; temporal and spatial price relationships; price forecasting; and the economic consequences of pricing decisions.

430 Agricultural Trade Policy Fall. 3 credits.

Primarily for seniors and M.S. candidates.

Prerequisites: 351, 352 or Econ 311.

Lec, T Th 11:15; disc, W 12:20. D. Blandford.

An examination of the rationale and method of commodity trade policy. The course analyzes problems and issues in both developed and less developed countries and deals with the major questions associated with the organization of international commodity markets.

450 Evaluating Resource Investment and Environmental Quality Spring. 3 credits.

Prerequisite: an introductory course in economics and/or a 300-level course, or permission of instructor. Primarily for juniors and seniors.

T Th 10:10-11:30; other discussion as arranged.
D. J. Allee.

Means of reaching decisions on environmental questions. Concepts of social value and cost-benefit analysis, determination of degrees of importance of environmental problems, environmental impact statements, definitions of environmental quality, and questions of political economy.

452 Agricultural Land Policy Spring. 3 credits.

Lec F 8-9:55; disc, F 1:25-4:25; field trips to be arranged. H. E. Conklin.

An examination of changes made in recent decades in the institutional arrangements that control the use of farm land in northeastern United States; of the manner in which these changes have been made; and of the groups that have pressed for and against these changes. The field trips will be designed to familiarize students with local and state agencies and legislatures and with special interest groups.

650 Economic Analysis of Public Policy Spring.

4 credits. Primarily for graduate students, but open to seniors. Prerequisites: Econ 311 or 511, Calculus, or permission of instructor.

T Th 9:05-11. J. M. Conrad.

A review of the theoretical foundations underlying the analysis of public policy. The theory and techniques of cost-benefit analysis, cost effectiveness, and multiple objective programming will be covered. Special emphasis will be given to public policy aimed at improving environmental quality and the management of renewable and nonrenewable resources. The theory of externalities and dynamic optimization will be introduced using economic models of the natural environment and natural resource systems. Five case studies will be presented.

651 Economics of Exhaustible Resources Fall. 4 credits.

Lecture/seminar to be arranged. L. D. Chapman. Economic theory relevant to problems of finite

resources, including macroeconomics and dynamic optimization. Application to particular resources such as petroleum and forestry. Recent developments in empirical analysis, including demand forecasting, supply-demand simulation, and substitutability between energy, capital, and labor.

652 Special Problems in Land Economics Fall

or spring. 1 or more credits. Graduate students only. Prerequisite: permission of instructor.

Hours to be arranged. D. J. Allee, H. E. Conklin. Special work on any subject in the field of land economics.

730 Seminar on Agricultural Trade Policy Fall

(offered even numbered years only). 3 credits. Open only to graduate students. Prerequisites: 430 and basic familiarity with quantitative methods.

F 1:25-4. D. Blandford and D. G. Sisler.

A discussion of selected topics in agricultural trade policy such as export promotion versus import substitution in developing countries, and the role of international commodity agreements. The preparation of a term paper is an important part of the course.

[731 Seminar on Methods of Trade and Commodity Policy Analysis Fall (odd numbered years only). 3 credits. Open only to graduate

students. Prerequisites: a basic training in quantitative methods (710 and 712 or equivalent) and permission of instructor. Not offered 1978-79.

F 1:25-4. D. Blandford.

A discussion of the structure, use, and usefulness of alternative quantitative methods of commodity policy analysis. The preparation of a term paper is an important part of the course.]

[751 Seminar on Agricultural Policy Spring.

2 credits. Open only to graduate students. Offered in alternate years. Not offered 1978-79.

M 1:25-3:20. K. L. Robinson.

A discussion of current policy issues related to food and agriculture and techniques appropriate to the analysis of such issues.]

752 Readings in Philosophy Spring. 3 credits.

Open only to Ph.D. candidates.

S 9:05-12. H. E. Conklin.

Readings are selected for their relevance to research in agricultural economics and are chosen from among books such as *Structure of Scientific Revolutions*, *The Theory of Experimental Inference*, *The Nerves of Government*, *Economics as a Science*, and *A Theory of Economic History*.

Quantitative Methods

Attention is directed to related courses in economics, economic and social statistics (ILR), industrial engineering and operations research, mathematics, and statistics and biometry; selected courses particularly relevant to agricultural economics are dual listed.

310 Introductory Statistics Fall. 3 credits.

Prerequisite: Orientation 115 or equivalent level of algebra.

Lec, M W F 12:20; lab, M 2:30, 3:35, T 2:30, 3:35, W 2:30, 3:35. Instructor to be appointed.

An introduction to statistical inference including probability concepts, estimation, hypothesis testing, and linear regression.

412 Introduction to Linear Programming

Spring. 3 credits. Primarily for juniors, seniors, and M.S. candidates. Prerequisite: 310 or equivalent.

Lec, M W 10:10; disc, W 1:25 (if 30 or more students, Th 1:25 also). B. F. Stanton.

Introduction to the concepts and computational procedures of linear programming. Emphasis on interpretation of results, model building and data requirements for estimation using standard computer programs. Topics include sensitivity analysis,

parametric programming, the transportation problem, scheduling, and distribution. Primary applications are made to agriculture and business.

710 Econometrics I Spring. 4 credits.

Prerequisites: Statistics and Biometry 416 and 601, or their equivalents. Not open to undergraduates.

Lec, T Th 2:30-4:25. T. D. Mount.

A comprehensive treatment of the classical linear regression model at the level of *Econometric Methods* by Johnston. Generalized least squares, analysis of covariance, and elementary distributed lag models are introduced. Simultaneous equations estimators constitute about 30 percent of the course. Principles of econometrics are emphasized as a basis for empirical research.

711 Econometrics II Fall. 4 credits. Prerequisite:

710 or equivalent; Statistics and Biometry 417 recommended.

Lec, M W 3:35-5. T. D. Mount.

Additional coverage (beyond that of 710) of generalized least squares, models with stochastic regressors, testing linear hypotheses, and the effects of specification errors. Applications include seemingly unrelated regressions, estimation with pooled data, models with stochastic coefficients, and distributed lag models. Other topics covered are principal components, factor analysis, and probit and logit analysis. Applications emphasize single equation models.

712 Quantitative Methods I Fall. 4 credits.

Prerequisite: Statistics and Biometry 416 or equivalent; Statistics and Biometry 417 suggested but not required.

Lec, M W F 11:15; discussion arranged.

R. N. Boisvert.

Comprehensive treatment of linear programming and its extensions, including postoptimality analysis and the transportation model. Special topics in integer and nonlinear programming, including spatial equilibrium and risk programming models. Input-output models are treated in detail. Applications are made to problems in agricultural, resource, and regional economic problems.

713 Quantitative Methods II Spring. 4 credits.

Prerequisite: 712 or consent of instructor.

Lec, M W F 9:05-9:55; disc, F 1:25. R. A. Milligan.

A study of quantitative techniques used to solve dynamic problems. The first half of the course concerns simulation. The second major topic is dynamic optimization.

[714 Econometric Models Spring. 3 credits.

Offered in alternate years. Not offered 1978-79.

Lec, hours to be arranged. T. D. Mount,

W. G. Tomek.

The theory and art of specifying and evaluating econometric models. Topics include economic theory as a guide to model building, evaluating parameters estimates, sequential estimators, and evaluating the forecasting ability of a model. Empirical studies in agricultural economics provide a basis for discussion.]

717 Research Methods in Agricultural

Economics Spring. 2 credits. Open to graduate students only.

M 1:25-3:20. B. F. Stanton and D. G. Sisler.

Discussion of the research process and scientific method as applied in agricultural economics. Topics include problem identification, hypotheses, sources of data, sampling concepts and designs, methods of collecting data, questionnaire design and testing, field organization, analysis of data, and development of research proposals.

See also:

Statistics II (I & LR 311)

Introduction to Computer Uses in Data Analysis (Ag Eng 304)

Matrix Algebra I (Stats 416)**Matrix Algebra II (Stats 417)****Other Courses****380 Independent Honors Research in Social Science**

Fall and spring. 1 to 6 credits. Open only to candidates who have met the requirements for the honors program. A maximum of six credits may be earned in the honors program.

499 Undergraduate Research

Fall and spring. 1 to 4 credits. S-U grades optional. Student must attach to preregistration material the written permission of the staff member who will supervise the work and assign the grade. Open to seniors with quality point averages of 2.7 or higher. Permits outstanding undergraduates to carry out independent studies of suitable problems under appropriate supervision.

699 Graduate Research

Up to six credits. Prerequisite: graduate standing and permission of major adviser.

700-701 Special Topics in Agricultural Economics

Fall or spring. Credit to be arranged. Open only to graduate students. Staff. A group discussion of areas of special interest in the field of agricultural economics. Students will be required to review literature and present oral and/or written reports.

Agricultural Engineering

N. R. Scott, chairman; L. D. Albright, R. D. Black, J. K. Campbell, J. R. Cooke, E. O. Eaton, E. W. Foss, R. B. Furry, W. W. Gunkel, R. W. Guest, D. A. Haith, W. W. Irish, L. H. Irwin, W. J. Jewell, F. G. Lechner, G. Levine, R. C. Loehr, H. A. Longhouse, R. T. Lorenzen, D. C. Ludington, E. D. Markwardt, W. F. Millier, R. A. Parsons, D. R. Price, G. E. Rehkugler, E. S. Shepardson, J. W. Spencer, T. S. Steenhuis, M. F. Walter

101 Mechanical Drawing

Fall. 3 credits. Lec, T Th 8; lab, W 1:25-4:25. H. A. Longhouse. Introduction to mechanical drawing including lettering, sketching, multiview drawings, sections, auxiliaries, revolutions, pictorial drawings, elementary descriptive geometry, and the application of these principles to problems. Both machine and architectural drawing conventions are discussed.

110 Farm Metal Work

Fall or spring. 2 credits. Lec, Th 9:05; fall labs, M T 1:25-4:25; spring labs, M T or Th 1:25-4:25. F. G. Lechner. Monday lab, limited to 24 students, includes instruction in the fundamentals of metal lathe work and arc and oxyacetylene welding. Tuesday and Thursday labs, limited to 20 students, include instruction in sheet metal work, pipe fitting, hot and cold metal work, and arc and acetylene welding.

131 Elements of House Design

Spring. 3 credits. S-U grades optional. Lec, T Th 10:10; lab, T W or Th 1:25-4:25. L. D. Albright.

An introduction to the design process. The basic principles of planning and design of buildings and systems for human habitation with emphasis on the rural dwelling. Topics include site selection, structural design, water and waste water systems, electrical systems, lighting, heating, ventilation, and air conditioning.

132 Farm Carpentry

Fall. 2 credits. Lec, T 9:05; labs, limited to 15 students, T W or Th 1:25-4:25. F. G. Lechner. Instruction in the fundamentals of farm carpentry, including concrete work, and equipment and

buildings constructed of wood. Each student is required to plan and construct an approved carpentry project. Indoor furniture projects are not acceptable.

151 Introduction to Agricultural Engineering and Computing

Fall. 2 or 3 credits. Prerequisite: one term of calculus or concurrent registration. Lec, T F 1:25-2:15; rec-lab, T F 2:30-4:25. G. E. Rehkugler.

An introduction to digital computing with the PL/C language through the use of computing problems specifically in agricultural engineering subjects and generally in related areas such as environmental technology and agriculture. Basics of PL/C will be completed in 10 weeks for 2 credits. The remaining study will introduce interactive computing through APL.

152 Engineering Drawing

Spring. 3 credits. Lec, M W 8; lab, M or T 1:25-4:25. H. A. Longhouse. Designed to promote an understanding of the engineer's universal graphic language. The lectures and laboratories will develop working knowledge of drawing conventions, drafting techniques, and their application to machine, architectural, and pictorial drawing problems. Introduction to descriptive geometry and problem-solving techniques also will be included.

201 Energy and Man

Spring. 3 credits. Lec, M W F 10:10. L. D. Albright. Basic concepts of energy. Energy use in agriculture and the food system. Traditional and alternate sources of energy. Individual attitudes and energy conservation will be explored. The energy transfer process will be investigated. Topics will include heating, cooling, drying, solar radiation, electricity, refrigeration, wind power, geothermal, OTEC, and biogas production.

221 Plane Surveying

Fall. 3 credits. S-U grades optional. Limited to 90 students, 30 per laboratory. Lec, T Th 11:15; lab, M T or W 1:25-4:25. H. A. Longhouse.

An introduction to plane surveying. The use and care of equipment is stressed while doing field problems related to construction and mapping.

271 Applied Hydraulics

Spring. 3 credits. S-U grades optional. Lec, T Th 9:05; lab W 1:25-4:25. Lab limited to 30 students. R. D. Black. Elements of fluid mechanics and hydrology as applied to common problems in nature associated with the flow of water. Emphasis will be on the practical problems related to flow in pipes, open collection, data analysis, and hydromachinery.

301 Safety and Accident Prevention

Spring. 2 credits. S-U grades optional. Lec, T Th 9:05. E. W. Foss. Educational programs, engineering design, and legal efforts including the Federal Occupational Safety and Health Act will be studied. Safety related organizations ranging from local police and fire departments to international organizations such as National Fire Protection Association and the United Nations will be reviewed. Emphasis will be placed on agricultural and rural applications.

304 (314) Introduction to Computer Uses in Data Analysis

Spring. 3 credits. S-U grades optional. Prerequisite: one course in college mathematics or statistics or permission of instructor. T Th 11:15; lab to be arranged. R. B. Furry. An introductory course in computing open to all students having interests in utilizing digital computers for data handling. Topics include description and preparation of data; preparation and processing computer programs; computer attributes and applications; computer library programs; and related computing facilities. No prior knowledge of computers or computing languages is necessary.

305 Principles of Navigation

Fall. 4 credits. 3 lec, disc, and project period at times to be arranged. R. D. Black. Coordinated systems, chart projections, navigational aids, instruments, compass observations, tides and currents, soundings. Celestial navigation: time, spherical trigonometry, motion of stars and sun, star identification, position fixing, Nautical Almanac. Electronic navigation.

310 Advanced Farm Metal Work

Fall or spring. 1 credit; spring, 1 or 2 credits. Prerequisite: 110 or permission of instructor. Lab, fall and spring, F 1:25-4; for 2 credits a second lab must be arranged. F. G. Lechner. Fall, advanced machine shop. Spring, advanced welding and metal construction project.

311 Farm Machinery

Fall. 3 credits. Not open to freshmen. Not offered 1978-79. Lec, T Th 10:10. One rec-lab each week, T W or Th 1:25-4:25. Limited to 15 students each lab section. W. F. Millier.

A study of the operating principles, use, selection, and methods of estimating costs of owning and operating farm machines. The laboratory work will include practice in the calibration of planting, fertilizing, and pesticide application machinery, plus study of the functional characteristics of agricultural machines and machine components.]

312 Internal Combustion Engines For Agriculture

Spring. 3 credits. Lec, T Th 11:15; lab, T W or Th 1:25-4:25. Limited to 16 students per lab section. W. F. Millier. A study of the principles of operation, the adjustment and maintenance of hydrocarbon fueled single and multicylinder internal combustion engines. Topics include engine cycles, fuels, lubricants, carburetion, fuel injection systems, ignition, charging circuits, pollution control methods, valve reconditioning, and engine testing.

315 Electricity on the Farm

Spring. 3 credits. Prerequisite: 131 or Phys 102 or equivalent. Lec, T Th 10:10; lab, T or Th 1:25-4:25. Staff. The application of electricity for light, heat, and power on farms, with emphasis on the principles of operation, selection, and installation of electrical equipment for the farmstead.

321 Soil and Water Conservation

Spring. 2 credits. S-U grades optional. Must be taken with Agron 321. Lec, F 8; disc-lab, M or T 1:25-4:25. Additional labs offered if enrollment requires. Instructor to be assigned.

A study of the principles and practices used in the solution of soil and water conservation problems. Both farm and nonfarm problems are explored. Engineering aspects of erosion control, water management, water storage, and drainage are examined.

325 Introduction to Environmental Pollution

Spring. 3 credits. S-U grades optional. M W F 9:05. D. C. Ludington. A general course dealing with impairment of the environment by the wastes of man. The causes and effects of air, water, and soil pollution will be discussed. Fundamental factors underlying waste production, abatement, treatment, and control will be included. Wastes from urban, rural, and industrial areas will be used to illustrate the factors.

331 Farmstead Production Systems

Fall. 3 credits. S-U grades optional. M W F 8. R. T. Lorenzen. A study of layout, materials handling, and environment associated with agricultural production on the farmstead. Planning and design techniques pertaining to biointrinsic and integrated systems are emphasized.

10 Agricultural Engineering

332 Farm Buildings Design

Fall. 2 credits. Prerequisite: concurrent or previous registration in 331.

Lec-lab combination, Th 1:25-4:25. R. T. Lorenzen. Structural and thermal design of buildings used for farmstead production systems. Wood is emphasized as a structural material. For students with no background in statics or properties of structural materials.

400 Special Problems in Agricultural Engineering

Fall or spring. 1 credit or more. Normally reserved for seniors in upper two-fifths of class; undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade. Prerequisite: adequate ability and training for the work proposed.

* Staff.

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

401 Career Development in Agricultural Engineering

Fall. 1 credit. S-U grades optional. Open only to seniors.

Lec, T Th 10:10. W. W. Gunkel. Presentation and discussion of the opportunities, qualifications, and responsibilities for positions of service in the various fields of agricultural engineering.

461 Agricultural Machinery Design

Fall. 3 credits. Offered in alternate years. Prerequisite: mechanical design or equivalent.

Lec, T Th 10:10; lab, Th 1:25-4:25. W. W. Gunkel. The principles of design and development of agricultural machines to meet functional requirements. Emphasis is given to computer-aided analysis and design, stress analysis, selection of construction materials, and testing procedures. Engineering creativity and agricultural machine systems are also stressed.

462 Agricultural Power

Spring. 3 credits. Offered in alternate years. Prerequisite: engineering mechanics (dynamics) or equivalent. Not offered 1978-79.

Lec, T Th 10:10; lab, M 1:25-4:25. W. W. Gunkel. Use of energy in agriculture. Emphasis is given to basic theory and analysis and testing of internal combustion engines and suitable components for use in farm tractors and other power applications. Soil mechanics related to traction and vehicle mobility; economics and human factors in design will be considered.]

465 Processing and Handling Systems for Agricultural Materials

Fall. 3 credits. Offered in alternate years.

Lec, T Th 11:15; lab, T 2:30-4:25. R. B. Furry. Drying, psychrometrics, fluid flow measurement, heat transfer applications, with an introduction to dimensional analysis and controls for agricultural applications. Problem solutions employ both analog and digital computers.

466 Engineering Design and Analysis of Food Processing Equipment

Spring. 3 credits. Prerequisite: Food Science 302, its equivalent, or enrollment in an engineering curriculum.

T Th 9:05, W 1:25-4:25. G. E. Rehkugler. The analysis and design of food processing equipment from the point of view of selecting and designing equipment that is appropriate for transport or modification of a food product.

471 Soil and Water Engineering

Fall. 3 credits. Prerequisite: fluid mechanics or hydraulics and soils, or concurrent registrations, or permission of instructor.

Lec, T Th 9:05; lab, W 2:30-4:25. M. F. Walter. The application of engineering principles to problems of soil and water management. Hydrology,

design and construction of erosion control systems, channel stabilization, small reservoirs, earth embankments, drainage, and hydraulic structures.

475 Introduction to Environmental Systems

Analysis Fall. 3 credits. Prerequisite: 1 year of calculus.

M W F 1:25-2:15. D. A. Haith. Introduction to systems analysis and its application to environmental quality management. Simulation, linear programming, and dynamic programming applied to problems in water and air pollution control, solid waste disposal, agricultural wastes, etc.

481 Agricultural Structures Design

Spring. 3 credits. Offered during alternate years. Prerequisite: Structural Engineering I. Not offered 1978-79.

2 lec and 1 disc-lab, hours to be arranged. Staff. Application of basic structural concepts to design of agricultural structures. Emphasis on wood structures, including design of trusses, rigid frames, prefabricated panels, and columns.]

482 Environmental Control for Animals and Plants

Fall. 3 credits. Offered during alternate years. Prerequisite: thermodynamics.

2 lec, 1 disc-lab, hours to be arranged. J. A. DeShazer. Thermal interchanges between animals (including man) and plants with the environment. Physiological principles affecting thermal comfort and health. Ventilation, air conditioning, psychrometrics, solar energy, and weather phenomena.

491 Highway Engineering

Fall. 3 credits. Prerequisite: Civil Engineering D301 recommended or permission of instructor.

Lec, W F 12:20; lab, M 12:20-3:20. L. H. Irwin. Study of highway systems, planning, economy analysis, road location and geometric design, traffic engineering, drainage design and soil engineering. Introduction to highway materials, pavement design, and highway maintenance.

492 Bituminous Materials and Pavement Design

Spring. 3 credits. Prerequisite: concurrent registration in Civil Engineering D301 or permission of instructor.

Lec, W F 12:20; lab, M 12:20-3:20. L. H. Irwin. Properties of asphalts, aggregates, and bituminous mixtures; bituminous mixture design. Seal coat and surface treatment design. Soil stabilization methods. Flexible pavement design methods; rigid pavement design methods; pavement design for frost conditions.

501-502 MPS Project

Fall and spring. Total credit up to six hours.

Hours to be arranged. Staff. Comprehensive project utilizing applied problems pertinent to agricultural engineering. Required of each MPS candidate in the field.

551-552 Agricultural Engineering Design

Project Fall and spring. 6 credits. Prerequisite: admission to the M. Eng. (Agr.) degree program or equivalent preparation.

Hours to be arranged. L. D. Albright and staff. Comprehensive design projects dealing with existing engineering problems in the field. Emphasis is on the formulation of alternate design proposals which include consideration of economics, nontechnical factors, engineering analysis, and complete design for the best alternative design solution.

600 Special Topics in Agricultural Engineering

Fall or Spring. 1-6 credits. S-U grades optional. Undergraduates must attach to their preregistration material written permission from the staff member in

charge of course. Prerequisite: permission of instructor.

Time to be arranged. Staff. Topics to be studied will be arranged by the staff at the beginning of the term.

651 Similitude Methodology

Fall. 3 credits. 2 lec, 1 lab, hours to be arranged. R. B. Furry. Similitude methodology, including the use of dimensional analysis to develop general equations to define physical phenomena; model theory, distorted models, and analogies, with an introduction to a variety of applications in engineering.

652 Instrumentation

Spring. 3 credits. Prerequisite: electrical systems or permission of instructor.

2 lec, 1 lab, hours to be arranged. Staff. Application of instrumentation concepts and systems to physical and biological measurements. Characteristics of instruments, signal conditioning and interfacing, shielding and grounding, transducers, data acquisition systems, and radiotelemetry are considered.

672 Drainage Engineering

Spring. 3 credits. Offered in alternate years. Prerequisite: 471 or permission of instructor. Not offered 1978-79.

Lec, T Th 9:05; lab, Th 1:25-4:25. R. D. Black, T. S. Steenhuis.

Analysis and design of surface, subsurface, and combined drainage systems with emphasis upon agricultural applications. The elements of surface, channel, and porous media flow will be analyzed as well as entire systems of collectors, storages, pumps, and methods of overflow protection for large areas. Effect of drainage on water quality will be reviewed.]

677 Treatment and Disposal of Agricultural

Wastes Fall. 3 credits. Prerequisite: permission of instructor.

3 lec, hours to be arranged. W. J. Jewell. Emphasis is on the causes of agricultural waste problems and application of fundamentals of treatment and control methods to minimize related pollution. Fundamentals of biological, physical, and chemical pollution control methods are applied to animal wastes, crop production, and food and fiber processing wastes in examples and design of management systems.

678 Water Quality Models for Nonpoint Sources

Spring. 2 credits. Prerequisite: permission of instructor.

Hours to be announced. D. A. Haith. Mathematical models for the prediction and management of water pollution from agricultural runoff, urban runoff, and seepage to ground waters.

679 Use of Land for Waste Treatment and Disposal

Spring. 3 credits. Prerequisite: permission of instructor.

2 Lec T Th 3:35-4:50. W. J. Jewell. Three areas are covered: the socio-legal-technical factors; the properties of land and crop systems that make land application of wastes a viable alternative; and the use of fundamentals to development of regulations and the design of full-scale units.

685 Biological Engineering Analysis

Fall. 4 credits. Prerequisite: permission of instructor, or Engineering T & AM 311.

T Th 10:10-11:40. Staff. Engineering problem-solving strategies and techniques will be explored. The student will solve several representative engineering problems which inherently involve biological properties. The mathematical modeling will emphasize problem formulation and interpretation of results. The student's knowledge of fundamental principles will be used extensively. Principles of feedback control theory will be applied to biological systems.

700 General Seminar Fall and spring. Noncredit. M 12:20. N. R. Scott.
Presentation and discussion of research and special developments in agricultural engineering and related fields.

750 Orientation for Research. Fall. 1 credit. S-U grades only.

Lec, M 4 except first 5 weeks, 3:20.
G. E. Rehkugler.

Introduction of newly joining graduate students to departmental research policy, programs, methodology, resources, and candidate responsibilities and opportunities.

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

Hours to be arranged. W. W. Gunkel.
Study and discussions of research and new developments in agricultural power and machinery.

771 Soil and Water Engineering Seminar

Spring. 1 to 3 credits. S-U grades optional. Prerequisite: graduate status and/or permission of instructor.

Hours to be arranged. Staff.
Study and discussion of research or design procedures related to selected topics in irrigation, drainage, erosion control, agricultural hydrology, and water quality.

775 Agricultural Waste Management Seminar

Spring. 1 credit. S-U grades only. Prerequisite: permission of instructors.
Hours to be announced. Staff.
Management of agricultural wastes with emphasis on physical, chemical, biological, and economic factors effecting waste production, treatment and handling, utilization, and disposal.

781 Agricultural Structures and Related Topics Seminar

Spring. 1 credit. S-U grades only. Prerequisite: graduate status or permission of instructor.
1 disc, hours to be arranged. N. R. Scott.
Consideration of farmstead production systems with emphasis on biological, economic, environmental, and structural requirements.

785 Biological Engineering Seminar

Spring. 1 credit. S-U grades only. Prerequisite: graduate status or permission of instructor.
1 disc, hours to be arranged. N. R. Scott, J. R. Cooke.
The interaction of engineering and biology will be examined, especially the environmental aspects of plant, animal, and human physiology in order to improve communications between engineers and biologists.

Agronomy

R. F. Lucey, chairman; M. Alexander, W. H. Allaway, R. W. Arnold, D. R. Bouldin, W. B. Duke, J. M. Duxbury, G. W. Fick, D. L. Grunes, W. K. Kennedy, W. R. Knapp, J. Kubota, D. J. Lathwell, E. R. Lemon, A. C. Leopold, D. L. Linscott, M. B. McBride, R. D. Miller, R. B. Musgrave, R. L. Obendorf, G. W. Olson, J. H. Peverly, W. S. Reid, T. W. Scott, R. R. Seaney, T. R. Sinclair, P. L. Steponkus, E. L. Stone, F. N. Swader, A. Van Wambeke, R. M. Welch, M. J. Wright

Crop Science

111 Introduction to Crop Science Fall or spring. 4 credits. No prerequisite.

Lec, M W F 10:10; fall lab, M T W Th or F 1:25-4:25; spring lab, M T W or Th 1:25-4:25. Fall, R. L. Obendorf. Spring, to be announced.

Principles of field crop growth, development and maturation, species recognition, soil and climatic adaptations, liming and mineral nutrition, weed control, cropping sequences, management systems, and crop improvement are considered. Feed crops for livestock and food and fiber crops including forage, grain, protein, and oil crops are emphasized. Field trips (one or two) to study experimental methods and/or farm operations are held during laboratory periods until 5 or on weekends.

312 Feed Crops Spring. 4 credits. Prerequisites: 111 or equivalent; Anim Sci 112 is recommended.

Lec, M W F 8; disc, T 9:05. G. W. Fick.
The production and management of crops used for livestock feed are considered in terms of establishment, growth, maintenance, harvesting, and preservation. Forage grasses, forage legumes, and corn are emphasized and consideration is given to their value as livestock feed in terms of energy, protein, and other nutritional components.

315 Weed Science Spring. 3 credits.

Prerequisites: 111, 200, and Bio S 103 and 104 or Bio S 145.
Lec, T Th 8; lab, M T or W 2-4:25. W. B. Duke.
Principles of weed science are examined. Emphasis is given to (a) weed ecology; (b) chemistry of herbicides in relation to effects on plant growth; and (c) control of weeds in all crops. Laboratory covers factors that affect herbicide activity and includes some weed identification.

371 Undergraduate Research in Crop Science

Fall or spring. Credit to be arranged. Written permission from the staff member who will supervise the work and assign the grade must be attached to preregistration material.
Hours to be arranged. Staff.
Independent research on current problems selected from any phase of crop science.

422 Production of Tropical and Subtropical Crops

Spring. 3 credits. Prerequisite: a course in crop production.
Lec, M W F 10:10. M. J. Wright.
An introduction to the characteristics and culture of the principal food staple crops of the tropics and subtropics, and of some of the crops grown for export. Vegetables and fruits are not emphasized.

611 Analysis and Computer Simulation of Crop Production

Fall. 3 credits. Offered in alternate years. Prerequisite: permission of instructor; plant physiology and computer programming suggested.
M W F 11:15. G. W. Fick.
Study of existing crop models is followed by development and refinement of programs representing the students' work. The computer language CSMP is used. Emphasis is placed on quantitative formulation and testing of complex hypotheses related to crop growth. Carbon exchange, transpiration, microclimate, soil water supply, root functions, and dry matter distribution in growing crops are covered.

[613 Crop Ecology Fall. 2 credits. Offered in alternate years. Prerequisites: 111, 200, and Bio S 242. Class meetings to be twice weekly for last ten weeks of semester for two hours per meeting. Not offered 1978-79.

Hours to be arranged. Staff.
A study of special techniques used to obtain and analyze physiological data on crop plant responses to environmental conditions occurring in the field.]

651 Special Topics in Crop Science Fall or spring. 1 to 6 credits. S-U grades optional.

Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade.
Hours to be arranged. Staff.
The topic to be treated will be arranged at the beginning of each term for individual self-study or for group discussions.

761 Graduate Research in Crop Science Fall, spring, or summer. Credit and hours by arrangement. Not open to undergraduates. Open to all members of the graduate field.

790 Agronomy Seminar Noncredit. See Agronomy—Soil Science.

See also:

Forages of the Tropics for Livestock Production (An Sc 403)

Special Studies of Problems of Agriculture in the Tropics (Int Ag 602)

Soil Science

200 Nature and Properties of Soils Fall or spring. 4 credits. S-U grades optional. Prerequisites: Chem 103, 207 or 215.

Lec, M W F 9:05; lab, M T W Th or F 1:25-4:25. Fall, D. J. Lathwell; spring, T. W. Scott.

A comprehensive introduction to the field of soil science with emphasis on scientific principles and their application in solutions of practical soil management problems.

301 Identification, Appraisal, and Geography of Soils

Fall. 4 credits. Offered in alternate years. S-U grades optional. Prerequisite: 200 or permission of instructor.

Lec, M W F 10:10; lab, W 2-4:25. Staff.
The soil as a natural body. Principles of identification and classification of geographic units of soil and interpretation of such units for applied objectives. Geography of major kinds of soil of North America in relation to environment and cultural patterns. Field practice characterizing, mapping, and interpreting geographical soil units.

321 Soil and Water Conservation

Spring. 2 credits. S-U grades optional. Prerequisite: 200. M W 8. W. H. Allaway.
Must be taken with Agricultural Engineering 321. A study of the principles and practices used in soil and water conservation, agronomic aspects of erosion control, water management, storage, drainage, and irrigation.

324 Soil Fertility Management

Fall. 3 credits. Prerequisite: 200 or permission of instructor. M W F 9:05. D. R. Bouldin.
An integrated discussion of soil-crop yield relationships with emphasis on the soil as a source of mineral nutrients for crops and the role of fertilizers and manure in crop production.

331 Aquatic Plant Management

Fall. 3 credits. Prerequisites: Bio Sci 101-102 and Chem 207-208 or equivalents.
T Th 11:15 and T 1:25-4:25. J. H. Peverly.
The chemistry and physiology of higher aquatic plants will be studied from the inorganic solid, solution, and gaseous phases of the environment to cellular and subcellular levels of the plants. Application of the basic physical and chemical concepts presented to predict effects on aquatic plant growth will be illustrated in laboratory and field situations.

401 Geography and Appraisal of Soils of the Tropics

Spring. 3 credits. S-U grades optional. Prerequisite: 200 or equivalent or permission of instructor.
Lec, M W 12:20; disc, F 2:30-4:25. A. Van Wambeke.
Character of principal kinds of soils in the major climatic regions of the tropics: wet, wet-dry, and dry. Soil properties are related to the position in the landscape and to profile genesis. Emphasis is on soil properties as a basis for interpretation of crop management requirements and production potential.

12 Animal Sciences

Lectures introduce principles whose applications are examined through discussions, problem solving, and independent literature study.

403 Organic Soils Fall. 2 credits. Offered in alternate years. Prerequisite: 200.

W 1:25-4:25. J. M. Duxbury.
A combination of field study and discussion of the genesis, ecology, physical and chemical properties, agricultural uses, and management of organic soils. Some field trips will not return before 5:30 p.m.

404 Forest Soils Fall. 2 credits. Prerequisite: 200.

Lab (Sept-Oct), lec, M or T 1:25-4:25. E. L. Stone. Each section limited to 20 students. Ecology of forest and wildland soils, including relationships to soil development, vegetation, and land use. First half of the course consists of local field trips and exercises that often will not return before 5 or 5:30 p.m.

[406 Soil Microbiology (Lectures)] Spring. 3 credits. Offered in alternate years. Prerequisite: 200 or Microbio 290. Not offered 1978-79.

M W F 10:10. M. Alexander.
A study of the major groups of soil microorganisms, their ecological interrelationships, and the biochemical functions of soil organisms.]

[407 Soil Microbiology (Laboratory)] Spring. 1 credit. Offered in alternate years. Prerequisite: concurrent registration in 406 and permission of instructor. Not offered 1978-79.

T 1:25-4:25. M. Alexander.
Laboratory exercises concerned with the ecology and biochemical activities of soil microorganisms.]

410 Microbial Ecology Spring. 3 credits. Offered in alternate years. Prerequisite: an elementary course in some facet of microbiology.

M W F 10:10. M. Alexander.
An introduction to the basic principles of microbial ecology. Attention is given to the behavior, activity, and interrelationships of bacteria, fungi, algae, and protozoa in natural ecosystems.

450 Special Topics in Soil Science Fall or spring. 1 to 6 credits. S-U grades optional.

Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade.
Hours to be arranged. Staff.
The topics to be treated will be arranged at the beginning of each term for individual self-study or for group discussions.

470 Undergraduate Research in Soil Science Fall or spring. Credit to be arranged. Written permission from the staff member who will supervise the work and assign the grade must be attached to preregistration material.

Hours to be arranged. Staff.
Independent research on current problems selected from any phase of soil science.

480 Management Systems for Tropical Soils Spring. 3 credits. S-U grades optional. Offered in alternate years. Prerequisite: 401 or permission of instructor.

Lec, W F 8; disc, W 2:30-4:25. A. Van Wambeke. Physical, chemical, and biological bases for adapting soil management systems, needs, and potential to important kinds of tropical soils. Emphasis is on combinations of practices for managing soil fertility, water, and till for crop production. Soils of contrasting properties and environments will be studied.

[506 Use of Soil Information and Maps as Resource Inventories] Fall. 2 credits. S-U grades optional. Offered in alternate years. Open to everyone interested in using soils. Not offered 1978-79.

T Th 11:15. G. W. Olson.

Principles, practices, and research techniques in interpreting soil information and maps for planning, developing, and using areas of land.]

602 Chemical Methods of Soil Analysis Spring. 3 credits. Prerequisites: 200 and Chem 207-208 or their equivalent.

T Th 1:25-3:30. M. B. McBride.
Lectures and lab exercises designed to present the fundamental concepts and analytical methods of soil chemistry.

603 Morphology, Genesis, and Classification of Soils Spring. 3 credits. Offered in alternate years. Prerequisite: 301 or permission of instructor.

T Th 10:10-12. Staff.
Principles of soil classification, reactions, and processes of soil genesis, soil taxonomy, and development and significance of major groups of soils of the world.

606 Advanced Soil Microbiology Fall. 1 credit. S-U grades only for graduate students. Prerequisite: 406 or permission of instructor.

T 12:20. M. Alexander.
Discussions of current topics in special areas of soil microbiology. Particular attention is given to biochemical problems in microbial ecology.

607 Soil Physics Fall. 3 credits. Offered in alternate years. Prerequisites: 200 and one year of college physics or permission of instructor.

M W F 11:15. R. D. Miller.
A study of physical properties and processes in soils with emphasis on basic principles.

608 Water Status in Plants and Soils Fall. 2 credits. S-U grades optional. Offered in alternate years. Prerequisite: permission of instructor.

Lec, 1 hour to be arranged; lab, Th 1:25-4:25 or as arranged. R. D. Miller, T. R. Sinclair.
Techniques for field appraisal of status of water in plants and soil, including methods used in evapotranspiration studies.

[609 Soil Organic Matter] Fall. 2 credits. Offered in alternate years. Prerequisites: 200 and Chem 357-358 or equivalent. Not offered 1978-79.

T Th 9:05. J. M. Duxbury.
A discussion of current concepts of the nature, mode of formation, dynamics, and role of organic matter in soils. Some consideration is given to the behavior of man-made organic chemicals in the soil environment.]

701 Soil Chemistry Fall. 3 credits. Offered in alternate years. Prerequisites: 200 and a one-year course in physical chemistry, or permission of instructor.

T Th 10:10-11:25. M. B. McBride.
Chemical properties of soils, with emphasis on structure and surface chemistry of soil minerals, ion exchange, mineral-solution equilibria, and adsorption reactions of soil clays and oxides.

724 Soil Fertility Advanced Course Spring. 3 credits. Offered in alternate years. Prerequisite: graduate status with a major or minor in agronomy.

T Th S 9:05. D. R. Bouldin.
A study of selected topics in soil-crop relationships with emphasis on concepts of soil fertility, interpretation of experimental data, and soil fertilizer chemistry.

760 Graduate Research in Soil Science Fall or spring. Credit and hours by arrangement. Not open to undergraduates. Open to all members of the graduate field.

790 Agronomy Seminar Fall or spring. Noncredit. Required of graduate students majoring or minoring in the department.

T 4.

Special Studies of Problems of Agriculture in the Tropics (International Agricultural Development 602)

Animal Sciences

Department of Animal Science: R. J. Young, chairman; H. R. Ainslie, B. J. Appgar, W. F. Brannon, W. R. Butler, L. E. Chase, J. M. Elliot, R. W. Everett, R. H. Foote, D. G. Fox, R. C. Gorewit, W. Hansel, H. F. Hintz, D. E. Hogue, R. E. McDowell, W. G. Merrill, R. P. Natzke, E. A. Oltenacu, P. A. Oltenacu, W. G. Pond, R. L. Quaas, J. T. Reid, S. W. Sabin, H. F. Schryver, S. T. Slack, D. R. Smith, C. J. Sniffen, J. R. Stouffer, M. L. Thonney, H. F. Travis, D. R. Van Campen, N. L. VanDemark, P. J. Van Soest, L. D. VanVleck, R. G. Warner

Department of Poultry Science: M. L. Scott, chairman; R. E. Austic, R. C. Baker, A. Bensadoun, S. E. Bloom, G. F. Combs, Jr., D. L. Cunningham, R. R. Dietert, H. G. Ketola, C. E. Ostrander, J. M. Regenstein, E. A. Schano, A. van Tienhoven

100 Introductory Animal Science Fall. 3 credits. S-U grades optional.

Lec, W F 10:10; lab, T Th F 2-4:25. J. M. Elliot.
For the beginning student, an introduction to the subject matter dealing with domestic animals and with current practices and problems of the livestock and meat industries. The place of the physical and biological sciences in animal agriculture is discussed. Emphasis is on the nutrition, physiology, breeding, and management of dairy cattle, beef cattle, sheep, swine, and horses.

105 Contemporary Perspectives of Animal Science Spring. 1 credit. S-U grades optional.

T 1:25, W 10:10, 12:20. Animal science faculty.
A forum for students and faculty to discuss the contemporary and future role of animals in relation to the needs of man.

230 Poultry Spring. 3 credits.

Lec, T Th 11:15; lab, W 2-4:25. On the several days when there are field trips, a longer Wednesday session may be necessary.
G. F. Combs, Jr.
Designed to acquaint the student with the scope of the poultry industry, with emphasis on the principles of avian biology and their application in the various facets of poultry production.

[241 Applied Livestock Selection and Meat Evaluation: Beef Cattle, Sheep, and Swine] Fall. 2 credits. Prerequisite: 100 or permission of instructor.

Lec and lab, W 2-4:25. Not offered 1978-79.
Staff.
Practical application of the various methods used in determining the utility value of market and breeding classes of meat animals and carcasses. Grading standards, meat quality and yield factors, performance, and progeny tests are considered. A one-day field trip is taken to study market and consumer acceptability of meat products.]

260 Beef Cattle Spring. 3 credits. Prerequisite: 100 or permission of instructor.

Lec, T Th 10:10; lab, M 2-4:25. M. L. Thonney.
Emphasis is placed on the management of reproduction, nutrition, and selection in beef cattle enterprises. A cattle growth model is studied. Laboratory periods are conducted to acquaint students with the management skills of a beef operation.

265 Horses Spring. 2 credits. Prerequisite: 100 or permission of instructor.

Lec, Th 9:05; lab, Th 1:25-4:25. H. F. Hintz, J. E. Lowe.
Selection, management, feeding, breeding, and training of light horses.

290 Meat and Meat Products Fall or spring. 3 credits.

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

J. R. Stouffer.

An introduction to meat science through a study of the characteristics of meat from slaughter to consumption. Structure, composition, inspection, grading, preservation, cutting, and processing will be included. A trip to commercial meat plants will be taken.

330 Commercial Poultry Production Fall.

1 credit. Prerequisites: 100, 230, or permission of instructor. Offered alternate years.

F 2-4:25. C. E. Ostrander.

The course is designed to provide the student with a good understanding of what takes place and is required in a commercial egg production operation. It will consist of one lecture each week and field trips to commercial production operations. The course should be beneficial to undergraduate students interested in agricultural service work, Extension Agent work, students going back to the farm, and graduate students working in the poultry field.

365 Seminar on Horse Production Fall.

2 credits. S-U grades optional. Prerequisites: 112, 220, 221, and 265, or equivalent. Enrollment limited to 18 students.

F 1:25-4. H. F. Hintz.

Students present seminars on the management of various types of horse enterprises such as the breeding farm, training stable, and riding stable. One all-day field trip will be taken.

370 Swine Fall. 3 credits. Prerequisite: 100; 112, 220, and 221 also recommended.

Lec, T Th 11:15; lab and disc periods, alternate M or T 1:25-4:25. The laboratory and discussion period is offered on alternate Mondays and Tuesdays, arranged so students can take 380 concurrently. W. G. Pond.

The characteristics of swine and their breeding, feeding, management, and selection. Laboratory and discussion periods are designed to give the student a practical knowledge of the pig as an animal and of commercial swine production practices.

380 Sheep Fall. 3 credits. Prerequisite: 100; 112, 220, and 221 also recommended.

Lec, T Th 10:10. Lab and disc periods, alternate M 1:25-4:25. The laboratory is given on alternate Mondays, arranged so students can take 370 concurrently. D. E. Hogue.

The breeding, feeding, management, and selection of sheep. Lectures and laboratory are designed to give the student a practical knowledge of sheep production as well as the scientific background for improved practices.

400 Livestock Production in Warm Climates

Spring. 3 credits. Prerequisites: 112, 220, and 221 or permission of instructor.

Lec, T Th 10:10; disc, W 1:25-3:20.

R. E. McDowell.

An analysis of the tropical environment in relation to limitations on livestock production; restrictions on contributions of animals to farm incomes due to limitations in genetic potential, feed resources, and social structures. The role of small or subsistence farms and the interdependence of man and animals for food, services, and nonfood uses are stressed. Lectures introduce principles whose application are examined through discussions, problem solving, and independent literature study.

[403 Forages of the Tropics for Livestock Production Spring. 3 credits. Offered in alternate years. Limited to seniors and graduate students except by permission of instructor. Prerequisite: crop production, livestock nutrition. Not offered 1978-79.

Lec, T Th 12:20; disc, T 1:25. R. E. McDowell, P. J. Van Soest, L. V. Crowder.

Review of tropical grasslands, sown pastures, and fodders and their use as feed resources; grass and

legume characteristics; establishment and management of pastures and feed source alternatives; forage quality and utilization; problems of utilization of tropical forages as hays and silages.]

440 Application of Systems Analysis in Livestock Production Management Fall.

3 credits. Prerequisites: Math 105 and courses in livestock production or permission of instructor. Limited to 30 students.

M W F 9:05. P. A. Oltenacu.

The all-embracing systems concepts are applied to livestock production management. The use of mathematical modeling and simulation in solving management problems is illustrated with practical cases. The course emphasizes the principles behind the systems approach and not the technique's methodology.

See also:

Poultry Hygiene and Disease (Veterinary 255)**Health and Diseases of Animals (Veterinary 475)****Special Studies on Problems of Livestock Production in the Tropics (International Agriculture 602)****Animal Breeding and Genetics****221 Introductory Animal Genetics** Spring.

3 credits. Prerequisite: one year of college biology.

Lec, T Th 12:20; disc, W Th or F 2-4:25.

E. A. Oltenacu

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

321 Seminar on Genetics of the Horse Spring.

1 credit. Prerequisite: 265 or permission of instructor; 221 or Bio S 281 recommended.

T or W 9:05. L. D. Van Vleck.

Discussion of genetics of the horse with special reference to simply inherited traits and selection for quantitative traits.

419 Animal Cytogenetics Fall. 4 credits.

Prerequisites: 221 or Bio S 281, or permission of instructor.

Lec, T Th 9:05; lab, T or W 1:25-4:25 and 2 other hours to be arranged. S. E. Bloom.

A study of normal and abnormal chromosomes in higher animals. Lecture topics include chromosome organization, chromosome movement, cytogenetics of abortuses, parthenogenesis, chromosomes and cancer, mitotic and meiotic errors, and human clinical cytogenetics. In laboratory, students obtain chromosome preparations from various animals and use cytochemical and photographic methods for karyotype analysis.

420 Quantitative Animal Genetics Fall.

3 credits.

Lec, T Th 11:15; lab, W Th or F 2-4:25.

L. D. Van Vleck.

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

421 Seminar in Animal Genetics Fall. 1 credit.

Prerequisite: 221 or may take concurrently with 420.

Hours to be arranged: L. D. VanVleck,

R. W. Everett.

Discussion of applications of principles of quantitative genetics and animal breeding to specific types of animals such as dairy, meat, and horses.

422 Research Techniques in Quantitative

Animal Genetics Fall. 1 credit. Prerequisite: 420 or coregistration in 420.

Th 12:20. L. D. VanVleck.

Introduction to methods of research in quantitative genetics and animal breeding, including estimation of heritability, repeatability, and genetic and phenotypic correlations.

430 Livestock Improvement through Artificial Breeding Spring. 4 credits. Open to upperclass and graduate students. Prerequisites: 220, 221, or equivalent, and permission of instructor.

Lec, T 10:10; disc, Th 10:10; lab, T F or M Th 2-4:25. Staff.

Study of the artificial breeding industry and the physiological and genetic principles used to maximize the improvement of the genetic traits of economic importance in farm livestock production. An opportunity is afforded students to gain individual experience in both the physiological and genetic techniques relevant to both the male and female aspects of artificial breeding.

620 Seminar in Animal Breeding Fall or spring.

1 credit. S-U grades only. Open to graduate students with major or minor in animal breeding.

Hours to be arranged.

720 Experimental Methods in Quantitative Genetics and Animal Breeding Spring. 3 credits.

Prerequisites: courses in matrix algebra, linear models, and mathematical statistics.

Hours to be arranged. R. L. Quaas

Estimation of genetic and environmental parameters required to design efficient selection programs. Particular emphasis is given to interpretation of experimental and survey data with unequal subclass numbers and to prediction of genetic progress resulting from alternative selection methods.

Animal Nutrition**112 Livestock Nutrition** Spring. 4 credits.

Prerequisite: Chemistry 103 or 207; recommended: Animal Science 100.

Lec, M W F 10:10; lab M T Th or F 2-4:25.

D. E. Hogue.

Introduction to animal nutrition, covering fundamentals of nutrition, the composition of feeds, feeding standards, and their application to various forms of production in dairy and beef cattle, sheep, swine, and horses.

113 Nutrition of Companion Animals Fall.

1 credit. S-U grades optional. Prerequisite: 112 or equivalent.

W 7:30-9:25 p.m. First seven weeks. H. F. Hintz.

Nutrition of companion animals with emphasis on the dog and cat. Digestive physiology, nutrient requirements, feeding practices, and interactions of nutrition and disease will be discussed.

410 Principles of Animal Nutrition, Lectures

Fall. 3 credits. Prerequisite: organic chemistry; biochemistry is recommended prior to or concurrently.

M 8, W F 8; M 4:30 for students with a scheduling conflict only. 2 disc during term to be arranged.

R. G. Warner.

The principles of nutrition are developed from a discussion of the biochemical and physiological interaction of the nutrients as they apply to the cell and the whole animal. Examples are selected from a broad range of animal species including man.

411 Principles of Animal Nutrition, Laboratory

Fall. 1 credit. Enrollment limited to 20 students. Must be concurrently registered in 410.

Hours to be arranged. R. G. Warner, H. F. Hintz,

R. E. Austic, H. F. Travis, G. F. Combs, Jr.,

M. L. Thonney.

Laboratory problems with animals are designed to introduce the student to techniques of experimental nutrition.

415 Poultry Nutrition Spring, 1 credit.

Prerequisite: 410 or permission of instructor.
F 11:15. G. F. Combs, Jr.

A practical consideration of principles of nutrition applied to feeding poultry, including use of linear programming techniques in diet formulation.

611 Laboratory Work in Animal Nutrition

Spring, 4 credits. S-U grades optional. Prerequisites: 410 or its equivalent, biochemistry, physiology, and quantitative analysis, or permission of instructor.

Lab, M W F 2-4:25 first 8 weeks; schedule to be arranged independently during last 7 weeks.
W. G. Pond.

Each student engages in a series of group and individual short research projects with laboratory and farm animals. Both classical and modern techniques of animal experimentation are considered. The applications of biochemical methods to the solution of animal nutrition problems are stressed.

619 Field of Nutrition Seminar Fall or spring.

Noncredit.

M 4:30.

Current research in nutrition presented by visitors and faculty.

Advanced Nutrition

A series of nutrition courses is offered jointly by the Department of Animal Science, College of Agriculture and Life Sciences; Department of Poultry Science, College of Agriculture and Life Sciences; and the Division of Nutritional Sciences.

Prerequisites include courses in nutrition, physiology, and biochemistry to include intermediary metabolism, or permission of instructor.

Among the topics presented are the biochemical and physiological bases of digestion; absorption, transport and metabolism of nutrients, and species differences where applicable. Historical as well as current concepts of nutrition are discussed.

601 Proteins and Amino Acids in Nutrition (Also NS 601) Spring, 3 credits.

Prerequisite: courses in physiology, biochemistry, and nutrition or consent of the instructors.

M W F 11:15. R. E. Austic, M. Morrison.

Advanced course in amino acid and protein nutrition with emphasis on the dynamic aspects of protein digestion, amino acid absorption, protein synthesis, amino acid metabolism, and nitrogen excretion. Discussions will include nutritional interrelationships, amino acid and protein requirements, assessment of nutritional status, evaluation of protein quality, bioavailability of amino acids and techniques of amino acid analyses. Emphasis is on basic principles and their application in animal and human nutrition.

603 Nutritional Energetics Spring, 2 credits.

M W 10:10. J. T. Reid.

[604 Vitamins Fall, 2 credits. Not offered

1978-79.

T Th 10:10. M. L. Scott.

A discussion of the chemistry, biochemistry, and physiological functions of the vitamins with emphasis on nutritional aspects.]

605 Forages, Fiber, and the Rumen Spring,

4 credits. Prerequisites: a course in general nutrition and biochemistry 431, or permission of instructor.

M W F 12:20, F 1:25. P. J. Van Soest.

Ruminant nutrition, lower-tract fermentation in monogastrics, nutritional biochemistry of forage plants, fiber, and cellulosic material.

613 Forage Analysis Spring, 2 credits.

Prerequisite: permission of instructor.

Lab only, Th 2-4. P. J. Van Soest.

Chemical composition and nutritive evaluation of forage plants and related materials. Course will

include a term paper summarizing results of independent laboratory study of either materials or methods.

See also:

Lipids (NS 602; also Bio S 619)**Animal Physiology****200 Animal Physiology** Fall, 3 credits.

Prerequisite: one year of college biology.

Lec, M W 11:15; lab F 11:15. W. R. Butler and staff. General animal physiology with emphasis on the large domestic species. Lectures and laboratory demonstrations are designed to relate physiology to production traits. A course in general physiology which provides a basis for nutrition, production, and specialized physiology courses in animal science, but not for more advanced general physiology courses.

220 Animal Reproduction and Development

Fall, 4 credits. Prerequisite: a year of college biology or equivalent. Limited to 36 students per lab section.

Lec, T Th 9:05; dem and lab, M T W or Th 2-4:25 or T 10:10-12:35 or F 11:15-1:25. R. H. Foote.

An introduction to the comparative anatomy and physiology of reproduction of farm animals. The life cycle from fertilization through development and growth to sexual maturity will be studied, with emphasis on physiological mechanisms involved, relevant genetic control, and the application to fertility regulation of animal and human populations. An audio-tutorial laboratory is available for independent study to prepare for laboratory experiments.

427 Fundamentals of Endocrinology Fall,

4 credits. Prerequisite: a course in human or veterinary physiology, or permission of instructor.

Lec, T Th S 10:10; lab, T or Th 1:25-4:25.
W. R. Butler.

The physiology of the endocrine glands and the roles played by each hormone in the regulation of normal body processes. The laboratory work consists of a series of experiments designed to illustrate the basic principles of endocrinology.

451 Physiology and Biochemistry of Lactation

Spring, 3 credits. Prerequisite: 220 and Bio Sci 231, or permission of instructor.

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

Emphasis is placed on mammary gland development, anatomy, physiological control of milk secretion, and biochemical synthesis of milk constituents in laboratory and farm animals.

452 Comparative Physiology of Reproduction of Vertebrates (Also Bio S 452) Spring, 2 credits.

Prerequisite: 427 or permission of instructor.

Lec, W F 1:25. A. van Tienhoven.

Sex and its manifestations. Neuroendocrinology, endocrinology of reproduction, sexual behavior, gametogenesis, fertilization, embryonic development, oviparity, viviparity, environment and reproduction, nutrition and reproduction.

454 Reproductive Physiology of Vertebrates Laboratory (Also Bio S 454) Spring, 2 credits.

Prerequisite: 428 or coregistration in 428, or permission of instructor.

Hours to be arranged; organizational meeting first F 2:30. A. van Tienhoven.

The laboratory provides students with an opportunity to design and execute independently experiments with limited objectives.

See also:

Introductory Animal Physiology (Bio S 314)**Introductory Animal Physiology Laboratory (Bio S 319)****Dairy Husbandry**

250 Dairy Cattle Fall, 3 credits. S-U grades optional.

Lec, T Th 10:10; lab, M T Th 1:25-4. R. P. Natzke. Introduces students to the major components of the dairy industry. Topics discussed include breeding, feeding, reproduction, milking, milk secretion, replacement rearing, disease prevention, and record keeping. Laboratories are designed to provide limited practice in husbandry techniques.

251 Dairy Cattle Selection and Type Evaluation

Spring, 3 credits.

Lab, W 12:20-4:25. 1 all-day Sat. field trip.
S. T. Slack.

Emphasis on conformation characteristics for practice type to achieve wearability for high lifetime production. Practical sessions include planned trips to outstanding herds in the state.

350 Dairy Cattle Production and Management

Spring, 3 credits. Prerequisites: 112, 220, 221, or permission of instructor. 250 recommended for students with limited dairy experience.

Lec, T Th 11:15; lab, T W 1:25-4:25. Will include 1 all-day field trip. R. P. Natzke, J. M. Elliot, L. D. VanVleck.

Analysis of breeding, feeding, housing, and management systems for economical production; evaluation of milking systems, including principles of milk secretion and milking procedures. Includes farm visits to observe application of modern technology in operation.

352 Advanced Dairy Cattle Selection Fall,

3 credits. Prerequisite: 251. Registration by permission.

Practice hours to be arranged. S. T. Slack.

Emphasis on additional training in comparative judging for students selected from 251 to represent the institution in intercollegiate judging competition.

See also:

Milk Quality (Food Sci 351)**Departmental Research and Seminars****390 Poultry Problems** Fall or spring,

1, 2, or 3 credits. S-U grades optional.

Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade. Not open to students who have earned 6 or more undergraduate research credits elsewhere in the College.

M. L. Scott.

Investigation of a basic or applied problem in some area of poultry science including nutrition, genetics, physiology, food science, and management. The student conducts a short research project under the direction of an appropriate staff member for each specialty. Each student will be expected to review pertinent literature, prepare a project outline, conduct the research, and prepare a report.

395 Undergraduate Research Fall or spring,

6 credits maximum during undergraduate career; not open to students who have earned 6 or more undergraduate research credits elsewhere in the College. Open only to juniors and seniors with grade averages of 2.7 or above. Designed to afford opportunities for students to carry out independent studies of research problems under appropriate supervision. Each student will be expected to review pertinent literature, prepare a project outline, conduct the research, and prepare a report.

396 Undergraduate Teaching Fall or spring, 1

or 2 credits; no more than 4 credits may be earned during entire undergraduate career. Open only to students with grade averages of 2.7 or above. Designed to consolidate the student's knowledge by assisting in the teaching of a course allied with the student's education and experience. A participating

student is expected to meet regularly with a discussion or laboratory section, to gain teaching experience, and regularly to discuss teaching objectives, techniques, and subject matter with the professor in charge.

402 Undergraduate Seminar Spring. 1 credit. S-U grades optional. Restricted to advanced undergraduates.

Hours to be arranged. L. D. VanVleck.

A study of literature pertinent to special topics in animal science. Students will be required to review literature and to present oral and written reports.

600 Research Fall or spring. Credit and hours to be arranged. All members of animal science program area.

609 Seminar in Poultry Biology Fall or spring. S-U grades only. For graduate students.

Hours to be arranged. Members of the department staff.

A survey of recent literature and research in poultry biology.

610 Seminar Fall and spring. 1 credit. S-U grades only. Required of all graduate students with either a major or minor in animal science.

M 11:15. Animal science faculty.

Atmospheric Sciences*

B. E. Dethier, W. W. Knapp, A. B. Pack, D. A. Paine

101 Basic Principles of Meteorology Fall. 3 credits. Limited to 140 students.

Lec, T Th 11:15; lab, M T W or Th 1:25-4:25.

B. E. Dethier.

Simplified treatment of structure of the atmosphere: heat balance of the earth; general and secondary circulations; air masses, fronts, and cyclones; hurricanes, thunderstorms, tornadoes, and atmospheric condensation. In the laboratory, emphasis is on techniques of analysis of weather systems.

103 Basic Principles of Meteorology (Laboratory) Fall. 1 credit. Prerequisite: Introductory course in meteorology without a laboratory.

M T W Th 1:25-4:25. B. E. Dethier.

Techniques of analysis of weather systems and the application of dynamical and empirical methods of prediction of the daily atmospheric circulation.

202 Dynamic Climatology Spring. 3 credits. Prerequisite: 101.

M W F 11:15. B. E. Dethier.

The first part of the course is devoted to the description of world climates in terms of global distribution of radiation, temperature, pressure, and wind; precipitation and air masses. The second part of the course relates climates and climatic anomalies to planetary, regional, and local circulations.

314 Agricultural Meteorology Spring. 3 credits. T Th 10:10-11:25. A. B. Pack.

An examination of atmospheric conditions and relationships near the ground, including the interplay between the atmosphere and land surfaces, plant covers, and topography. Moisture relationships in the soil-atmosphere-plant continuum, bioclimatic requirements of plants, and crop protection from weather hazards are also discussed.

325-326-327-328 Meteorological

Communications 325 and 327, fall; 326 and 328, spring. 1 credit. S-U grades optional. Primarily for undergraduate meteorology majors.

Hours to be arranged. Staff.

The student will become acquainted with facsimile, teletype, and satellite receiving equipment and the data products used in weather forecasting.

411-412 Theoretical Meteorology I and II Fall and spring. 3 credits. Prerequisites: 1 year each of calculus and physics. Course 411 is prerequisite to 412, unless special permission is obtained from instructor.

M W F 10:10. W. W. Knapp.

Topics include thermodynamics of dry air, water vapor and moist air, hydrostatics and stability; meteorological coordinate systems; variation of wind and pressure fields in the vertical; winds in the planetary boundary layer; surfaces of discontinuity; mechanisms of pressure change; vorticity and circulation.

417 Physical Meteorology Fall. 3 credits.

Offered in alternate years. Prerequisite: 1 year each of calculus and physics.

M W F 12:20. W. W. Knapp.

Primarily a survey of natural phenomena of the atmosphere with emphasis on their underlying physical principles. Topics include composition and structure of the atmosphere; atmospheric optics; acoustics and electricity; solar and terrestrial radiation; and principles of radar probing of the atmosphere.

430 Synoptic Meteorology Spring. 4 credits.

Prerequisites: 411 and 412, or permission of instructor.

Lec, F 12:20; lab, T 9:05-11. D. A. Paine.

The application of quasi-geostrophic theory as a diagnostic and forecast methodology, including the use of facsimile products derived from the barotropic, baroclinic, and primitive equation numerical models. Lab work includes surface and upper air analyses and thickness and vorticity computations using synoptics and radiosonde data documenting macroscale cyclogenesis.

432 Isentropic Theory and Analysis Spring.

4 credits. Prerequisite: 430 or permission of instructor

Lec, M 12:20; lab, W 9:05-11. D. A. Paine.

The equations of motion, continuity, and energy relationships in constant entropy coordinates. Derivation and construction of adiabatic versus diabatic trajectories. Ertel's potential vorticity theorem evaluated by the quasi-Lagrangian trajectory technique. The lab employs the 430 storm data to contrast constant pressure and isentropic methods of analysis.

461-462 Undergraduate Research in

Meteorology Fall and spring. 1 to 3 credits.

Staff.

Required of honor students in the physical sciences majoring in meteorology.

474 Multiscale Studies of the Atmosphere

Spring. 3 credits. Prerequisites: 411 and 412 and permission of instructor.

Lec, W 1:25; lab, Th 9:05-11. D. A. Paine.

A study of the energy-momentum cascade from macroscale to microscale weather phenomena. Data from severe weather outbreaks serve as a practicum in mesoscale analysis.

650 Special Topics in Meteorology and Climatology Fall or spring. 1 or more credits.

Staff.

Study of meteorological topics more advanced than or different from those in other courses. Subject matter depends on the background and desires of those enrolling.

691 Seminar in Meteorology Fall or spring.

Prerequisite: permission of instructor.

Hours to be announced. B. E. Dethier.

Subjects for future times may be such things as weather modification, paleoclimatology, and atmospheric pollution.

962 Research in Meteorology Fall or spring. 1 or more credits. Thesis research. Staff.

Biological Sciences

See p. 141.

Communication Arts

C. H. Freeman, chairman; N. E. Awa, J. A. Barwind, M. J. Barwind, R. D. Colle, R. H. Crawford, B. O. Earle, J. E. Hardy, J. E. Lawrence, D. Martin, R. D. Martin, C. C. Russell, T. M. Russo, R. E. Shew, V. R. Stephen, W. B. Ward, S. A. White, A. M. Wilkinson

150 Writing for Media Fall. 3 credits. Limited to communication arts freshmen and first-year transfer students.

T Th 9:05; discussion to be arranged. Staff. The basics in writing for print or broadcast. Media form and style will be analyzed. Frequent writing assignments, analysis of good media writing, and a back-to-basics approach for clarity and style will be emphasized.

200 Theory of Human Communication Fall or spring. 3 credits. S-U grades optional.

Lec, T Th 10:10; disc, T or Th 12:20. J. A. Barwind. Introduction to behavioral theories of communication from a multidisciplinary perspective. Contributions from the mass media, anthropology, sociology, psychology, social psychology, rhetoric, and cybernetics are considered.

205 Parliamentary Procedure Fall and spring. 3 credits. Not open to freshmen. Limited to 20 students per section.

T or Th 1:25-4:25. R. D. Martin.

Study of the principles and practice of parliamentary procedure as related to conducting an effective meeting. Emphasis on practical experience and the importance of a well-run meeting as an integral component of effective communication. Includes recording of minutes, committee assignments, development of bylaws, and meeting evaluations.

210 Communicating Public Information Fall. 3 credits. For non-communication arts majors.

M W F 8. J. E. Lawrence.

Examines concepts, methods, techniques, and processes for communicating information to the general public. Explores use of public service time and space through broadcasting, films, publications, and other channels. Emphasis on basic understanding of media requirements and procedures in disseminating public information. Students will design information programs.

215 Introduction to Mass Media Fall or spring. 3 credits. S-U grades optional. Limited to 190 students above the freshman level.

M W F 11:15. C. C. Russell.

History, policies, philosophies, and practice of communication media. Freedom of the press, ethics, libel, and slander are considered in the day-to-day function of the media.

230 Visual Communication Fall. 3 credits.

Limited to 100 students above the freshman level.

M W F 10:10. V. R. Stephen.

A basic course in the use and importance of visual communication methods and materials in today's society. Not recommended for art or design majors. Posters, charts, displays, photography, slides, overhead projection, motion pictures, and television are among the topics discussed. Practical projects are assigned.

*Part of the Department of Agronomy

231 Art of Publication Spring, 3 credits. Not open to freshmen. Each section limited to 30 students.

M 1:25-4:25 or W 1:25-4:25. V. R. Stephen. A basic course designed to explore visual concepts that increase communication effectiveness through the printed word. Importance of selecting and coordinating format, layout, typography, and illustrations is stressed. Lectures, a field trip, in-class assignments, and three outside projects, examine opportunities and problems in publication design and production. Project materials will cost approximately \$5-25.

301 Oral Communication Fall or spring, 3 credits. Fall term, limited to juniors and seniors; spring term, open to sophomores, juniors, and seniors. Each discussion section limited to 24 students.

Dis, M W F 8, 9:05, 10:10, 11:15; M T W 1:25; M W 9:05 and T 12:20; T Th 9:05 and W 12:20; T Th 9:05 and W 1:25; T Th 10:10 and W 12:20; T Th 10:10 and W 1:25; T Th 10:10 and W 2:30; T Th 11:15 and W 12:20; T Th 11:15 and W 1:25. N. E. Awa, M. J. Barwind, B. O. Earle, C. H. Freeman, R. D. Martin, T. M. Russo, and staff. Designed to study the basic process and principles of oral communication. Through theory and practice, the student is encouraged to develop self-confidence and competence in public speaking. Provides experience in the preparation, delivery, and evaluation of oral presentations.

302 Persuasion Fall or spring, 3 credits. Prerequisite: 301.

Lec, M W F 11:15; disc, T Th 11:15, 12:20, or W F 11:15. In weeks discussion sections are held, there will be no Wednesday or Friday lecture. B. O. Earle.

The course will concentrate on the analysis and understanding of the persuasion events around us. The oral presentations will stress the application of various theories of persuasion to the interpersonal communication process.

303 Small Group Communication Spring, 3 credits. Open to juniors and seniors only. Prerequisite: 200 or permission of instructor.

T Th 10:10-11:40. N. E. Awa. Theory and practice in leadership and participation in small group communication. The course examines the values and limitations of group discussion, collaborative behavior, and conflicts in a democracy.

311 Radio and Television Writing Fall, 3 credits. Prerequisite: 200.

W 1:25-4:25. R. D. Colle. The writing and analysis of radio and television programs with emphasis on documentary, news, and public affairs formats. Considerable stress is placed on information gathering and other preparation leading up to the scripting process.

312 Advertising and Promotion Fall or spring, 3 credits. S-U grades optional. Fall, limited to 30 communication arts majors at the junior, senior, and graduate level; spring, limited to 190 students at the junior, senior, and graduate level. Fall: T 1:25-4:25; spring: M 1:25-4:25. C. C. Russell.

Examines advertising principles and techniques from both a historical and an economic perspective. Advertising and promotion campaigns and their overall effectiveness as a multiplier in the economy are analyzed. Current advertising trends and the strategy of media planning are examined.

313 Writing for Magazines Fall or spring, 3 credits. Open to juniors, seniors, and graduate students.

M 1:25-4:25. W. B. Ward. Intensive fact-writing to help students communicate more effectively through the medium of the printed word in magazines. Art and techniques of good

writing studied; continuous analysis of magazines in many fields of interest. All articles analyzed and returned to each student for rewriting and submission to a magazine.

314 Technical and Scientific Writing and Editing Fall or spring, 3 credits. Not open to freshmen. Sections limited to 20 students.

General sections, T Th 9:05 and W 11:15; T Th 10:10 and W 12:20; biological sciences section M W F 9:05; engineering and physical sciences section T Th 10:10 and W 12:20; graduate section T Th 9:05 and W 11:15; J. E. Hardy and A. M. Wilkinson.

Designed to develop skills in writing and editing scientific and technical information. Emphasis is on clarity, accuracy, and appropriate format. Students will interpret scientific and technical information through the study of reports, instructions, brochures, and articles. One writing or editing assignment each week.

315 News Writing and Analysis Fall, 3 credits. Limited to 30 students.

T 1:25-4:25. R. E. Shew, director, News Bureau, Cornell University. The writing and analysis of news stories. A study of the elements that make news, sources of news, interviewing, writing style and structure, new publishing techniques, press problems, and press-society relations. Reasonable typing ability is essential.

318 Radio Writing and Production Spring, 3 credits. S-U grades optional.

T 1:25-4:25. D. Martin, general manager, WHCU radio station. Writing for various radio formats, with emphasis on public affairs programs, including documentaries and interviews. Students will tape record their programs for possible use on radio-stations in the state.

319 Television Writing and Production Spring, 3 credits. S-U grades optional. Limited to 25 students. Prerequisite: 311.

T 1:25-4:25. R. D. Colle. Creation of television information programs, from development of idea through research, scripting, and production.

380 Independent Honors Research in Social Science Fall or spring, 1-6 credits. Open only to candidates who have met the requirements for the honors program. A maximum of 6 credits may be earned in the honors program.

401 Communication Law Spring, 3 credits. Enrollment limited to majors at the junior, senior, and graduate levels, and others by permission. M W F 11:15. Staff.

403 Topics in Communication Theory Fall, 3 credits. Offered in alternate years. Prerequisite: 200 or permission of instructor.

W 1:25-4:25. J. A. Barwind. Specific topics in communication theory will be discussed as determined by the interest of faculty and students.

404 Psychology of Communication Spring, 3 credits. Offered in alternate years. Prerequisite: 200 or permission of instructor.

M W F 9:05. J. A. Barwind. An advanced study of communication theory from a multidisciplinary orientation. Topics to be covered include interpersonal interaction, channels of communication, and effectiveness of message. Study will include intensive analysis of primary sources of major communication theorists.

420 Print Media Laboratory Fall, 2 credits. Prerequisite: either 313, 314, or 231. Open to majors only at junior, senior, and graduate levels. T 1:25-4:25. J. E. Hardy and V. R. Stephen.

Writing, editing, and layout principles practiced in publishing the *Cornell Countryman*. Some additional outside work sessions may be required.

421 Broadcast Media Laboratory Fall, 2 credits. Prerequisite: 318 or 319. Open to majors at junior and senior-levels.

T 1:25-4:25. R. D. Colle. Emphasis placed on production of television and radio programs for various audiences.

422 Print Media Laboratory Spring, 2 credits. Prerequisite: either 313, 314, or 231. Open to majors only at junior, senior, and graduate levels.

T 1:25-4:25. J. E. Hardy and V. R. Stephen. Continuation of 420.

423 Broadcast Media Laboratory Spring, 2 credits. Continuation of 421.

440 Photo Communication Fall or spring, 3 credits. Limited to 25 juniors and seniors. Priority given to communication arts majors; others by permission of instructor.

T 1:25-4:25. C. H. Freeman. Basic photography; camera handling, film processing, projection printing, and photographic lighting. Photo-journalism emphasized during the latter part of the course. Designed for those with limited experience in photography. Students will be expected to furnish their own supplies and cameras.

495-496 Independent Research Fall or spring, 1-3 credits. Open to seniors and graduate students in communication arts. Seniors must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade.

Staff. Designed to permit outstanding students to carry out independent studies in communications research under appropriate supervision.

601 Intercultural Communication Spring, 3 credits.

T 1:25-4:25. N. E. Awa. A systematic analysis of sociocultural and psycholinguistic obstacles to effective communication between cultures, subcultures, and ethnic and identity groups. Also examined are the subtleties and complexities of nonverbal behavior in cross-cultural transactions. Examples are drawn from ethnolinguistic and cross-cultural studies. Peace Corps experience and programs of change crossing cultural boundaries.

612 Seminar: Interpersonal Communication Spring, 3 credits.

W 1:25-4:25. J. A. Barwind. A study of recent advances and research in leadership; small-group interaction, and communication networks. New developments will be examined as they relate to business, administration, and education.

620 Communication in Organizations Spring, 3 credits. Open to communication arts seniors by permission.

M 1:25-4:25. S. A. White. Review of theories, research, and practical systems relative to human communication effectiveness in organizations. Includes components of interpersonal communication, intragroup and intergroup communication, communication factors and organizational goals, skill improvement, media in organizations—software and hardware, networking, and research methodology.

624 Communication in the Developing Nations Fall, 3 credits. Open to seniors and graduate students.

W 1:25-4:25. R. H. Crawford. An examination of existing communication patterns and systems and their contributions to the

development process. Special attention is given to the interaction between communication development and national development in primarily agrarian societies.

626 Comparative Mass Media Spring. 3 credits.

Th 1:25-4:25. R. H. Crawford. Not offered 1978-79.

An examination of differing national models for media system organization and how each developed in relation to its cultural context. Includes the study of relations with government, mode of support, purposes, scope, and objectives of the media system.]

631 Studies in Communication Fall. 3 credits.

Open to graduate students in communication arts; others by permission.

M 1:25-4:25. R. H. Crawford and staff.

A review of classical and contemporary research in communication, including key concepts and areas of investigation. Exploration of the scope of the field and the interrelationships of its various branches.

632 Methods of Communication Research Fall. 3 credits. Limited to graduate students.

T 1:25-4:25. J. A. Barwind.

An analysis of the methods employed in communication research. Particular emphasis is placed on understanding the rationale for experimental, descriptive (empirical and nonempirical), and historical-critical research methods.

640 Seminar in Organizational Communication

Fall. 3 credits. Open to seniors by permission.

Th 1:25-4:25. S. A. White and W. Frank.

Communication functions (human and mass media) in organizational structures of business, industry, labor, education, etc., from the perspectives of academic authorities and managers. Development of conceptual schemes for analyzing components of organizational communication and human communication effectiveness.

643 Frontiers in Communication Fall. 3 credits.

Th 1:25-4:25. R. D. Colle.

A study of recent developments in communication. Emphasis is on the strategic application of the newest methods, materials, and technology in visual, print, film, oral, and telecommunication media to contemporary and future problems involving communication.

650 Advanced Communication Seminar

Spring. 3 credits. Primarily for graduate students but open to seniors.

T 9:05-12:05. R. D. Colle.

An analysis of special communication problems faced by different types of organizations, institutions, and companies; case histories used to show how communication programs are organized and executed to help solve problems.

690-691 Communication Teaching Laboratory

Fall and spring. 1-3 credits. Limited to juniors, seniors, and graduate students. Prerequisite: permission of the staff member who will supervise the work and assign the grade.

Hours to be arranged.

Designed primarily for students who wish to gain experience in teaching communication courses. Students will work with an instructor in the development of course objectives, philosophy, and planning as well as aiding with actual instruction.

760 Advanced Communication Projects Fall or

spring. 3 credits. Open only to communication arts graduate students. May not be repeated.

Staff.

Independent studies and projects carried out in conjunction with selected undergraduate courses.

895 Directed Graduate Study Fall or spring.

3-6 credits.

Staff.

Education

G. W. McConkie, chairman; H. G. Andrus, J. P. Bail, A. L. Berkey, G. J. Broadwell, R. L. Bruce, H. R. Cushman, W. E. Drake, J. A. Dunn, A. R. Edsall, R. B. Fischer, H. A. Geiselman, D. B. Gowin, E. J. Haller, D. E. Hedlund, J. Millman, J. D. Novak, W. J. Pauk, G. J. Posner, R. E. Ripple, V. N. Rockcastle, K. A. Strike, H. L. Wardeberg, G. M. Winter

110 Introduction to Psychology Fall or spring. 3 credits.

Lec, M 10:10; 2 disc groups, sign up times to be announced. Instructor to be announced. Introduction to the field of psychology emphasizing clinical and applied psychology. Course includes possibility of individual learning contracts for credit in student's area of preference.

240 The Art of Teaching Spring. 3 credits.

T Th 1:25-2:40. G. J. Posner.

This course is designed for all students interested in finding out more about teaching. Teaching is considered an activity in which people of many occupations engage, not in a limited school-related context. Students engage in field experiences to find out what teaching actually involves (minimum of 1½ hours per week) in addition to class work. Class work builds on this experience and provides skills and concepts to make the field experience more profitable.

270 Educational Studies Fall. 3 credits.

M W 9:05, 1 additional hour arranged. K. A. Strike.

An introductory study of central and representative issues of policy and practice that mold education in the United States.

311 Educational Psychology Fall or spring.

3 credits. S-U grades optional. Prerequisite:

introductory course in psychology.

M W F 11:15. R. E. Ripple.

An introductory survey course covering topics in educational psychology. Emphasis is on human learning and the educational process from a psychological point of view. The course is set in a broadly based teaching-learning context appropriate for prospective teachers, youth group leaders, community leaders, and those in the service-helping professions.

312 Learning to Learn Spring. 3 credits.

Prerequisite: one or more courses in psychology and educational psychology.

M W 1:25-3. J. D. Novak.

This course is intended for persons interested in the improvement of educational programs through the application of new knowledge in learning theory. The course is conducted in seminar style with discussions based on assigned readings and contributions of class members. The learning theory of David Ausubel is presented in some detail. Other writers on cognitive and affective learning are also studied. A major assignment in the course is the analysis of instruction on the basis of the concepts presented.

317 Psychology of Adolescence Spring.

3 credits. S-U grades optional. Prerequisite:

introductory course in psychology.

T Th 1:25-2:40. R. E. Ripple.

A survey of the nature of adolescent development with emphases on causal factors pertaining to adolescent behavior. Focus is on an examination of the interrelationships among the major aspects of adolescent development, an examination of some of

the dominant themes of adolescence, acquaintance with research on adolescent development, and implications for the educational process.

331 Introduction to Teaching Agriculture

Spring. 2 credits.

Lec, M 1:25-3; lab, to be arranged. W. E. Drake.

An introduction to the origin, development of curricula, and methods of teaching agriculture in secondary schools. Purposes are (1) to provide exploratory experience in teaching agriculture and (2) to prepare prospective teachers for participation in the resident student teaching program leading to teacher certification. Required of persons who plan to enter the student teaching program.

335 Youth Organizations Spring. 3 credits.

Prerequisite: basic course in psychology.

Lec, T Th 10:10; lab, to be arranged. J. P. Bail.

Role of selected youth organizations in providing educational experiences for adolescents. Factors affecting membership in such organizations, including psychological, sociological, and economic aspects, will be surveyed. Emphasis will be placed on the various roles the adult volunteer leader may play. Field experience with a recognized youth organization will be required.

352 Reading Statistics Fall or spring. 1 credit.

Prerequisite: registration in spring term limited to those concurrently enrolled in Educ 353.

Fall, T 12:20; spring, T Th 8:30-9. J. Millman.

Introduction to statistical vocabulary and symbolism frequently used in reporting empirical research in education and other social sciences. Students will be taught how to comprehend statistical terminology and results.

353 Introduction to Educational Statistics

Spring. 3 credits. Prerequisite: 352 (may be elected concurrently) or permission of instructor.

T Th 9:05-11. J. Millman.

A study of common statistical procedures encountered in educational inquiry. Includes the mathematical bases, computation, and interpretation of univariate and multivariate descriptive and inferential statistics.

370 Issues in Educational Policy Spring.

3 credits.

M W F 9:05. K. A. Strike.

An examination of the social, political, and economic issues that affect teaching and learning in schools and other settings. Included are such issues as educational opportunity, governance and policymaking, school and community, the economics of education, and the teacher in a social context.

371 Sociology of Education Spring. 3 credits.

S-U grades optional.

T Th 10:10-11:30. E. J. Haller.

An introduction to the sociological study of schooling and education. Essentially, this course is intended to help students make sense of the educational processes they are currently experiencing and those experienced in the past in elementary and secondary schools. For example, topics include the effects of social factors on educational achievement, the norms and values learned as part of the process of schooling, the relations between students and teachers, and the school's functions in the economic and political systems. All levels of education, from the elementary school to the university, are considered.

380 Independent Honors Research in Social Science

Fall or spring. 1-6 credits. S-U grades optional. Open only to candidates who have met requirements for the honors program. A maximum of 6 credits may be earned in the honors program.

Staff.

400 Field Experience Fall or spring. 1-4 credits.

S-U grades optional. Undergraduates must attach to their preregistration material written permission from the faculty member who will supervise the work and assign the grade.

Staff.
A student may engage in planned semiprofessional or professional practice in an educational enterprise. Each student prepares a plan of action including rationale, purposes, and procedures, and arranges with a faculty member to supervise and evaluate the field experience.

401 Our Physical Environment Fall or spring. 3 credits. Permission of instructor required. Charge for lab supplies (depending on individual use) approximately \$7.

T 1:25-4:25. V. N. Rockcastle.
A practical study of the basic physical principles of the environment, with special reference to the kind of analysis that might aid in teaching others about these principles. Includes commonplace phenomena in physics and earth science and relates these to the biota. Also includes a two-week unit on photography and darkroom procedures. Especially useful for teachers and environmental educators.

403 Environmental and Natural History Writing Spring. 3 credits. Prerequisite: previous course in composition plus working knowledge of biology and ecology; permission of instructor required. Open to upperclass and graduate students.

W 7:30-9:25 p.m. R. B. Fischer.
This course is designed for persons who want a second-level course to improve their ability to reach and influence others through publishing in magazines and newspapers. The class produces a weekly environmental awareness column for a local newspaper, and publishes *Environmental Synopsis* as a service to the profession. Subject matter includes outlets for articles, news releases, and preparation of newsletters and brochures aimed at changing environmental attitudes and behavior.

404-405 Field Natural History Fall and spring. 3 credits. Prerequisites: basic biology and ecology and permission of instructor. 404 not prerequisite to 405. Open to upperclass and graduate students.

Lec, M 10:10; lab, M Th 1:25, followed by field trip until 4:25. R. B. Fischer.

This course is designed for persons planning careers in environmental education centers, junior museums, school systems, and field biology teaching. Lectures and weekly field trips acquaint students with northeastern plants, animals, and their environments along with methods of using them as teaching resources. Man's impact on biological communities and his obligations towards them are emphasized.

407 Teaching Elementary Science Fall. 3 credits.

W 1:25-4:25. V. N. Rockcastle.
An analysis and synthesis of science concepts and related behaviors for children and young adults, with special emphasis on sequencing and instruction in school and environmental centers. Includes practical experiences in local schools and youth centers.

413 Developmental Counseling Fall. 3 credits. Prerequisites: 110 and 317 or equivalent.

T 10:10, Th 10:10-12:20. D. E. Hedlund.
Examination of selected theoretical approaches to facilitating human development. Exploration of the methods and the interpersonal skills defined by several systems of counseling, human relations, and psychotherapy. Focus on facilitating specific adult developmental issues such as career planning and career change, aging, and coping with death.

432 Teaching Agriculture: Methods, Materials, Practice Fall. 9 credits. Prerequisite: Educ 331. 434 may be taken concurrently.

M T W Th F 8-3. A. L. Berkey and staff.

Directed participation in teaching agriculture at the secondary school level. Program includes an intensive four-week on-campus period where methods and materials of teaching agriculture are treated in detail, combined with a ten-week period in a student teaching center. Includes evaluation of area resources; instructional materials and facilities; development of curricula; directing work experience; planning instruction; and advising youth organizations.

433 Special Problems in Agricultural Education Fall. 2 credits. S-U grades optional.

Time to be arranged. Staff.
Opportunity to study individually selected problems in agricultural education.

434 Adult Education Programs in Agriculture Fall. 3 credits. To be taken concurrently with 432.

Lec, to be arranged. H. R. Cushman.
Determining instructional needs, planning programs of instruction, teaching in groups, giving on-job instruction, and evaluating adult education programs in agriculture.

435 Educating for Community Action Spring. 3 credits.

T Th 10:10-12:05. R. L. Bruce.
Design and execution of educational aspects of community action programs. Deals with the identification and statement of educational goals, selection of teaching strategies, and evaluation of outcomes.

445 Curriculum Design Fall. 3 credits.

T Th 10:10-11:30. G. J. Posner.
A general "how-to-do-it" approach to course planning. Readings, group discussions, workshops, and individual conferences centering on each student's own project. This project consists of designing a course in a subject area, for an age level and an institutional setting of the student's own choosing. May be taken concurrently with Educ 545.

446 Implementing Instruction Spring. 2 credits.

Lec, lab, W 1:25-4:25. V. N. Rockcastle.
A study of the elements of effective instruction in lecture, laboratory, seminar, field trip, and other modes of instruction. Actual practice in developing and presenting various modes of instruction, with critiques by the class.

[448 Reading, Learning, and Study Skills

Spring. 3 credits. Not offered 1978-79.
T 1:25-3:30. W. J. Pauk.
The teaching approach will be practical. Students will learn: (1) how to use readability formulas; (2) how to formulate questions for both expository and imaginative prose; (3) how to select reading tests; and (4) how to use commercial materials. In addition, the latest techniques for speed reading will be demonstrated and discussed. There will be lectures on how to read textbooks, take lecture notes, study for and take exams, develop one's vocabulary, gather data for a research paper, and on many other topics pertaining to reading, studying, and learning.]

472 Philosophy of Education Fall. 3 credits.

T 2:30-4:25. K. A. Strike.
A study of central issues in the philosophy of education. Questions of ethics, political philosophy, and the theory of knowledge will be examined and the implications for education assessed.

473 Contemporary Philosophy of Education Spring. 3 credits. Prerequisite: none—an interest in philosophical matters recommended.

M W 11:15, plus 1 hour to be arranged.
D. B. Gowin.
In the recent past there has been a spectacular upsurge of interest in an emphasis on "values" and "valuing" in education. This course undertakes conceptual analyses of curriculum materials in five areas of value education: inculcation, moral

development (Kohlberg), analysis, values clarification, action learning. A special topic will be adult reconstruction of values.

475 Political and Social Philosophy of Education Spring. 3 credits. Offered in alternate years.

T 2:30-4:25. K. A. Strike.
An examination of philosophical viewpoints on political and social ideals, such as liberty and equality, and an application of the results to educational institutions.

500 Informal Study Fall or spring. 1-3 credits. S-U grades optional. Undergraduates must attach to their preregistration material written permission from the faculty member who will supervise the work and assign the grade.

Staff.
A student may, with approval of a faculty adviser, study a problem or topic not covered in a regular course, or may undertake tutorial study of an independent nature in an area of educational interest.

511 Educational Psychology Fall. 3 credits. S-U grades optional. Prerequisite: introductory course in psychology.

M W F 1:25. R. E. Ripple.
A basic survey course for graduate students covering topics in educational psychology. Emphasis on psychological factors involved in human learning and the educational process. Set in a broad-based conceptual model of any behavioral setting for learning. Appropriate for graduate students seeking an introductory survey course in educational psychology and for those who want a refresher contemporary educational psychology course.

512 Standardized Tests: Use and Interpretation Fall. 3 credits.

Th 3:35-5:15, 1 additional hour to be arranged.
H. G. Andrus.
Designed for teachers, counselors, or personnel majors who plan to work with standardized tests.

513 A Theory of Education Fall. 3 credits.

Prerequisite: 311 or 511, or permission of instructor.
T Th 10:10-11:30. J. D. Novak.
Presents a coherent theory of education combining concepts from philosophy, psychology of learning, curriculum and instruction, together with selected writings on affective development. The course is designed to assist graduate students and teachers to prepare better instructional material and to design better educational research, based on theory. Classes are conducted in seminar style.

514 Group Processes in Education Spring.

3 credits. S-U grades optional. Prerequisite: permission of instructor.
T Th 10:10-12:20. D. E. Hedlund.
Consideration of effective group membership and leadership, with emphasis on the theory and practice of facilitating small group processes. Included are the design and evaluation of structured group exercises for the classroom, the use of groups in counseling, and an examination of the consulting role as an educational strategy.

[515 Affective Education Spring. 3 credits. Offered in alternate years. Prerequisite: permission of instructor. Not offered 1978-79.

M W 1:25-3:30. D. E. Hedlund.
This course examines the conceptual base and the methodology of teaching for objectives in the affective realm. The first part of the semester will be devoted to the intrapersonal dynamics of individual development and the relationship of affective and cognitive learning. The second part of the course will focus on the interactive nature of the teaching-learning transaction and the effective use of small group dynamics in teaching. The capability to design teaching-learning experiences that incorporate affective objectives is a major goal of the

course. The course is largely experiential, providing participation in a variety of approaches to affective education.]

519 Methods of Educational Inquiry Fall. 3 credits. Prerequisite: one course in statistics or 352 (may be elected concurrently).

T Th 2:30-4. J. Millman.
Techniques of empirical research in education, including design of experiments and methods of data collection. Provides an opportunity for students to write a research proposal and for small groups to conduct a ministudy. Students will be taught how to plan and conduct an empirical research study and how to critique the work of others.

532 Teaching Agricultural and Occupational Education Spring. 3 credits. Prerequisite: an introductory course in teaching methods or permission of instructor.

T 2:30-5. A. L. Berkey.
The focus of the course is on the selection, use, and evaluation of methods and materials for teaching occupational subjects. Methods for both group and laboratory instruction will be covered. Opportunity is provided through use of modules for students to develop teaching competencies based on their individual needs and interests. Videotaping of student presentations will be used to develop self-evaluation skills. A class project on the selection and/or development of instructional materials will be required.

533 Curriculum in Agricultural and Occupational Education Fall. 3 credits.

M 1:25-3:30, labs arranged. W. E. Drake.
Current situations affecting occupational education curricula will be examined. Principles, objectives, and sources of information will be developed for planning curricula. Strategies for developing occupational courses will be examined. Consideration will be given to planning, developing, and managing work experience programs. Participants will have an opportunity to observe on-going programs at the secondary and two-year college levels and pursue individual interests in curriculum improvement.

534 Adult Education Programs: Organization and Direction Fall. 3 credits.

F 1:25-4:20. H. R. Cushman.
Alternative procedural models for organizing and conducting adult occupational education courses will be presented. Guidelines and procedures for implementing the models in secondary and postsecondary school settings will be emphasized.

535 Continuing Education Programs Spring. 3 credits. Prerequisite: some practical work experience.

W 1:20-4. G. J. Broadwell.
An overview of selected theories, principles, and strategies applicable to problems of administering and supervising autonomous professionals in decentralized informal educational organizations and change agencies. Content includes management functions, managerial leadership styles, management by objectives, performance appraisal, collective negotiations, decision making, and conflict management. Lectures, films, a variety of readings, and group discussion will be augmented by individual papers oriented to application of conceptual information.

543 Structure of Knowledge and Curriculum Spring. 3 credits. Prerequisite: permission of instructor.

M W 12:20-2:10. D. B. Gowin.
A method for the critical analysis of knowledge and value claims embedded in primary sources is presented. Students use this method of analysis on materials chosen according to their own background or interest. Students develop their materials to the

point where they could be used for instructional purposes. A special theory of curriculum developed by the instructor will be presented.

544 Teaching Mathematics Spring. 3 credits.

T Th 3:35-4:50. H. A. Geiselmann.
Intended to provide competence in presenting mathematics using various approaches—discovery, audiovisual aids, laboratory techniques, individualized instruction, use of games, puzzles; acquaintance with teaching resources; geometrical constructions; discussion of the slow learner. Each student must select a project and present it to the class.

545 Curriculum Theory and Analysis Fall. 3 credits. Prerequisite: 311 or 511 (may be taken concurrently) or permission of instructor.

M W 10:10-11:30. G. J. Posner.
An examination of the basic elements involved in making curriculum decisions and an analysis of current approaches to curriculum. Students learn to analyze a curriculum in the context of a conceptual framework. This course is the basic graduate course in curriculum.

546 Evaluation for Program Management

Spring. 3 credits. S-U grades optional
M 2:30-5. R. L. Bruce.
Primary attention is given to educational and other community change programs but inferences to other program management tasks are made.

561 Administration of Educational Organizations Fall. 3 credits.

W 3:35-6. E. J. Haller.
Perspectives on the administration of educational organizations. Consideration of classic and contemporary organization theories and their application to both public and higher education. Intended for students who are considering careers as educational administrators as well as for those who wish to further their understanding of schools as organizations.

[563 Governance of Public Education Fall. 3 credits. Offered in alternate years. Not offered 1978-79.

W 3:35-6. E. J. Haller.
Consideration of the structure of control in public education. Relationships among federal, state, and local agencies, and the administrative roles in school districts. Considerable attention will be directed to social and political analyses of the community.]

564 Educational Finance Spring. 3 credits. S-U grades optional.

T 3:35. G. M. Winter.
Attention will be focused on tasks and procedures involved in budgeting, support systems, allocation, control, accountability, and the measurement and reporting of benefits and productivity. Opportunity for individuals to focus upon their own areas of interest, such as occupational education, the two-year college, the secondary school, or higher education.

[569 Personnel Development: Issues in Higher Education Spring. 3 credits. Not offered 1978-79.

Th 3:35-6. H. L. Wardeberg.
An examination of selected issues that affect the administration and development of academic and nonacademic personnel in continuing and higher education institutions.]

574 History of American Education Fall. 3 credits.

M 3:35-5:15. Instructor to be announced.
An examination of American schools, colleges, and other educative agencies from colonial beginnings to the present. An attempt is made to view education in the context of American norms and values as these have evolved over time.

[575 Educational Policy Development and Decision Making Fall. 3 credits. S-U grades optional. Not offered 1978-79.
T 3:35-5:30. E. J. Haller.]

600 Internship in Education Fall or spring. 2-6 credits. S-U grades optional. Each registration must be arranged with and approved by a faculty member who will assume responsibility for supervising work.

Staff.
Opportunity for practical experience in educational professions development.

602 Proseminar in Organization and Management of Sponsored Research Fall.

2-4 credits. Permission of instructor required.
F 2:30-4. J. A. Dunn.
Designed for doctoral students, advanced graduate students, and practitioners in the field who have responsibility for the promotion, management, or supervision of educational research, development, or evaluation projects. The seminar will be devoted to an in-depth review of the history of educational research, patterns of federal support, the federal procurement process, and proposal preparation. Successful and unsuccessful proposals will be analyzed. Attention will be given to alternative strategies for proposal development.

606 Seminar in Science and Environmental Education Fall or spring. 1 credit.

T 7:30-9:30 p.m. R. B. Fischer.
Coordinates various interest groups in science and environmental education. Discussions center around curriculum development, research and thesis writing, and current problems.

[611 Seminar in Educational Psychology and Curriculum Spring. 3 credits. S-U grades optional. Offered in alternate years. Prerequisite: permission of instructor. Not offered 1978-79.

Hours to be arranged. R. E. Ripple.
Selected aspects of the relationship between curriculum and the psychology of education. Although specific content focus may vary, emphasis will be on the psychology of human learning with implications for structuring learning experiences and curriculum development. Appropriate for graduate students in educational psychology, curriculum and instruction, and others with interests in the relationship between psychology and curriculum.]

615 Seminar in Applied Behavioral Science Fall. Variable credit. S-U grades.

W 1:25-3:30. D. E. Hedlund.
Selected topics in adult counseling, human relations training, and applied educational psychology.

617 Experimental Research in Reading Spring. 3 credits. S-U grades optional. Offered in alternate years. Prerequisite: background in cognitive psychology or psycholinguistics.

Hours to be arranged. G. W. McConkie.
An opportunity to explore selected areas of reading research in depth and to gain research skills in those areas.

618 Adult Learning and Development Spring. 3 credits. S-U grades optional. Prerequisite: permission of instructor.

Hours to be arranged. R. E. Ripple.
Deals with adult development and learning behavior from points of view of educational psychology, social psychology, and sociology. Inferences are drawn from theory and research to the practice of adult continuing education. Appropriate for graduate students in educational psychology, extension and continuing education, community service education, and others interested in adult learning and development.

619 Conceptual Problems in Educational Inquiry Fall. 3 credits. S-U grades optional. Prerequisite: experience or course work in research.

Th 12:20-2:20. D. B. Gowin.

Techniques and procedures for the critical appraisal of research documents. Practice in such appraisal is required, with primary emphasis upon conceptual structures rather than research techniques. Students may use their own research proposals or research products as material for analysis.

624 Designing Extension and Continuing Education Programs Fall. 3 credits. Prerequisite: permission of instructor.

T 1:25-4. R. L. Bruce.

Designed to help students develop understanding of current theories, concepts, principles, and procedures central to the process of developing programs and curricula for the continuing education of adults. Emphasis is placed on such key problems as conceptualization of the nature and role of programming, situation analysis and needs identification, choosing among alternative courses of action, stating program objectives, macro and micro planning, and program organization.

627 Achieving Behavioral Change in International Rural Modernization Spring. 3 credits.

Instructor to be announced.

This course is intended for students with interests or experience in international rural and community development, irrespective of subject matter field. Five related current problems or issues concerning educational programs and their contribution to the development process will be examined in detail, drawing on the experience of staff, students, and outside resource persons. Enrollment by permission.

635 Teacher Preparation in Agriculture Fall. 3 credits. Prerequisite: teaching experience in agriculture.

W 1:25-3:20. J. P. Bail.

Open to persons with teaching experience interested in the preparation of occupational teachers. Involvement in the Cornell program of teacher preparation in agriculture is expected.

636 Occupational Education Program: Administration and Supervision Spring. 3 credits.

W 2:30-4:25, with special sessions arranged.

J. P. Bail.

Practices and procedures of organizing, administering, and supervising programs of occupational education at the secondary and postsecondary level will be stressed. The role of the director in providing leadership in the improvement of instruction, designing programs, and use of resources at federal, state, and local levels will be considered.

639 Evaluating Programs in Occupational Education Spring. 3 credits.

T 1:25-3:20; labs, arranged. W. E. Drake.

This course examines objectives, criteria, and strategies for evaluating programs of occupational education in secondary and postsecondary schools. Evaluation models, case studies, and evaluation as a function of program planning will be considered. Participants will examine the roles of supervision in evaluation and have an opportunity to develop and apply evaluative instruments. Field trips and resource persons will provide opportunities to observe actual evaluation problems and procedures.

645 Seminar in Curriculum Theory and Research Spring. 3 credits. Prerequisite: 545 or 445 or permission of instructor.

Hours to be arranged. G. J. Posner.

Theoretical issues in curriculum and appropriate areas for curriculum research are discussed.

669 Studies in Educational Administration Spring. 3 credits. S-U grades optional.

W 3:35-6. E. J. Haller.

Analysis and critique of current research in educational administration. Discussion of research priorities and strategies in the conceptual area of educational governance. Open to graduate students interested in conduct of research on problems of educational governance.

[670 The American University] Spring. 3 credits. S-U grades optional. Not offered 1978-79.

T Th 10:10-12:05.

Designed for students who intend to become academic professionals, teachers, counselors, or do research on higher education.]

673 Seminar in Dewey's Philosophy of Education Fall. 3 credits. S-U grades optional.

Prerequisite: prior work in philosophy and permission of instructor.

Hours to be arranged. D. B. Gowin.

A detailed analysis of some selected major Dewey work (*Democracy and Education*, *Experience and Education*, *Art As Experience*). One objective of the seminar will be to help students learn how to read Dewey and to compare and apply his ideas about education to problems and issues that are pressing today.

700 Master's Level Thesis Research Fall or spring. Credit arranged. S-U grades optional. Each registration must be approved by a faculty member who will assume responsibility for guiding the work.

Staff.

Limited to students working on theses or other research and development projects.

716 Seminar in Educational Research Fall. 3 credits. S-U grades only. Prerequisite: permission of instructor.

Hours to be arranged. J. Millman.

An intensive study of the literature in a particular area of research methodology. Topics in recent years have included procedures and issues in educational evaluation, the interface of instruction and measurement, and the design of educational experiments. The topic for the current term to be announced.

730 Seminar in Agricultural and Occupational Education Spring. 2 credits. S-U grades optional.

Th 2:30-4:25. A. L. Berkey.

For master's degree candidates who have had teaching experience and doctoral candidates with majors or minors in agricultural and occupational education. Emphasis on current problems and research and includes discussion of student research proposals.

771 Seminar in the Sociology of Education Fall. 3 credits. S-U grades optional.

W 9-11. E. J. Haller.

Intensive study of a selected topic in the sociology of education, with consideration of its organizational and policy implications.

772 Seminar in Philosophy of Education Spring. 3 credits. S-U grades optional. Prerequisite: permission of instructor.

W 10:10-12. K. A. Strike.

Topics to be announced.

800 Doctoral Level Thesis Research Fall or spring. Credit arranged. S-U grades optional. Each registration must be approved by a faculty member who will assume responsibility for guiding the work.

Staff.

Limited to students working on theses or other research and development projects.

See also:

Historical Roots of Modern Psychology (Psych 490)

Entomology

E. H. Smith, chairman; C. O. Berg, W. L. Brown, Jr., E. W. Cupp, J. E. Dewey, G. C. Eickwort, P. P. Feeny, J. G. Franclemont, G. G. Gyrisco, H. H. Hagedorn, R. G. Helgesen, W. T. Johnson, J. P. Kramer, R. A. Morse, A. A. Muka, L. L. Pechuman, D. Pimentel, E. M. Raffensperger, R. B. Root, E. T. Schmidtman, M. Semel, M. J. Tauber, W. M. Tingey, C. F. Wilkinson, R. G. Young.

200 Insects and Man Fall. 2 credits. S-U grades optional.

Lec, T Th 11:15. E. M. Raffensperger.

A presentation of the insects with attention to their roles in nature and in civilization. Biological, historical, social, economic, and cultural aspects will be discussed. Course content is intended for students in all colleges.

212 Insect Biology Fall. 3 credits. Prerequisite: Bio S 101-102 or concurrent registration, or equivalent.

Lec, W F 11:15; lab, M T W Th or F 2-4:25.

G. C. Eickwort.

Introduces the science of entomology by focusing on basic principles of systematics, morphology, physiology, behavior, and ecology of insects. The laboratory in early fall includes field trips to collect and study insects in the natural environment. A small collection stressing ecological categories is required.

618 Techniques of Biological Literature Fall. 2 credits. Offered in alternate years.

Lec, T Th 9:05. J. G. Franclemont.

History of the development of entomological literature and critical study of the biologists' works of reference. Practice in the use of indices and use and preparation of bibliographies.

Apiculture

260 Introductory Beekeeping Spring. 2 credits.

T Th 11:15. R. A. Morse.

Introduces the fundamentals of beekeeping, including the life history, instincts, and general behavior of honey bees. Special attention is given to the biology of the honey bee. Some lectures are devoted to pollination of agricultural crops and the production of honey and beeswax.

262 Biology of the Honey Bee Fall. 1 credit. Limited to 10 students. Prerequisite: permission of instructor.

15 laboratories by arrangement in September and October only. R. A. Morse.

A laboratory and field course in which the classical experiments by von Frisch on vision, chemical senses, and language of the honey bee are repeated. Laboratories include demonstration of sex attractant, swarm orientation, the natural nest, and a study of wasp, bumble bee, and other social insect nests.

264 Practical Beekeeping Spring. 1 credit. Limited to 20 students. Prerequisite: 260 (may be taken concurrently).

Lab only, Th F 2:00-4:30. R. A. Morse.

Fourteen laboratories designed to acquaint students with practical methods of colony management. Laboratories involve actual work with package bees and mature colonies. Three laboratories are concerned with apple pollination and methods of moving colonies into orchards.

Department Seminar

Jugatae Fall and spring.

M 4-5.

A seminar conducted by Jugatae, the entomology club of Cornell University, to discuss topics of interest to its members and guests.

Environmental Entomology

370 Pesticides in the Environment Fall. 2 credits. Prerequisites: Bio S 101-102 or equivalent.

Lec, T Th 10:10. R. J. Kuhr.

A survey of the different types of pesticides, their uses, their distribution in the environment, and their effects on various components of the environment. Intended for students whose main emphasis is not in pesticide usage.

[400 Insect Ecology (also Bio S 460)] Fall. 4 credits. Prerequisites: 212 and Bio S 360, or their equivalents. Not offered 1978-79.

Lec, W F 11:15; lab, W 1:25-4:25 and either F 1:25-4:25 or S 8-11. R. B. Root.

Familiarity with ecological principles is assumed; emphasis is placed on integrating these concepts through detailed analysis of entire life systems. Includes adaptive syndromes and functional role of insects in terrestrial ecosystems, field methods, natural history of arthropod guilds, contrast between natural and managed systems, and population dynamics.]

471 Bionomics of Fresh-Water Invertebrates Spring. 4 credits. Prerequisite: 212; Bio S 360 recommended.

Lec, T Th 9:05; lab, M F or T Th 1:25-4:25. C. O. Berg.

A field and laboratory study of aquatic insects and other macroscopic fresh-water invertebrates, including conditions for life in streams, ponds, and other fresh-water habitats, identification of macroscopic invertebrates (especially aquatic insects), found there, life histories, methods of collection, trophic interactions, and other ecological relationships.

660 Insect Ecology Field Course Spring. 2 credits. Restricted to graduate students. Prerequisites: courses in ecology, entomology, and taxonomy, and permission of instructor.

W 7:30 p.m. The class will be away from campus during spring recess and the following week. R. B. Root.

A field course stressing methods for study of insect populations and communities. The class will engage in a coordinated set of projects at the Archbold Field Station and Everglades National Park in Florida. Estimated cost: \$50 plus meals en route.

664 Seminar in Coevolution Between Insects and Plants Spring. 2 credits. S-U grades optional. Limited to 15 students. Prerequisites: courses in entomology, ecology, evolution, and organic chemistry, and written permission of instructor. Offered in alternate years.

Hours (one evening a week) to be arranged. P. P. Feeny.

Intended for graduate students and senior undergraduates. Presentations and discussions by students on the evolution of patterns of interaction between plants and insects, emphasizing critical evaluation of concepts and evidence.

[672 Seminar in Aquatic Ecology] Fall. 1 credit. Offered in alternate years. Prerequisites: 471 or Bio S 462, and permission of instructor. Not offered 1978-79.

Hours to be arranged. C. O. Berg.

Discussion and analysis of current concepts and problems in limnology and aquatic entomology, including the critical study of selected reference works and research papers.]

695 Environmental Biology Fall and spring sequence. 1-3 credits. Prerequisite: permission of instructor.

Hours to be arranged. D. Pimentel.

Focuses on complex energy-environmental problems, using a multidisciplinary approach, task force groups of nine students, each representing several disciplines, investigate significant energy-

environmental problems. Each task force group will spend two semesters preparing a report for publication, modeled after National Academy of Sciences reports.

Insect Physiology, Biochemistry, and Behavior

483 Insect Physiology Spring. 4 credits. Prerequisite: 212, and a biochemistry course.

Lec, M W F 11:15; lab, W or F 1:25. H. H. Hagedorn.

An introduction to insect physiology with emphasis on development and organ systems.

662 Insect Behavior Seminar Spring. 1 credit.

Prerequisites: 212 and Bio Sci 321 or equivalent, and permission of instructors.

Hours to be arranged. G. C. Eickwort, M. J. Tauber.

687 Insect Biochemistry Fall. 2 credits. Offered in alternate years. Prerequisite: permission of instructor.

Hours to be arranged. R. G. Young.

Primarily a laboratory course, emphasizing some comparative aspects of biochemistry. Lectures provide rationale for the laboratory.

690 Insect Toxicology and Insecticidal Chemistry Spring. 4 credits. Offered in alternate years. Prerequisites: general chemistry and organic chemistry. Undergraduate students by permission of instructor.

Lec, M W F 9:05; lab, day to be arranged, 1:25-4:25. C. F. Wilkinson.

The chemistry of insecticides and their metabolism and mode of action in insects and mammals.

Insect Taxonomy, Morphology, and Acarology

322 Insect Morphology Fall. 5 credits. Offered in alternate years. Prerequisites: 212 or 241.

Lec, M W F 10:10; lab, M F or T Th 1:25-4:25. G. C. Eickwort.

An introduction to the external and internal anatomy of insects, with emphasis on the comparative and functional aspects. The laboratory is devoted largely to dissection.

331 Introductory Insect Taxonomy Spring. 3 credits. Prerequisite: 212.

Lec, Th 10:10; lab, T Th 2-4:25. J. G. Franclemont.

An introduction to the systematics and distribution of insects. Laboratory practice in the identification of orders, families, and representative genera of insects; methods of collection and preparation of insect specimens. Field trips are taken in the late spring.

[621 Acarology] Fall. 4 credits. Offered in alternate years. Prerequisites: 212 and permission of instructor. Not offered 1978-79.

Lec, M F 10:10; lab, M F 1:25-4:25. G. C. Eickwort.

An introduction to the taxonomy, morphology, and bionomics of mites and ticks, with emphasis on taxa of economic importance. A collection will be required.]

[631 Taxonomy of the Smaller Orders of Insects] Fall. 3 credits. Offered in alternate years.

Prerequisite: 331. Not offered 1978-79.

Disc, F 10:10; lab, F 2-4:25 and 1 other by arrangement. W. L. Brown.

Discussions of the classification, evolution, and bionomics of the orders and families of insects exclusive of the larger orders of Holometabola. Laboratory studies on the literature and on the characters and classification of representative genera and species. Continuation of taxonomy of Holometabola is in courses 632, 633, and 634.]

632 Taxonomy of the Immature Stages of Holometabola Fall. 3 credits. Offered in alternate years. Prerequisite: 631 or permission of instructor.

Lec, W 10:10; lab, W F 2-4:25. J. G. Franclemont. Lectures on structure and habits of insect larvae. Laboratory studies of the literature, comparative morphology, and identification of the immature stages of the Holometabola.

633 Taxonomy of the Coleoptera and Lepidoptera Spring. 3 credits. Offered in alternate years. Prerequisite: 331.

Lec, W 10:10; lab, W F 2-4:25. J. G. Franclemont. Laboratory studies on the literature and on the characteristics and classification of representative genera and species of these orders.

[634 Taxonomy of the Diptera and Hymenoptera] Spring. 3 credits. Offered in alternate years.

Prerequisite: 331. Not offered 1978-79.

Lec, W 10:10; lab, W F 2-4:25, and 1 other by arrangement. W. L. Brown.

Laboratory studies on the literature and on the characters and classification of representative genera and species of these orders.]

Medical Entomology and Insect Pathology

[452 Medical Entomology] Fall. 3 credits. Prerequisites: 212 and Vet 330, or permission of instructor. Not offered fall 1978.

Lec, M W 9:05; lab, F 8-11. E. W. Cupp. A survey of arthropods of public health and veterinary importance with emphasis on transmission dynamics of pathogens, the bionomics of vector populations, and current control concepts. Morphology and taxonomy of selected groups are examined in the laboratory with additional exercises in vector-pathogen relationships and epidemiological techniques.]

453 Insect Pathology Spring. 4 credits.

Prerequisite: 212 or equivalent, a course in microbiology, or permission of instructor.

Lec, M W 10:10; lab, Th 1:25-4:25. J. P. Kramer. A survey of the diseases of insects caused by viruses, bacteria, fungi, and protozoans plus a consideration of the role of microbial diseases in natural and applied insect control. Laboratory investigations center around living insect-pathogen associations and the consequences of these associations for both insect and microbe.

Pest Management

241 Applied Entomology Spring. 3 credits. Prerequisite: Bio Sci 101-102 or equivalent.

Lec, T Th 10:10; lab, M T W Th or F 2-4:25. E. M. Raffensperger.

A compendium of the insects associated with crops and farm animals. Discussions of insect pest management requirements on farm and garden along with descriptions of control methods, materials, and equipment.

340 Insect Pest Management Spring. 4 credits. Prerequisites: 212 or 241, and 400 or Bio S 360, or permission of instructor.

Lec, M W F 9:05; lab, M 1:25-4. R. G. Helgesen. A lecture and laboratory introduction to principles and techniques of insect pest management as these relate to the diverse problems in contemporary economic entomology.

341 Arthropod Pests of World Importance Fall. 2 credits. Prerequisite: 340.

Lec, T Th 9:05. E. H. Smith.

Major arthropod pests of the world are surveyed in the context of the nature and extent of injury and pest management options. The roles of agencies involved in pest management are considered together with the social and economic factors relating to the implementation of control programs.

342 Special Topics in Economic Entomology

Term to be arranged. 1 or 2 credits. Offered in alternate years. Prerequisite: 212 or 241.

Hours to be arranged. Entomology faculty and invited lecturers.

Deals with specialty topics such as plant resistance to arthropods (see Plant Breeding 616C); pesticide application technology; insect monitoring, scouting, and survey technology; potential of insect growth regulators and pheromones and livestock entomology.

[677 Biological Control Fall, 3 credits.

Prerequisites: 212, Bio S 360, and permission of instructor. Not offered 1978-79.

Lec, T Th 9:05; lab, T 2-4:25. M. J. Tauber. Theory and method of biological control of arthropod pests and weeds. Laboratory includes studies with living parasites and predators.]

See also:

Pathology and Entomology of Trees and Shrubs (PI Pa 403)**Research or Special Topics**

Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work.

408 Undergraduate Research

Entomology faculty.

418 Special Topics for Undergraduates

Entomology faculty.

707 Special Topics for Graduate Students

Entomology faculty.

708 Graduate Research

Entomology faculty.

709 Teaching Entomology Credit is given for

teaching entomology or for extension training. Entomology faculty.]

Floriculture and Ornamental Horticulture

C. F. Gortzig, chairman; A. Bing, J. W. Boodley, A. M. Elliot, C. C. Fischer, R. T. Fox, G. L. Good, R. J. Lambert, R. W. Langhans, A. S. Lieberman, R. G. Mower, E. F. Schauffler, J. G. Seeley, H. B. Tukey, Jr.

100 Introductory Floriculture and Ornamental Horticulture Fall, 3 credits. S-U grades optional for

students not specializing in floriculture.

Lec, M W 8; lab, T or W 2-4:25. J. W. Boodley. Principally for freshmen. Emphasis is placed on an introduction to and comprehension of basic plant physiology and plant processes, control of the plant environment, and the industry and opportunities. A required weekend field trip to visit commercial enterprises is made and costs approximately \$20, plus room and meals.

105 Principles of Flower Arrangement Fall or

spring, 2 credits. Enrollment limited to 22 students for each laboratory section. Preference given to department majors.

Fall; lec-lab, T W or Th 1:25-4:25. C. C. Fischer. Spring; lec-lab, T W or Th 1:25-4:25.

C. C. Fischer.

A study of the care and handling of flowers, the factors affecting keeping quality, and the design principles involved in the use of flowers and related decorative materials. There is a lab materials charge of \$20.

401-411 Physiology of Horticultural Plants

Fall, 401 (lec), 2 credits; 411 (lab), 1 credit. Prerequisite: Bio S 242 or 342, or permission of instructor. 411 limited to 40 students.

401 T Th 8; 411, Th 1:25-4:25. H. B. Tukey, Jr. Application of physiology to germination of seeds, rooting of cuttings, manipulation of bulbs, and propagation of plants by budding and grafting. Stress on basic mechanisms concerning initiation and development of roots and shoots.

402 Physiology of Horticultural Plants Spring,

4 credits. Prerequisite: Bio S 242 or 342, or permission of instructor.

Lec, M W F 8; lab, time to be arranged. Staff. A study of the physiology of growth and development of horticultural plants in response to their environment.

450 Special Topics on Ornamental Plants Fall

or spring. Credit to be arranged. Limited to 15 students (primarily for upperclass department majors). Prerequisites: 213, 312 or 313 or the equivalent, and permission of instructor.

Hours to be arranged. R. G. Mower. Topical subjects in plant materials. Independent and group study of important groups of woody and herbaceous plant materials not considered in other courses. The topic to be covered will be given each semester in the supplementary announcement.

451 Special Problems in Floriculture and Ornamental Horticulture 1 or more credits. S-U

grades optional. Prerequisite: adequate training for the work. Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade.

C. F. Gortzig and staff. Special work on problems under investigation by the department or of special interest to the student, provided adequate facilities are available. Students must satisfy the staff member under whom the work is to be taken, that their preparation warrants their choice of problems.

600 Seminar Fall or spring. S-U grades only. For

department staff and graduate students. Th 12:10.

See also:

General Horticulture (Veg 103)**Introduction to Landscape Design (LA 102)****Commercial Floriculture****325 Flower-Store Management** Fall, 3 credits.

Prerequisites: 105 and permission of instructor. Lec, 2 hours to be arranged; lab, F 1:25-4:25.

R. T. Fox. Lectures devoted to flower-shop management, business methods, merchandising, and marketing of floricultural commodities. Laboratories to include the application of subject matter and the principles of commercial floral arrangement and design. Lab materials charge, \$20. Required field trips made to flower shows and to wholesale and retail florist establishments; cost, \$15 plus room and meals.

424 Principles of Florist Crop Production

Spring, 4 credits. Prerequisites: Flor 401 and Bio S 242 or 342 (may be taken concurrently) or equivalent, or permission of instructor. Limited to 40 students, with 20 per lab section. Preference given to juniors.

Lec, M W F 9:05; lab, M or Th 2-4:25. J. G. Seeley. Commercial production of florist crops. Emphasis on principles of culture of ornamental plants as influenced by greenhouse environment. Field trips are made to commercial greenhouses. Cost: \$20 plus meals.

425 Greenhouse Production Management

Spring, 4 credits. Prerequisite: an elementary course in horticulture or equivalent. Primarily for seniors.

Lec, T Th 10:10-12:05. R. W. Langhans. Intended to provide the latest information relative to efficient operation and administration of a commercial greenhouse range outside the sphere of actual production methods for specific crops. Consideration is given to the industry, centers of production, competition, location, types of structures, heating, ventilation, cooling, fertilizing, and watering systems, and business analysis and management. Two field trips will be taken; total cost \$100.

Nursery and Turfgrass Crop Management**314 Turfgrass Management** Spring, 3 credits.

Prerequisite: Agron 200 or permission of instructor.

Lec, T Th 10:10; lab, Th 2-4:25. Staff. The scientific principles, practices, and materials for the construction and maintenance of lawn, sports, and utility turfgrass areas. Environmental effects on growth also studied.

317 Nursery Crop Production and Maintenance

Fall, 4 credits. Prerequisite: 401.

Lec, M W F 9; lab, M 12:20-2:15, 2:30-4:25.

G. L. Good. Problems of commercial propagation and growth of nursery plants to marketable stage. Digging, storage, and packaging of nursery stock included. Some consideration is given to the planting and culture of landscape plants. Field trips are included in lab work.

318 Advanced Turfgrass Management Fall,

2 credits. Prerequisites: 314 or equivalent, and permission of instructor.

Staff. A continuation of 314 with emphasis on applying scientific principles to management of golf courses, athletic fields, parks, industrial grounds, and sod production. A weekend inspection trip is taken to experimental test plots and special turfgrass areas; cost \$10 plus room and meals.

Plant Materials**210 Taxonomy of Cultivated Plants** Spring,

4 credits. Intended primarily for department majors. Prerequisite: Bio S 105-106 or 245 or an equivalent course, or permission of instructor.

Lec, M W 10:10; lab, M W 2-4:25. J. W. Ingram, Jr. A study of the kinds of cultivated ferns and seed plants and their classification into families and genera. Emphasis is placed on methods of identification, preparation, and use of analytical keys, distinguishing characteristics of families, their importance in horticulture, and the basics of nomenclature.

213 Woody Plant Materials Spring, 4 credits.

Limited to 60 students (primarily department majors). Prerequisite: 210 or permission of instructor.

Lec T Th 9:05; Lab T 1:30-4:30 (2 sections to be arranged) and W or F 2-4:25. R. G. Mower.

A study of the trees, shrubs, and vines used in landscape plantings. Emphasis is placed on winter identification and their values for use as landscape material.

312 Garden and Interior Plants I Fall, 3 credits.

Limited to 50 students (primarily department majors). Prerequisite: 210 or permission of instructor.

Lec T Th 10:10; lab T 1:30-4:30 (2 sections to be arranged). R. G. Mower.

A study of ornamental plants used in garden and interior situations. The first seven weeks will cover primarily herbaceous annuals and perennials with the laboratory devoted to various practical gardening activities. The remainder of the semester will cover the major kinds of foliage and flowering

plants used in the home and other interior landscape situations. Emphasis will be on identification, use, and general cultural requirements.

313 Woody Plant Materials for Landscape Use Fall. 3 credits. Limited to 30 students (primarily landscape architecture majors).

Lec, W 10:10; lab, F 9:05–12:05. R. G. Mower. A study of the trees, shrubs, vines, and ground covers used in landscape plantings in the northeastern United States. Emphasis is placed on leaf identification and on characteristics that determine their usefulness as landscape subjects. Opportunity for independent study will be provided.

322 Garden and Interior Plants II Spring. 3 credits. Prerequisite: 312 or permission of instructor.

Lec M W 11:15; lab M 1:30–4:30 (2 sections to be arranged). R. G. Mower. A continuation of fall semester course (312). The first seven weeks will be devoted to a further study of interior plants with emphasis on the specialized groups of interior plants such as orchids, cacti and succulents, gesneriads, ferns, palms, bromeliads, and others. The second seven weeks will be devoted to outdoor herbaceous plants such as tulips, daffodils, crocus, iris, as well as other spring-blooming bulbs and perennial plants. Outdoor laboratories will emphasize practical gardening activities appropriate to the spring season.

Freehand Drawing and Illustration

109 Drawing for Landscape Architects Fall. 3 credits. Primarily for department majors; others admitted with permission of instructor. Limited to 25 students.

Lec, Th 10:10; studio, T 9:05–11, Th 1:25–4:25. A. Elliot. Emphasizes the development of a graphic language and an approach to freehand perspective. Outside sketchbook assignments.

110 Perspective for Landscape Architects Spring. 3 credits. Primarily for department majors. T Th 1:25–4:25. R. J. Lambert.

Practice in perspective construction from plans and elevations, rendering techniques, and basic design principles. Outside sketchbook assignments.

111 Freehand Drawing Fall or spring. 3 credits. S-U grades optional. Prerequisite: permission of instructor. Credit may not be received for both 109 and 111. Limited to 2 sections of 25 students (spring); limited to 25 students (fall).

Fall: M W F 10:10–12:05. R. J. Lambert. Spring: 6 studio hours scheduled in either two- or three-hour units between 9:05 and 12:05 M T W Th F, or T 2–4:25. These hours must include lec, T or W 10:10. A. Elliot. Objective is to develop accuracy of observation and skill in delineation. Practice is given in outdoor sketching and still-life and figure drawing. Principles of freehand perspective are taught and applied. Outside sketchbook assignments.

211 Freehand Drawing and Illustration Fall. 2 credits. Prerequisite: 111 or equivalent. S-U grades optional.

6 studio hours schedule in either two- or three-hour units between 9:05 and 12:05. M T W Th F. R. J. Lambert. Progression to the organization of complete illustrations. Subject matter largely from sketchbooks, still-life, and imagination. Composition, perspective, and ways of rendering in different media are considered.

214 Watercolor Spring. 2 credits. Prerequisite: 111 or equivalent. S-U grades optional.

6 studio hours scheduled in either two- or three-hour units between 9:05 and 12:05. M T W Th F. R. J. Lambert.

A survey of watercolor techniques. Subject matter largely still-life, sketchbook, and on-the-spot outdoor painting.

316 Advanced Drawing Fall or spring. 2 credits. S-U grades optional. Prerequisite: 211 or permission of instructor.

6 hours to be arranged. A. Elliot, R. J. Lambert. For students who wish to attain proficiency in some particular type of illustration or technique.

417 Scientific Illustration Fall. 2 credits. Prerequisite: 211, 316, or equivalent. S-U grades optional for graduate students only.

6 studio hours scheduled between 9:05 and 12:05. M T W Th. A. Elliot. A survey of methods of illustration. Training in techniques of accurate representation in media suitable for reproduction processes, including pen and ink, scratchboard, wash, and mixed media.

Landscape Architecture

M. I. Adleman, E. J. Carter, R. L. Dwelle, T. H. Johnson, A. S. Lieberman, L. J. Mirin, P. J. Trowbridge

The Landscape Architecture Program at Cornell is sponsored by the College of Agriculture and Life Sciences (in association with the Department of Floriculture and Ornamental Horticulture) and the College of Architecture, Art, and Planning. The program is accredited by the American Society of Landscape Architects and offers three professional program alternatives: a four-year undergraduate program leading to a Bachelor of Science degree with specialization in landscape architecture, a three-year graduate program, and a two-year graduate program. Both graduate programs lead to a Master of Landscape Architecture degree.

Landscape Architectural Design Sequence Courses

231 Design I: Basic Landscape Architectural Design Fall. 5 credits. Open to landscape architecture majors only.

Lec, M 12:20; studio M W F 1:25–4:25. T. H. Johnson. An introduction to the principles of landscape architectural design. The course will introduce graphics and drafting, two- and three-dimensional design, color abstraction, form, space and spatial sequence, uses of plant material, site inventory and analysis, and the site design process. This is the first course in a sequence of six studio courses required for specialization in landscape architecture. Drafting equipment and supplies required will cost approximately \$120. (Drafting equipment will be used throughout the six-studio sequence.) Participation in the program's five-day annual field trip is required. Basic expenses for this trip are estimated at \$100.

232 Design II: Basic Landscape Architectural Design Spring. 5 credits. Prerequisite: 231.

Lec, F 9:05; studio, M W F 10:10–12:35. M. I. Adleman. A continuation of the exposure to basic problem solving and the design process with emphasis on the development of site design and graphic skills. Projects will deal with the organization of outdoor space and the siting of buildings as well as the interrelationships of vehicular and pedestrian circulation, parking, open space, earth form, and vegetation.

331 Design III: Intermediate Landscape Architectural Design Fall. 5 credits. Prerequisite: 232.

Lec, F 9:05; studio, M W F 10:10–12:35. P. J. Trowbridge. Application of planning and design techniques to a variety of environmental problems. Timely issues will

be investigated and site development problems at several scales and land-use intensities will be examined. Participation in the program's five-day annual field trip is required. Basic expenses for this trip are estimated at \$100.

332 Design IV: Intermediate Landscape Architectural Design Spring. 5 credits.

Prerequisite: 331. Lec, M 12:20; studio, M W F 1:25–4:25. T. H. Johnson. Consideration of the design process within the context of comprehensive site master planning. Sequentially related projects will include site energy conservation, prototype development, planned-unit development, financial feasibility studies, and environmental assessment.

431 Design V: Advanced Landscape Architectural Design Fall. 4 credits. Prerequisite: 332. Corequisite: 491.

Studio, M W F 1:25–4:25. M. I. Adleman. Project planning studies emphasizing the planting design component of site development. Design problems will focus on the functional uses and spatial interrelationships of plants in the landscape. Several field exercises will deal with aspects of planting implementation normally specified by the landscape architect. A two-day field trip will be made to selected sources of nursery stock. Participation in the program's five-day annual field trip is also required. Basic expenses for this trip are estimated at \$100.

432 Design VI: Advanced Landscape Architectural Design Spring. 5 credits. Prerequisite: 431.

Lec, F 9:05; studio, M W F 10:10–12:35. P. J. Trowbridge. An application of inventory and analysis methods to timely problems in both urban and rural environments. Several documentation formats will be investigated, including computer mapping techniques.

****581 Landscape Planning and Design Workshop** Fall. 5 Credits.

L. J. Mirin.

****889 Thesis Research and Preparation in Landscape Architecture** Fall or spring. Credit and time to be arranged. Prerequisite: candidate for Master of Landscape Architecture degree and permission of the graduate field members concerned.

Nonsequence Courses

102 Introduction to Landscape Design Fall or spring. 3 credits. Lecture.

M W F 9:05. R. L. Dwelle. An introduction to the scope and principles of landscape design as well as interrelated horticultural considerations associated with the built environment. Guest lecturers in landscape architecture, ornamental horticulture, and related fields will be scheduled throughout the semester.

201 Residential Landscape Design I Fall. 3 credits. Limited to 15 students. Priority given to landscape horticulture majors.

Lec, M 12:20; studio, M W 1:25–4:25. R. L. Dwelle. Fundamentals of landscape design applied to residential and other small-scale site planning projects. Work in the studio will introduce basic design process, site design principles, planting design and graphics.

202 Residential Landscape Design II Spring. 3 credits. Limited to 15 students. Priority given to landscape horticulture majors. Prerequisites: Flor 213, LA 201 (or equivalent).

**Courses offered through the College of Architecture, Art, and Planning.

Lec, M 12:20; studio, M W 1:25, W 1:00-4:25.
R. L. Dwelle.

Advanced involvement with site design on a variety of residential and commercial projects. Emphasis will be on site organization, form, construction materials, details, grading, and planting design.

555 Special Projects in Landscape Architecture Fall or spring. 1 or 2 credits as assigned. May be repeated for credit. S-U grades optional.
Staff.

Work on special topics by individuals or small groups. Open to students in the Landscape Architecture Program with permission of the faculty member directing the study.

****689 Informal Study in Landscape Planning and Design** Fall or spring. 1 to 3 credits.
L. J. Mirin.

****690 Summer Internship Seminar** Fall. 2 credits.

Hours to be arranged. L. J. Mirin.
Primarily for landscape architecture graduate students.

See also:

Drawing for Landscape Architects (Drwng 109)

Perspective for Landscape Architects (Drwng 110)

Landscape Architecture Principles, Theory, and History

211 Introduction to Environmental Design (also Arch 261) Fall. 2 credits.

Lec, M W 9:05. P. J. Trowbridge.
An introduction to the basic principles involved in inventory and analysis techniques as they relate to design implementation in the outdoor environment. Case studies depicting application of these principles at all scales of land planning and design will be presented. The course will include the use of natural determinants in the land planning and design process, the organization of structures and outdoor space, vehicular and pedestrian circulation systems, land-form development and grading, water and plants as design materials, site construction materials, and site utilities.

***212 Introduction to Environmental Design** Fall. 1 credit. Corequisite: 211.

Hours to be arranged. P. J. Trowbridge and staff.
Discussion of 211 lecture material at greater depth. Seminar format. Paper required.

****481 Contemporary Issues in Landscape Architecture** Fall. 2 credits.
L. J. Mirin

491 Plants and Design Fall. 2 credits.
Prerequisite: Flor 213 or 313. Landscape architecture majors must register concurrently in 431.

Lec, T Th 9:05. M. I. Adleman.
A study of planting design principles relating to the functional uses and spatial interrelationships of plants in the man-made environment. Site, horticultural, and maintenance determinants affecting the selection and use of plant materials, as well as planting specifications, cost estimates, and planting implementation processes will be included.

572 Regional Landscape Inventories and Information Systems: An International Perspective Fall. 3 credits. Prerequisites: basic courses in landscape architecture, ecology and systematics, agronomy, and permission of instructor. Primarily for graduate students and upperclass students in landscape architecture. Also open to students in architecture, city and regional planning,

ecology, international studies, international agriculture, natural resources, and environmental horticulture.

Lec, Th 10:10-12:05. A. S. Lieberman.
Reading-seminar course exploring major current methodologies, approaches, academic and research centers for landscape inventory and analysis, and supporting land-use and natural resource information systems. Case studies in regional landscape planning in North America, Europe, Australia, and the Middle East will be given attention.

***573 Analysis and Use of Vegetation in Comprehensive Land Planning** Spring. 3 credits. Prerequisites: basic courses in landscape architecture, ecology and systematics, agronomy, and permission of instructor. Primarily for graduate students and upperclass students in landscape architecture. Also open to students in architecture, city and regional planning, ecology, international studies, international agriculture, natural resources, and environmental horticulture.

Lec, M W F 9:05. A. S. Lieberman.
An exploration of vegetation analysis techniques and methods applied to comprehensive land use planning, followed by consideration of the environmental uses of plants in regional landscape planning. The landscape functions of vegetation at the regional scale will be addressed through review of case studies in North America, Europe, the Middle East, and Australia.

****583 Urban Landscape Planning and Design** Fall. 3 credits.
L. J. Mirin.

****585 Historic Development of Landscape Architecture** Spring. 3 credits.
Lec, T Th 11:10. L. J. Mirin.

Landscape Materials, Construction, and Practice

242 Site Construction I Spring. 4 credits. Prerequisite: permission of instructor, and surveying.
Lec, M W 9:05; studio, T Th 9:05-11.
P. J. Trowbridge.

Lectures, short exercises, and projects dealing with land-form design and the preparation of grading plans, calculation of earthwork, and the layout of circulation systems, parking, and site utility systems.

341 Site Construction II Fall. 4 credits. Prerequisite: permission of instructor.
Lec, T Th 1:25-2:15; studio, T Th 2:30-4:25.
T. H. Johnson.

The nature of construction materials and methods of construction employed by landscape architects to implement project design proposals. Course process includes field trips, lab demonstrations, lectures, and studio work on models; details, and a construction documentation package for a design project.

451-452 Professional Practice (Also Arch 481-482) 451 fall, 452 spring. 2 credits per term.
Lec, Th 1:25-3:20. R. W. Crump.

An examination of organizational and management theories and practices for delivering professional design services. Included are an assessment of the building industry and its influence on practice, an analysis of the basic management functions within professional firms, and the legal concerns facing practitioners today. Lectures and seminar/workshop sessions with selected guest participants will use case studies as a major instructional vehicle.

See also:

Woody Plant Materials for Landscape Use (Flor 313)

*Pending approval of the College Curriculum Committee

**Courses offered through the College of Architecture, Art, and Planning.

Food Science

J. E. Kinsella, chairman; R. C. Baker, D. K. Bandler, H. F. DeGraff, T. W. Downes, D. C. Graham, L. F. Hood, W. K. Jordan, F. V. Kosikowski, R. A. Ledford, F. W. Liu, R. P. March, N. N. Potter, J. M. Regenstein, G. E. Rehkugler, J. W. Sherbon, W. F. Shipe, Jr., J. R. Stouffer, G. H. Wellington, R. R. Zall

100 Introductory Food Science Fall. 3 credits. M W F 10:10. N. N. Potter.

A comprehensive introduction to food science and technology—its scope, principles, and practices. Topics are constituent properties, methods of preservation, the major food groups including their handling and processing, and current problems such as chemical additives and world feeding needs. Interrelationships between chemical and physical properties, processing, nutrition, and food quality are stressed.

150 Food Facts and Fads Spring. 2 credits. S-U grades optional.

Lec, M 7:30 p.m.; disc, W 7:30-9:25 p.m., Th 12:20-2:15, 2:30-4:25, F 8:00-9:55 (sessions during even numbered weeks of the term only).
W. F. Shipe, staff, and invited speakers.

A series of public lectures dealing with current topics relating to foods. Attempts will be made to dispel misconceptions about foods and the factors affecting them. Lectures are open to students and public. Students enrolled participate in biweekly discussions dealing with lecture material and assigned readings.

200 Man and His Food Spring. 2 credits.

Lec and disc, Th 2:30-4:25. Herrell DeGraff.
The dynamics of food and population balances in both the developed and less-developed world regions, and the world's growing dependence on science to provide adequate food.

210 Food Analysis Spring. 3 credits. Prerequisite: Chem 104 or 208.

Lec, W F 12:20; lab, Th or F 1:25-4:25.
J. W. Sherbon.

Designed to acquaint the student with chemical tests used by food analysts. Emphasis is on understanding and use of good analytical techniques, including gravimetric, volumetric, and spectrophotometric methods. Procedures for screening, routine quality control, and official tests for fats, proteins, carbohydrates, and selected minor nutrients introduced.

220 Food Science for Industry Fall. 2 credits.

Lec and lab F 12:20-4:25. R. C. Baker.
Provides understanding of food industry operations. Half of the laboratories will be production of food products (sausages, pastries, etc.) by students and half will be visits to commercial plants producing those products. One or two longer field trips may be offered.

247 Post Harvest Food Systems. Fall. 2 credits.

S-U grades optional. Prerequisite: freshman chemistry, Food 100 recommended.
T Th 10:10. M. C. Bourne.

This interdisciplinary course describes various courses of post harvest food losses in developing countries and methods available to reduce the losses. Designed for all students in agriculture. Emphasis on cereal grains. Biology and control of rodents, birds, insects, and molds in stored foods, chemical causes of quality loss, simple drying and storage practices, effects of climate. Economic and social factors affecting food preservation and storage technology will be discussed.

300 Physical Chemistry of Foods I Fall. 3 credits. Prerequisite: Orient 115 or equivalent. Not open to graduate students.

Lec, M W 11:15; disc, F 12:30–2:15 or 2:30–4:15. J. M. Regenstein (odd years), J. W. Sherbon (even years).

An introduction to the principles of molecular structure, energetics, and kinetics is offered with applications of these principles to food systems and similar biological materials. Topics include thermodynamics, properties of solutions, phase equilibria, reaction mechanisms, and transport phenomena.

301 Nutritional Aspects of Raw and Processed Foods Spring. 3 credits. Prerequisite: Nutr Sci 115 or permission of instructor.

M W F 9:05. D. C. Graham.
Deals with those principles that relate processing procedures to the nutritional value of foods.

302 Introduction to Food Engineering Fall. 4 credits. Prerequisites: 100 and a course in physics.

Lec, M W F 10:10; lab, M 1:25–4:25. W. K. Jordan.
Engineering aspects of dairy and food plant operations.

303 Introduction to the Economics of Food Packaging Spring. 1 credit. Offered in alternate years.

T 10:10. T. W. Downes.
An introduction to the materials, functions, and costs associated with food packaging.

304 Food Sanitation as Related to Public Health Spring. 3 credits. Prerequisites: 100.

Lec, T Th 10:10; lab, Th 1:25. R. R. Zall.
Deals with the sanitary principles and control measures essential to the production and processing of wholesome and safe foods. Rules and regulations of the United States Public Health Service, The Food and Drug Administration, the United States Department of Agriculture, and others important to the food industry are covered.

311 Milk and Frozen Desserts Fall. 2 credits. Given in alternate years. Prerequisite: 100 or equivalent or permission of instructor.

Lec, W 12:20; lab, W 1:25. W. K. Jordan, R. R. Zall.
Deals with the principles and practices of processing fluid milk products and frozen desserts. The chemical, microbiological, and technological aspects of processing these dairy products will be considered. Field trips to processing plants will supplement the lectures and laboratory work.

351 Milk Quality Spring. 1 credit. Prerequisite: Concurrent or previous enrollment in An Sc 350, or permission.

Lec F 12:20. D. K. Bandler and R. R. Zall.
Aspects of farm sanitation and milk handling as they apply to milk quality. Quality control tests, farm bacteriology, cleaning, and sanitizing. Special problems of marketing fresh and manufactured dairy products.

394 Food Microbiology Lectures Spring. 2 credits. Prerequisites: Micro 290, 291.

M W 12:20. R. A. Ledford.
The major families of microorganisms of importance in foods are studied systematically with emphasis on the roles of these organisms in food preservation, food fermentations, and public health.

395 Food Microbiology Laboratory Spring. 2 credits. Graduate students must have permission of the instructor.

M W 2–4:25. R. A. Ledford.
Work includes studies of the physiological characteristics of representative food microorganisms, practice in the use of general and special methods for microbiological testing and control of food products, and practice in the isolating and characterization of organisms of importance in foods.

400 Undergraduate Research in Food Science Fall or spring. 2 credits. Students must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade. Except for students enrolled in the honors program, credit will be limited to 4 credits.

Hours to be arranged. Staff.
Independent study.

401 Concepts of Product Development Spring. 2 credits. S-U grades optional. Prerequisite: 100 or equivalent. Not offered 1978–79.

M W 10:10. L. F. Hood.
A discussion of the sequence of events involved in the development and marketing of new food products. Topics will include packaging and labeling, food additive and ingredient regulations, taste panels, market testing, market research, and patents.]

402 Product Development Laboratory Spring. 2 credits. S-U grades optional. Offered in alternate years. Prerequisite: concurrent registration in 401 and permission of instructor. Not offered 1978–79.

Lec, M W 10:10; lab, W F 1:25–4:25. L. F. Hood.
A laboratory to be taken concurrently with 401. Emphasis will be on gaining practical experience in the development of new foods.]

403 International Food Science and Development Fall. 3 credits. Offered in alternate years. Not offered 1978–79.

M W 1:25–4:25. F. V. Kosikowski.
Characteristics of the development, processing, and marketing of staple and exotic foods throughout the world. Expanding protein resources for man in critical areas, pollution control, and diseases related to food are considered. Organization, operations, and contributions of United Nations technical agencies, governments, and nongovernment organizations are discussed.]

404 Food Processing I—Drying, Freezing, Heat Preservation Spring. 3 credits. Offered in alternate years. Not offered 1978–79.

Lec, T Th 11:15; lab, T 1:25–4:25. N. N. Potter.
Deals with the principles and practices of drying, freezing, canning, and other heat treatments applied to foods. Current processing methods will be considered as related to the chemistry, microbiology, and technology of the ingredients and final products.]

405 Food Processing II—Concentrating, Separating, Mixing Spring. 3 credits. Offered in alternate years. Prerequisites: 302 and Micro 290 and 291.

Lec, T Th 11:15; lab, T 1:25–4:25. W. K. Jordan, R. R. Zall.
Deals with the principles and practices of evaporation, reverse osmosis, homogenization, size reduction, waste management, and other unit operations important to the food industry.

406 Food Processing III Lecture—Fermentations Fall. 3 credits. Offered in alternate years. Prerequisite: background in microbiology and biochemistry. Not offered 1978–79.

Lec, T Th 11:15; disc, Th 1:25–4:25. F. V. Kosikowski.
A presentation of the principles and practices of fermentations leading to important foods from plant, animal, and single-cell protein sources. Included are wine and malt beverages, cheese, petroprotein, and vegetable foods.]

407 Food Processing IV—Fats and Oils Fall. 3 credits. Offered in even years. Open to upperclass and graduate students.

Lec, W F 9:05; lab, F 1:25–4:25. J. E. Kinsella.
Sources, composition, and properties of edible fats and oils are discussed. Effects of lipids on food quality and storage stability and factors affecting chemical and physical stability of food fats are

described. Chemical technology of emulsions, shortenings, edible oils, margarine, and butter is taught.

[408 Food Processing III Demonstration—Fermentations Fall. 2 credits. Offered in alternate years. Prerequisite: concurrent registration in 406. Enrollment limited. Not offered 1978–79.

Lab, T 1:25–4:25. F. V. Kosikowski.
Laboratory demonstrations in food-processing fermentations.]

409 Food Chemistry Spring. 3 credits. Prerequisites: organic chemistry or biochemistry; concurrent registration in 410 recommended.

Lec, T Th 8–9:25. W. F. Shipe, L. F. Hood, J. E. Kinsella, J. M. Regenstein.
Deals with the relationship between the chemical composition and properties of foods. Special attention will be given to the interactions among the components of food.

410 Sensory and Objective Evaluations of Foods Spring. 3 credits. Prerequisites: statistics; concurrent registration in 409 recommended.

Lec, M W F 11:15. W. F. Shipe.
Deals with the sensory techniques used in evaluating the flavor, color, and texture of foods and effects of these properties on consumer acceptance. Objective methods for measuring these qualities and appropriate statistical methods for analyzing the subjective and objective results and establishing a quality control program.

411 Food Mycology Fall. 3 credits. Offered in alternate years. Prerequisites: Micro 290, 291, or equivalent; Micro 394 recommended.

Lec, T Th 9:05; lab, W 1:25–4:25. D. C. Graham.
To acquaint students with important fungi, both from the standpoint of their beneficial as well as their harmful effects in food production, preservation, and spoilage. Labs deal with morphology, culture and isolation, identification of fungi, and isolation and quantification of fungal toxins.

415 Principles of Food Packaging Fall. 3 credits.

Lec, M W F 9:05. T. W. Downes.
Intended primarily for students in food science and related fields. The basic properties of some packaging materials and systems will be discussed and these principles will be applied to specific packaging systems for meats, dairy products, fruits and vegetables, fats and oils, etc.

450 Special Topics in Food Science Fall or spring. Maximum 3 credits each term. Registration by permission of the instructor.

Institute staff.
Designed for the food science student wishing to become informed on any specific topic selected that is related to food science. The course may include individual tutorial study, a special lecture topic selected by a professor or a group of students, and/or selected lectures of a course already offered. Topics may be changed so that the course may be repeated for credit.

600 Seminar Fall or spring. 1 credit, S-U grades only. For graduate students only; required of all food science graduate students.

601 Food Protein Chemistry Fall. 3 credits. Offered in alternate years. Open to graduate students and to qualified seniors with permission of the instructor. Prerequisite: 300 or its equivalent. Students who have already had Bio S 631 may not take this course for credit.

Lec, M W F 8. J. M. Regenstein.
The chemistry and physical chemistry of proteins will be discussed. Important proteins of food systems will be examined in terms of methodology currently used in protein chemistry for characterization and purification. Interactions of proteins with other food components also will be covered.

[602 Food Lipids] Fall. 2 credits. Offered in odd years. Open to graduate students. Not offered 1978-79.

T Th 8. J. E. Kinsella.

Disposition of lipid materials in foods and how lipids influence the chemical and physical attributes of various foods. Effects of storage, heating, refrigeration, and enzymes on food lipids and the chemical mechanisms of oxidation. Importance of lipids to food flavors is discussed.]

[603 Food Carbohydrates] Spring. 2 credits. Offered in alternate years. Open to qualified seniors and graduate students. Prerequisites: Bio S 431 or equivalent. Not offered 1978-79.

Lec, T Th 10:10. L. F. Hood, R. S. Shallenberger.

A consideration of the chemistry of carbohydrates in foods including sugars, starches, pectins, gums, and cellulose. Emphasis will be placed on their intrinsic chemistry, origins in raw materials, and the subsequent changes occurring during processing and storage.]

604 Chemistry of Dairy Products Fall. 2 credits. Offered in alternate years. Prerequisites: qualitative and quantitative analysis and organic chemistry.

Lec, T Th 12:20. Staff.

A study of milk constituents and physical properties. Deals with milk enzymes, lactose, milk fat, milk proteins, and minor constituents, and includes biological variations and processing effects.

605 Application of Physical Chemistry to Foods

Fall. 1 credit. Prerequisite: physical chemistry or coregistration in 300. Not open to students who have completed or are registered in 710.

Lec, F 11:15; disc, M 8 or 12:20. J. M. Regenstein (odd years), J. W. Sherbon (even years).

The application of physical chemical principles to important food systems with special emphasis on emulsions. Intended for students who have already had physical chemistry or are coregistered in 300.

606 Instrumental Methods Fall. 5 credits.

Prerequisite: permission of instructor.

Lec, M W F 8; lab, W or Th 1:25-4:25.

J. W. Sherbon.

Deals with instrumental methods widely used in research and industry. The major emphasis is on chromatography, spectroscopy, electrophoresis, thermal analysis, and the use of computers. The stress will be on the theoretical and practical aspects of the material presented.

607 High-Protein Food Technology Fall.

2 credits. Offered in alternate years. Prerequisites: majors in international food science and other qualified students; recommended: 403 or equivalent. M 1:25-4:25. Other hours by arrangement.

F. V. Kosikowski.

The characteristics and processing techniques of high-protein foods and their place in an expanding world population are examined. Protein foods from cereals, pulses, oilseeds, milk, and marine life will be considered along with single-cell protein foods from petroleum, cellulose, and whey.

[608 Food Color and Food Pigments] Fall.

1 credit. Offered in alternate years. Prerequisite: organic chemistry. Not offered 1978-79.

Lec, F 12:20. J. P. VanBuren.

An introduction to theories of color perception and color spaces will be followed by a survey of chemical and physical properties of the major food pigments and their stability during processing and storage. Color and pigments of selected commodities will be examined in detail.]

[609 Rheology] Fall. 1 credit. Offered in alternate years. Not offered 1978-79.

Lec, F 12:20. M. C. Bourne.

Fundamental concepts of rheology applied to foods with emphasis on objective methods for measuring textural properties. Principles and practice involved in measuring texture, viscosity, texture profiling, and

consistency; instrumentation, and correlations between objective and sensory methods of texture measurements. Examples of rheological problems in each major food group are discussed.]

610 Introductory Chemical Toxicology Fall.

1 credit. Offered in alternate years. Prerequisites: biochemistry and animal physiology.

Lec, F 11:15. G. S. Stoewsand.

An introduction to the concepts and essentials of toxicology, especially as related to foods; physiologically active compounds in natural and processed foods; antinutritive substances; intentional food additives; potential contaminants; safety evaluation and regulation of foods. Assigned writing or brief student lecture will widen knowledge of current research.

614 Mathematical Evaluation of Processed Packaged Foods Spring. 3 credits. Offered in alternate years.

Lec and disc, Th 2-4:25. T. W. Downes. Mathematical methods used to evaluate the thermal processing of packaged foods will be presented in depth. These techniques will also be used in predicting shelf-life and nutrient loss.

615 Secondary Plant Metabolites in Foods

Fall. 1 credit. Offered in alternate years. Prerequisite: biochemistry (Bio S 431 or 432).

Lec, F 12:20. G. Hrazdina.

Deals with the biochemistry of secondary plant metabolites (i.e. sulphur-containing compounds, alkaloids, flavonoids, terpenes, etc.) and their importance to food products. Major emphasis will be on the chemical properties of these compounds, their reactions, their occurrence in edible plants, and their influence on food products.

710 Physical Chemistry of Foods II Fall.

3 credits. Prerequisites: Orien 115 or equivalent. Not open to students who have had physical chemistry or 300. Open only to graduate students.

Lec, M W F 11:15; disc, M 8 or 12:20.

J. M. Regenstein (odd years), J. W. Sherbon (even years).

The application of physical chemical principles to important systems with special emphasis on emulsions. In addition, an introduction to the principles of molecular structure, energetics and kinetics is offered with applications of these principles to understanding foods and other biological materials.

See also:

Advanced Microbiology (Micro 390)

Meat and Meat Products (An Sc 250)

Science and Technology of Meat, Fish, and Eggs (An Sc 490)

Postharvest Handling and Marketing of Vegetables (Veg 312)

Marketing (Ag Ec 240)

Food Distribution (Ag Ec 441)

Food Industry Management (Ag Ec 443)

Economics of Food Marketing (Ag Ec 446)

Introduction to Agricultural Engineering and Computing (Ag En 151)

Physical Analysis of Plant and Animal Materials (Ag En 415)

Laboratory Practice in Physical Analysis (Ag En 416)

Engineering Analysis and Design of Food Processing Equipment (Ag En 466)

International Agriculture

600 Seminar: International Agriculture Fall and spring. Noncredit. S-U grades.

Third and fourth Wednesdays of each month, 4-5. Staff.

The seminar will focus on developing an understanding of the nature and interrelatedness to agricultural development of the social sciences, plant and animal sciences, foods and nutrition, and natural resources.

601 Agricultural Development in Southeast Asia Spring. 2 credits. S-U grades optional.

F. H. Gblay, G. Levine.

Major aspects of agricultural development in Southeast Asia will be considered from economic, social, and technological points of view.

602 Special Studies of Problems of Agriculture in the Tropics Spring. 3 credits. Prerequisite: one or more courses from international agriculture listing and permission of instructors. S-U grades optional.

Th 2:30-4:25. Staff.

Oriented to provide students an opportunity to observe agricultural development in a tropical environment and promote interdisciplinary exchange among staff and students. The two-week field-study trip during January to Latin American countries is followed by discussions and assignments during the spring semester dealing with problems in agriculture and livestock production in the context of social and economic conditions. Students should budget approximately \$200 to cover the cost of lodging, meals, and personal expenses on the field trip (transportation will be provided).

603 Administration of Agricultural and Rural Development (also Govt 692 and B&PA NCE 514) Spring. 3 credits. S-U grades optional.

T 2:30-5:30. M. L. Barnett, M. J. Esman,

J. F. Metz, Jr., N. T. Uphoff, L. W. Zuidema.

An intercollege course designed to provide graduate students a multidisciplinary perspective on the administration of agricultural and rural development activities in developing countries. The course is oriented to students trained in agricultural and social sciences who are likely to occupy administrative roles during their professional careers.

703 Seminar to Special Projects in Agricultural and Rural Development Spring. Variable credit. Required for graduate students enrolled in the M.P.S. (Agriculture), majoring in international agricultural and rural development; others with permission of the program director. S-U grades.

Time to be arranged. Staff.

The seminar will provide M.P.S. students the opportunity to present their special projects. It will also serve as a forum for discussion of current issues in low-income agricultural and rural development, with particular attention to interdisciplinary complexities.

See also:

Selected Topics in the Economics of Agricultural Geography (Ag Ec 151)

Agricultural Trade Policy (Ag Ec 430)

Economics of Agricultural Development (Ag Ec 464)

Food, Population, and Employment (Ag Ec 660)

Seminar on Latin American Agricultural Policy (Ag Ec 665)

Seminar in Agricultural Development (Ag Ec 666)

Seminar in the Economics of Agricultural Development (Ag Ec 668)

Seminar on Agricultural Trade Policy (Ag Ec 730)

Export Marketing (Ag Ec 743)

Geography and Appraisal of Soils of the Tropics (Agron 401)

Production of Tropical and Subtropical Crops (Agron 422)

Management Systems for Tropical Soils (Agron 480)

Livestock Production in Warm Climates (An Sc 400)

Forages of the Tropics for Livestock Production (An Sc 403)

Intercultural Communication (C Art 601)

Communication in the Developing Nations (C Art 624)

Comparative Mass Media (C Art 626)

Designing Extension and Continuing Education Programs (Educ 624)

Achieving Behavioral Change in International Rural Modernization (Educ 627)

Arthropod Pests of World Importance (Entom 341)

[International Food Science and Development (Food 403)]

High-Protein Food Technology (Food 607)

Regional Landscape Inventories and Information Systems: An International Perspective (L A 572)

National and International Food Economics (N S 457)

International Nutrition Problems, Policy, and Programs (N S 680)

Seminar in International Nutrition and Development Policy (N S 695)

Special Topics in International Nutrition (N S 699)

Plant Diseases in Tropical Agricultural Development (PI Pa 655)

[Economic Fruits of the World (Pomol 208)]

Rural Sociology and World Development Problems (R Soc 105)

Rural Development and Cultural Change (R Soc 355)

Subsistence Agriculture in Transition (R Soc 357)

Contemporary Sociological Theories of Development (R Soc 606)

[Social Organization of Agriculture (R Soc 650)]

Macrosocial Accounting (R Soc 715)

[Social Movements in Agrarian Society (R Soc 723)]

Applications of Sociology to Development Programs (R Soc 751)

Sociotechnical Aspects of Irrigation (R Soc 754)

Microbiology

R. P. Mortlock, chairman; E. A. Delwiche, N. C. Dondero, C. M. Rehkugler, H. W. Seeley, P. J. VanDemark

290 General Microbiology Lectures Fall or spring. 3 credits. Prerequisites: Bio S 101-102 and Chem 104 or 208. It is recommended that 291 be taken concurrently.

M W F 11:15. Fall, H. W. Seeley; spring, P. J. VanDemark.

A study of the basic principles and relationships in the field of microbiology, with fundamentals necessary to further work in the subject.

291 General Microbiology Laboratory Fall or spring. 2 credits. Prerequisite: concurrent or previous enrollment in 290.

M W 2-4:25; T Th 8-10:30, 11:15-1:45, 2-4:25. Fall, H. W. Seeley; spring, P. J. VanDemark.

A study of the basic principles and techniques of laboratory practice in microbiology and fundamentals necessary to further work in the subject.

292 General Microbiology Discussion Spring. 1 credit. S-U grades only. Prerequisite: previous or concurrent registration in 290.

Hours to be arranged. P. J. VanDemark.

A series of discussion groups in specialized areas of microbiology to complement 290.

304 Tissue Culture Techniques and Applications Fall. 2 credits. Prerequisites: 290 and 291 or permission of instructor.

F 1:25-3:30. Three different laboratory exercises will be scheduled during the term on a rotating basis; F 3:30-5:30. C. M. Rehkugler.

A series of lectures and demonstrations dealing with cell culture methods, especially those required to culture cells of plants and animals from different tissue origins. The application of cell culture to the study of bacterial diseases, virus replication, and the production of biologicals will be considered.

[390 Advanced General Microbiology Lectures Fall. 2 credits. Offered in alternate years.

Prerequisites: 290, 291, and organic chemistry. May be taken independently of 391 and in sequence or independently of 392. Not offered 1978-79.

M W 11:15. E. A. Delwiche, N. C. Dondero.

A consideration of the morphological, taxonomic, cultural, and physiological characteristics of important groups of heterotrophic microorganisms. Included will be (1) sporeforming bacteria, propionic acid bacteria, gram negative cocci; and (2) pseudomonads, enterics, and related forms.]

[391 Advanced General Microbiology Laboratory Fall. 2 credits. Offered in alternate years. Prerequisite: concurrent or previous enrollment in 390. Enrollment limited to 20. Not offered 1978-79.

M W 2-4:25. E. A. Delwiche, N. C. Dondero. Intended as a laboratory complement to 390. The isolation, characterization, and study of the groups of heterotrophic microorganisms included in 390.]

392 Advanced General Microbiology Lectures Fall. 2 credits. Offered in alternate years. Prerequisites: 290, 291, and organic chemistry. May be taken independently of 393 and in sequence or independently of 390.

M W 11:15. P. J. VanDemark and staff. A consideration of the morphological, taxonomic, cultural, and physiological characteristics of important groups of heterotrophic microorganisms. Included will be (1) the lactic acid bacteria; and (2) the staphylococcus-micrococcus group and related gram positive cocci.

393 Advanced General Microbiology Laboratory Fall. 2 credits. Offered in alternate years. Prerequisite: concurrent or previous enrollment in 392. Enrollment limited to 20.

M W 2-4:25. P. J. VanDemark and staff. Intended as a laboratory complement to 392. The isolation, characterization, and study of the groups of heterotrophic microorganisms included in 392.

396 Applied and Industrial Microbiology Fall. 3 credits. Prerequisites: 290 and organic chemistry. T Th 10:10-11:25. E. A. Delwiche, N. C. Dondero, and staff.

A survey of the microbiology of industrial fermentations, and public health aspects of water and waste water.

412 Aquatic Microbiology Spring. 3 credits. Prerequisite: 290 or Agron 406, and organic chemistry.

T Th 10:10-11:25. N. C. Dondero. A consideration of the relation of microorganisms, especially the bacteria, to aquatic environments, both natural and artificial. The microbiology of waste waters will be included. Attention will be given to fundamental biological concepts and to applied aspects of the occurrence and activities of microorganisms in water.

490 Microbial Physiology Lectures Spring. 3 credits. S-U grades optional. Prerequisites: 290, 291, and biochemistry.

M W F 11:15. R. P. Mortlock. The concern is with the physiological functions of microorganisms. Particular consideration is given to the dynamics of growth, the nutrition and energy metabolism of developing cultures, and the interactions of the physical and chemical environments with the growth process. Composition and structure of microorganisms, metabolism, and various microbial processes such as transport and regulation will be discussed.

491 Microbial Physiology Laboratory Spring. 3 credits. S-U grades optional. Prerequisites: concurrent or previous enrollment in 490 and permission of instructor. Enrollment limited to 12. T Th 12:20-4:25. R. P. Mortlock.

The laboratory component of 490. Experiments designed by the instructor and students to explore fundamental concepts, techniques, and instrumentation in microbial physiology.

496 Selected Topics in Microbial Metabolism Spring. 2 credits. S-U grades optional. Prerequisites: beginning courses in general microbiology, biochemistry, and organic chemistry. Primarily for upperclass and graduate students.

T Th 11:15. E. A. Delwiche. Selected topics pertaining to the energy metabolism, oxidative and fermentative abilities, and biosynthetic capacities of microorganisms. Where possible and appropriate the subject matter deals with the various microbial forms in a comparative sense.

499 Research in Microbiology Fall or spring. Credit variable. Undergraduates must attach to their preregistration material written permission of the staff member who will supervise the work and assign the grade. The course cannot be used to fulfill the specialization requirement. Hours to be arranged. Staff.

691 Graduate Seminar in Microbiology Fall and spring. 1 credit. Required of all graduate students majoring in the graduate Field of Microbiology. Hours to be arranged. Staff.

699 Microbiology Seminar Fall and spring. Required of all graduate students majoring in the graduate Field of Microbiology and open to all who are interested. Hours to be arranged. Staff.

See also:

Food Microbiology Lectures (Food 394)

Food Microbiology Lab (Food 395)

[Food Mycology (Food 411)]

[Soil Microbiology (Agron 406)]

[Soil Microbiology (Agron 407)]

Microbial Ecology (Agron 410)

Advanced Soil Microbiology (Agron 606)

Insect Pathology (Entom 453)

Microbial Genetics, Lectures (Bio S 485)

Microbial Genetics, Laboratory (Bio S 486)

Basic Immunology Lectures (Vet M 315)

Basic Immunology Laboratory (Vet M 316)

Pathogenic Microbiology (Vet M 317)

[Advanced Immunology Lectures (Vet M 705)]

[Advanced Immunology Laboratory (Vet M 706)]

Advanced Work in Bacteriology, Virology, or Immunology (Vet M 707)

Advanced Animal Virology Lectures (Vet M 708)

Advanced Animal Virology Laboratory (Vet M 709)

Immunopathology and Clinical Immunology (Vet M 712)

Natural Resources

W. H. Everhart, chairman; R. A. Baer, H. B. Brumsted, J. W. Caslick, R. J. Gutiérrez, L. S. Hamilton, E. E. Hardy, J. W. Kelley, J. P. Lassoie, R. A. Malecki, R. J. McNeil, A. N. Moen, R. R. Morrow, Jr., J. G. Nickum, R. T. Oglesby, M. E. Richmond, C. L. Schofield, D. A. Webster, B. T. Wilkins, W. D. Youngs

110 Ecological Basis for Conservation Spring, 2 credits.

Lec, T Th 10:10 or 12:20. R. J. McNeil. Ecological principles as applied to human use of environment, especially its living components. Survival strategies of animals and the application of these concepts to human beings. Ecological succession, carrying capacity, limiting factors, population dynamics, animal behavior, disease, and effects of contaminants on living organisms and systems are examples of environmental issues considered.

111 Ecological Basis Discussions Spring, 1 credit. Corequisite: 110.

Hours to be arranged, R. J. McNeil and staff. Treatment of lecture material from 110 in greater depth and with varying emphasis, depending on the background and interests of the instructors and students.

201 Environmental Conservation Fall, 2 credits. T Th 10:10 or 12:20. R. J. McNeil.

People, natural resources, and environment. Our use and misuse of the natural components of our environment. Current resource-use problems, including air and water pollution, radiation, garbage and waste, and the population explosion. An attempt is made to introduce the concept of a conservation ethic.

202 Environmental Conservation Discussions Fall, 1 credit. Corequisite: 201.

Hours to be arranged, R. J. McNeil and staff. Treatment of lecture material from 201 in greater depth and with varying emphasis, depending on the background and interests of the instructors and students.

210 Introductory Field Biology Fall, 3 credits.

Prerequisites: Bio S 101 and 102, or equivalent. Preference given to natural resources undergraduate majors.

Lec, W 10:10; lab, M W 1:25-4:25. Some overnight field trips are required for which students are expected to share expenses. No more than \$6. R. J. Gutiérrez.

Introduction to methods of inventorying, collecting, preserving, and identifying plants and animals. Principles and concepts of systematics and ecology will be studied as they apply to both aquatic and terrestrial systems. Selected aspects of current ecological thinking relevant to problems of resource management, particularly the assessment of the distribution and abundance of organisms, will be stressed. Observation and recording of field observations will be emphasized.

407 Religion, Ethics, and the Environment

Spring, 3 credits. S-U grades optional. Juniors, seniors, graduate students; others only by permission. Enrollment limited.

T Th 9:05; 1-hour disc to be arranged. R. A. Baer. Study of Western religion and values as these have affected our understanding and treatment of nature. Initial historical overview followed by consideration of selected themes, including progress, play and work, objectivity and subjectivity, human finitude and death, and knowledge as control. Also responsibility to future generations; limiting growth and questions of distributive justice; implications of environmental programs for minorities, the poor, and other nations; reverence for being.

430 Dynamics of Animal Populations Spring, 2 credits. Prerequisite: senior or graduate standing in the Department of Natural Resources, or permission of instructor.

T Th 10:10. W. D. Youngs. A quantitative examination of the dynamics of animal populations. This course uses interactive computing to assist in analysis and understanding of mortality, growth, population estimation, and population interaction.

490 Practicum in Natural Resources Analysis and Management Fall, 5 credits. Prerequisites: senior in the Department of Natural Resources or permission of instructors.

Hours to be arranged. Staff. An in-depth exercise in planning the management of selected resource(s) in a defined geographic area. Students will work in groups under the supervision of a faculty committee with other faculty acting as consulting experts. Student groups will make oral and written reports on their management plans to a client panel of faculty and outside evaluators.

500 Thesis Research and Professional Projects

Fall and spring. Credit arranged. S-U grades only. Limited to graduate students working on thesis research or professional master's projects. Staff.

610 Conservation Seminar Fall and spring.

Noncredit. All graduate students in the Field of Natural Resources are expected to participate. Time to be arranged. Staff.

611 Seminar in Environmental Values Fall, 3 credits. S-U grades optional. Graduate students and also juniors and seniors by permission.

W 1:25-3:50. Also weekend trip in late September for which students are expected to share

expenses. No more than \$12. Also several extra class sessions for presentation of student papers and projects. R. A. Baer.

How the humanities, particularly religion, philosophy, and ethics, contribute to our understanding of the environment. In successive years topics will include (1) the role of nonutilitarian values in our relationship to our natural environment, (2) land ethics, (3) new models for higher education in the age of ecology, and (4) concepts of growth and progress in Western culture and their impact on our treatment of the environment.

Fishery Biology

438 Fishery Resource Management Spring, 3 credits. Prerequisite: 440, or permission of instructor.

Lec, T Th 8. W. H. Everhart. Principles and problems in the management of freshwater and marine fishery resources considered in relation to problems of human population and management of other natural resources.

440 Fishery Science Fall, 3 credits. Prerequisite: one year of statistics and calculus. Open to seniors majoring in fishery science and other students by permission of instructor.

M W F 12:20. W. D. Youngs. Principles and theories involved in dynamics of fish populations, Methods of obtaining and evaluating statistics of growth, population size, mortality, yield, and production are considered.

442 Techniques in Fishery Science Fall, 2 credits. Upperclass and graduate fishery students only. Limited to 15 students.

T Th 1:25-4:25. 1 or more weekend field trips will be scheduled for which students will be expected to share expenses. No more than \$30.

D. A. Webster. Emphasis placed on methods of collecting fish and related data when information on population dynamics is of paramount importance. Laboratories include field experience in use of gear and instruments. Opportunities for additional experience in ongoing college fishery research program will be provided.

443 Managing the Aquatic Environment Fall, 2 credits. Limited to 30 students; juniors or seniors only. Non-aquatic science majors only.

Lec-disc, Th 1:25-4:25. R. T. Oglesby. Nature of aquatic environments and effects of man on them are initial foci. Wise use of aquatic resources is surveyed in terms of human impacts on them, including the introduction of toxicants and nutrients, removal or addition of particular biotic components, and modifications of the physical environment. Emphasis will be on lakes, rivers, and estuaries.

444 Aquaculture Spring, 3 credits. Prerequisites: Bio S 476 or permission of instructor. One or more overnight field trips will be scheduled for which students will be expected to share expenses.

Lec, T Th 12:20; lab, Th 1:25-4:25. J. G. Nickum. Introduction to the development, techniques, and uses of aquaculture. The biological bases, historical development, and current status of cultural practices for fishes and invertebrates throughout the world will be considered. Laboratory will consist of discussions, demonstrations, and field trips. Individual projects providing additional experience may be arranged. One or more two-day field trips will be scheduled. Field trips will cost no more than \$25 each.

494 Research in Fishery Science S-U grades optional. Credit and time to be arranged.

J. L. Forney, J. G. Nickum, R. T. Oglesby, C. L. Schofield, D. A. Webster, W. D. Youngs.

605 Ecology and Management of Disturbed Aquatic Systems Spring. 3 credits. Prerequisite: limnology or oceanography. Limited to 30 students; seniors or graduates only.

Lec, T Th 9:05; disc, W or F 1:25-3:25.
R. T. Oglesby.

Lectures and readings are focused on responses of aquatic ecosystems to stress and on significance of such reactions. Methods and strategies of management to minimize undesirable aspects of human activities will be considered. Detailed case histories will be studied and discussed. There will be at least one Saturday field exercise. Recommended for students specializing in the aquatic sciences.

601 Seminar on Selected Topics in Fishery Biology Fall or spring. 1 credit.

Hours to be arranged. Staff.

See also:

Bionomics of Fresh-Water Invertebrates (Entom 471)

Biology of Fishes (Bio S 476)

Oceanography (Bio S 461)

Ichthyology (Bio S 479)

Marine Ecology (Bio S 666)

Limnology (Bio S 462)

Phycology (Bio S 348)

Forestry

205 Maple Sirup Production Spring. 1 credit. S-U grades only. Limited to 20 students. Prerequisite: permission of instructor. 4 preliminary seminars, followed by several half-days of fieldwork during the maple season.

T 12:20-4:25. R. R. Morrow, A. Fontana.

Students will work in most phases of the Arnot Forest maple operation and learn modern sap collecting techniques and quality control in making sirup. A 100-tap area is reserved for student installation of a tubing sap collection network.

302 Forest Ecology Fall. 3 credits. Limited to seniors and graduate students.

Lec, T Th 11:15; lab T 1:30-4:30.

1 weekend trip Sat. thru Mon., for which students will be expected to share expenses. No more than \$20.

N. Richards.

Understanding the wildland environment. Development of ability to identify and analyze what is present, what was present, what is likely to happen in various forest ecosystems. All laboratory sessions in the field. One required weekend trip to the Adirondacks or other major forest region.

303 Woodland Management Fall. 3 credits. S-U grades optional.

Lec, M W 11:15; lab, W 1:25-4:25 (one field trip will end at 5:30). R. R. Morrow.

Designed to give the student the basic information necessary to permit sound woodland management decisions. Field trips to woodlots emphasize variations in value and potential as well as biological growth. Introduction to tree identification, log scaling, timber estimating, tree marking, and stand improvement work. Planting, management, harvesting, marketing, and multiple use are discussed, as well as relationships of forestry to people and to the environment.

496 Research in Forestry S-U grades; letter grade by permission of instructor. Credit and time to be arranged.

L. S. Hamilton, J. P. Lassoie, R. R. Morrow.

Resource Policy and Planning

300 Natural Resources Inventories Spring. 3 credits.

Lec, M W 12:20; lab, M T W 2. E. E. Hardy. Procedures for inventorying resources, the methods used, and theories of inventory development in relation to present needs. Examination of the processes used in generating currently used inventories; application of methods to improve existing inventories, and experience in developing inventories will be undertaken. Land resource inventories, will be emphasized.

498 Research in Resource Analysis and Planning Fall or spring. S-U grades optional. Prerequisite: permission of instructor.

H. B. Brumsted, L. S. Hamilton, J. W. Kelley, R. J. McNeil, B. T. Wilkins.

[510 Perspectives on Conservation Spring. 3 credits. S-U grades for graduate students. Offered in alternate years. Prerequisites: graduate standing or written permission of instructor. Not offered 1978-79.

Th 1:25-3:30. B. T. Wilkins.

A seminar based on extensive readings of articles highlighting varying philosophical approaches to the conservation of natural resources; Views espoused by developmentalists, preservationists, naturalists, economists, and welfare economists will be considered.]

[602 Seminar in Natural Resource Analysis for Ecologically Based Planning Spring. 2 credits. S-U grades only. Not offered spring 1979.

W 2-4:30. L. S. Hamilton.

Multidisciplinary graduate seminar. Theme changes each year but usually involves a case study of a specific area of land and water. Fieldwork usually required. Engineers, economists, sociologists, soil scientists, foresters, planners, and wildlife and fishery biologists are especially invited to bring expertise to the planning table.]

604 Seminar on Selected Topics in Natural Resources Conservation Fall or spring. 1 credit. S-U grades only.

Hours to be arranged. Staff.

Primarily for graduate students majoring or minoring in natural resources conservation.

606 Marine Resources Policies Spring. 2 credits. S-U grades optional. Offered in alternate years. Prerequisites: at least one related course such as Bio Sci 364, 666, 668, or Nt Res 438, 444, or permission of instructor.

Th 1:30-3:30. B. T. Wilkins.

A seminar discussing the law and issues concerning current marine policy questions, including coastal zone management, marine fish regulations, coastal protection, and wetland preservation.

See also:

Resource Economics (Ag Ec 350)

Evaluating Resource Investment and Environmental Quality (Ag Ec 450)

Analysis and Interpretation of Aerial Photographs (Engineering CEE A687)

Physical Environment Evaluation (Engineering CEE A685)

Wildlife Science

304 Wildlife Ecology Spring. 4 credits. Limited to 25 students with permission of instructor. Preference given to wildlife specializations. Three weekend field trips may be required. No more than \$15.

Lec, M W 8; W 1:25-4:25. A. N. Moen. Consideration of the basic physical, physiological, interspecific, and intraspecific relationships of the organism and its environment.

410 Principles of Wildlife Management Fall. 4 credits. Prerequisite: junior standing, Bio S 361, or permission of instructor.

Lec, M W F 8; lab, F 1:25-4:25. R. J. Gutiérrez. Fundamental characteristics and mechanisms of wildlife populations and habitats. Includes ecological, social, and economic aspects of wildlife management.

411 Techniques in Wildlife Science Spring. 2 credits. Prerequisite: 410 or permission of instructor.

Lec, F 11:15; lab, F 1:25-4:25. J. W. Caslick. Introduction to techniques used in wildlife research and management, with emphasis on field methods and Northeastern game species.

414 Selected Topics in Wildlife Resource Policies Spring. 2 credits. Prerequisite: at least junior standing, Nt res 410 or equivalent, or permission of instructor.

Time to be arranged. Several all-day field trips for which students will be expected to share expenses. No more than \$30.

H. B. Brumsted.

Review of trends in wildlife management as reflected by state and federal legislation, policies, and programs. Emphasis given integration of wildlife goals in land-use planning and other contemporary topics.

495 Research in Wildlife Science Fall or spring. S-U grades optional. Credit and time to be arranged. Prerequisite: permission of instructor. Staff.

600 Waterfowl Biology Fall. 3 credits.

Prerequisite: Permission of instructor.

Lec M W F 9:05; lab F 1:30-3:30 with several extended Friday field trips. R. A. Malecki.

An introduction to waterfowl and selected webless migrants. Emphasis is placed primarily on the waterfowl resource in North America; identification of species, their ecological relationships, population dynamics, and management.

603 Habitat Ecology Spring. 1 or 2 credits.

Prerequisites: senior or graduate standing with a major in natural resources or biological sciences.

F 12:20, with field trips to be arranged. Students will be expected to share expenses. No more than \$10.

M. E. Richmond.

This course will require an understanding of broad ecological concepts relative to plant/wildlife interactions. We will address the concept of habitat from the standpoint of island biogeography, and thereby explore the interactions of habitat size, shape, location, degree of edge, and temporal change. Major land forms and plant/animal communities of the Northeastern United States will be visited during scheduled weekend field trips.

See also:

Ornithology (Bio S 473)

Nature and Properties of Soils (Agron 200)

Wildlife Pathology (Vet M 636)

Nutritional Sciences

See p. 222.

Plant Breeding and Biometry*

R. L. Plaisted, chairman; R. E. Anderson, R. S. Chaleff, L. V. Crowder, H. L. Everett, V. E. Gracen, Jr., P. Gregory, C. C. Lowe, H. M. Munger, R. P. Murphy, W. D. Pardee, O. H. Pearson, H. M. Schaaf, R. R. Seaney, D. H. Wallace

225 Plant Genetics Spring, 4 credits.

Prerequisite: introductory biological sciences.

Lec, M W F 11:15; lab, W Th or F 1:25; lab section assignments at first lecture. L. V. Crowder.

An overview of genetic principles as related to plant sciences. Mendelian inheritance and cell mechanics, DNA as genetic material, genetic fine structure and gene regulation, gene recombination, linkage and mapping, gene interaction, extranuclear inheritance, environmental effect on phenotypic expression, gene mutation and chromosomal aberrations, variation in chromosome numbers, genes in populations, multiple gene inheritance, genetic aspects of pest resistance. Relationship of genetic principles and concepts to plant breeding, plant improvement, and food production. Students will conduct an independent inheritance project with *Brassica campestris*.

482 Plant Cell Genetics Spring, 2 credits.

Prerequisites: Bio S 281 or PI Br 225 or equivalent and Bio S 242 or equivalent.

T Th 10:10. R. S. Chaleff.

General principles and techniques of plant cell and tissue culture and of their application in genetic studies of higher plants. Discussions of the culture of cells, protoplasts, microspores, and callus, the isolation and characterization of mutant clones, and the regeneration and genetic analysis of plants from such clones.

603 Methods of Plant Breeding Fall, 4 credits.

Primarily for graduate students, but open to qualified seniors who expect to engage in plant breeding. Prerequisites: Bio S 101-102 and 281 or PI Br 225 and a course in at least one of the following—field crops, vegetable crops, floriculture, or pomology. Preregister by August 1.

Lec, T Th 8; lab, T Th 1:25-4:15 (labs till 5 for first four weeks). H. L. Everett, H. M. Munger.

Breeding systems for producing the possible crop variety forms are considered in detail. Laboratories include controlling pollination, producing heritable variation, and selection techniques with emphasis on disease resistance. There will be two Saturday field trips.

605 Physiological Genetics of Crop Plants

Spring, 3 credits. Prerequisites: courses in genetics, biochemistry, and plant physiology, or permission of instructor.

T Th 8-10. D. H. Wallace.

Both genetic and environmental influence on biochemical and molecular control of plant variation in physiological phenomena like photosynthesis, respiration, translocation, self-incompatibility, male sterility, yield, and heterosis will be discussed. Emphasis will be upon variation that can be exploited in plant breeding, particularly in breeding for higher yield and adaptability.

[608 Biochemical Analyses For Plant Breeders

Fall, 3 credits. Prerequisite: permission of instructor. Not offered fall 1978.

Lab M W 1:25-5. Peter Gregory.

A laboratory course primarily designed to acquaint the student with the specialized biochemical analyses commonly used in plant breeding programs. Nutrients and toxicants of several crops will be studied. Each student will be required to

complete a special project. Emphasis will be placed on developing an ability to critically assess biochemical analyses.]

612 Experimental Methods Spring, 2 credits.

Offered in alternate years. Prerequisite: 601 or permission of instructor.

M W F 12:20. C. C. Lowe.

Use of statistical methods and application of experimental designs and plot techniques to problems in plant breeding and related agricultural research.

622 Seminar Fall or spring, 1 credit. S-U grades only.

T 12:20. Members of departmental staff and graduate students.

629 Special Topics in Plant Science Extension

Spring, 2 credits.

F 1:25-4:25. W. D. Pardee.

Designed for graduate students and advanced undergraduates to provide a broader knowledge of Cooperative Extension philosophy and methods. The course is designed to prepare students for careers in extension and research or in related fields in public and commercial organizations. Topics relate to extension in other countries as well as in the United States.

650 Special Problems in Research and Teaching

Fall, spring, or summer, 1 or more credits by arrangement with instructor.

Undergraduates must attach to their preregistration material written permission of the staff member who will supervise the work and assign the grade.

Members of the departmental staff.

[717 Quantitative Aspects of Plant Breeding

Fall (begins eighth week of semester), 1 credit. S-U grades only. Prerequisites: 603, stats 601. Not offered 1978-79.

T Th 9:05. R. L. Plaisted.

Discussion of random mating populations, inbreeding, and components of genetic variance.]

718 Genetics And Breeding For Disease And Insect Resistance

Fall (first seven weeks of semester), 1 credit, S-U grades only. Prerequisite: 603.

T Th 10:10. V. E. Gracen.

Discussions of genetics and mechanisms of insect and disease resistance as they relate to the development and utilization of pest resistant varieties.

Plant Pathology

D. F. Bateman, chairman; J. R. Aist, P. A. Arneson, S. V. Beer, C. W. Boothroyd, B. B. Brodie, R. S. Dickey, W. E. Fry, M. B. Harrison, R. K. Horst, G. W. Hudler, H. W. Israel, E. D. Jones, R. P. Korf, J. W. Lorbeer, W. F. Mai, R. L. Millar, P. C. O'Brien, W. F. Rochow, O. E. Schultz, A. F. Sherf, W. A. Sinclair, R. W. Smiley, H. D. Thurston, H. D. VanEtten, R. W. Wilkinson, O. C. Yoder, M. Zaitlin

300 Introductory Plant Pathology (Lectures)

Fall or spring, 2 credits. Prerequisites: Bio S 101-102, 103-105, or 105-106.

Lec T Th 11:15. C. W. Boothroyd.

An introduction to the theory and practice of plant pathology, with emphasis upon recognition of plant diseases, life cycles of causal agents, and control. Detailed attention is given to the interrelationship of pathogen, host plant, and environment; and to specific aspects of the science, such as bacteria, fungi, mycoplasmas, nematodes, and viruses as pathogens; biological and chemical control; breeding for resistance; and disease forecasting.

301 Introductory Plant Pathology (Laboratory)

Fall or spring, 2 credits. Prerequisites: Bio S 101-102, 103-104, or 105-106, and PI Pa 300 (may be taken concurrently). Limited to 105 students, 21 per section; preference given to juniors, seniors, and graduate students.

Lab, M T W Th or F 2-4:25, conferences arranged. C. W. Boothroyd.

An opportunity to study fresh specimens of diseased field and forage crops, flowers, fruits, trees and shrubs, and vegetables, and for participation in an autotutorial approach to diagnosis of disease, including isolation of plant pathogens, screening for nematodes, and inoculating with viruses.

302 Plant Disease Control Spring, 3 credits.

Prerequisite: 300-301 or equivalent.

Lec T Th 11:15; lab and rec, T or Th 1:25-4:25.

P. A. Arneson.

For undergraduates who expect to engage in general or specialty farming, in pest control, or in agricultural extension or teaching. The course is designed to provide students with working experience with diseases. Recognition, identification, effect of environment, and epidemiology will be considered in relation to disease control. Rationale of procedures will be stressed in an integrated approach to disease control.

309 Introductory Mycology Fall, 4 credits.

Prerequisites: a year sequence of botany or its equivalent and permission of the instructor.

Lec T Th 1:25-2:15; lab, T Th 2:30-4:25; and one additional two-hour period to be arranged.

J. W. Lorbeer.

An introduction to fungi, emphasizing biology and comparative morphology rather than taxonomy. Required field trips. Expenses paid by department.

403 Pathology and Entomology of Trees and Shrubs

Spring, 5 credits. Prerequisites: 301 and Entom 212 or equivalent.

Lec M W F 10:10; lab, T or W 1:25-4:25, and Th or F at 1:25-4:25. W. T. Johnson and W. A. Sinclair.

For students desiring specialized knowledge of disorders of trees and shrubs in preparation for careers in horticultural professions, urban forestry, and pest management. Deals with the nature, diagnosis, assessment and treatment of diseases, and arthropod pests of trees and shrubs. Forest, shade, and ornamental plants are considered.

404 Pest Management for Plant Protection

Fall, 4 credits. Prerequisites: two or more of the following courses: Agron 815, Entom 212, 241, and 340, and PI Pa 300-301 and 302; courses in ecology, economics, and statistics are suggested.

Lec M W F 8:00; lab, M or W 1:25-4:25.

P. A. Arneson.

This is the "capstone" course in the sequence for students specializing in plant protection. It is also open to other seniors and to graduate students with the necessary prerequisites. Its goal is to integrate the principles of pest control, economics, and ecology in the design and management of pest-crop systems.

431 Undergraduate Research in Mycology or Plant Pathology

Fall and spring, 3-5 credits. S-U grades optional.

Not less than 3 labs, 3 hours each per week. Staff. Designed to afford opportunity for undergraduates to test their ability to do research work. The student is expected to pursue with interest and enthusiasm, under informal direction of the professor, some problem or problems.

501 Advanced Plant Pathology Fall, 5 credits.

S-U grades optional for students with a minor in plant pathology. Prerequisites: a course in introductory plant pathology and permission of instructor.

Lec T Th 11:15; and one additional period to be arranged; lab, T Th or W F 2-4:25. R. L. Millar.

*Biometry courses are listed under Statistics and Biometry

Designed to acquaint the student with the basic principles and techniques of the science of phytopathology and to provide an adequate foundation for successful pursuit of research in this field.

[502 Plant Disease Control and Epidemiology] Fall. 3 credits. Graduate students only. Prerequisite: 501 or equivalent. Not offered 1978-79.

Lec T Th 11:15; rec T 1:25; lab Th 1:25-4:25. Several additional field trips during the term are required.

Plant disease epidemiology is analyzed as the basis of disease management strategies. Techniques to identify the need for management practices are evaluated and the utility of those techniques is evaluated on the basis of effects on epidemics. The impact of current research in epidemiology on disease management is assessed.]

[505 Plant Virology.] Fall. 3 credits. Offered in alternate years. For graduate students with majors or minors in plant pathology; also open to graduate students interested in general virology. Prerequisite: 501 or permission of instructor.

Lec T Th 10:10; lab, F 1:25-4:25. M. Zaitlin. Designed to provide basic information on plant viruses and on the diseases they cause. Emphasis is placed on viral replication mechanisms.

[506 Plant Nematology] Spring. 3 credits. Offered in alternate years. For graduate students with major or minors in plant pathology and, in special cases, other students interested in nematology. Prerequisite: 501 or permission of instructor. Not offered 1978-79.

Two lec and one three-hour lab period each week. Hours to be arranged. W. F. Mai, M. B. Harrison. Anatomy, morphology, and taxonomy of plant parasitic forms and nonparasitic soil-inhibiting forms of nematodes are studied. Plant pathogenic forms also are considered from the standpoint of host-pathogen relationships, host ranges, life cycles, and the symptoms they cause. Principles and methods of control are discussed.]

[507 Bacterial Plant Pathogens] Spring. 3 credits. Offered in alternate years. For graduate students with majors or minors in plant pathology; others by permission only. Prerequisite: 501 or permission of instructor.

Lec T Th 10:10; lab, W F 2-4:25. R. S. Dickey. Designed to provide students with basic information on bacterial plant diseases and phytopathogenic bacteria. The laboratory will include some of the more important techniques used in the study of bacterial plant pathogens.

[508 Disease Physiology] Spring. 3 credits. Offered in alternate years. For graduate students with majors or minors in plant pathology; others by permission only. Prerequisites: 501, Bio S 330 or 331, and permission of instructor. Not offered 1978-79.

Lec W F 10:10; lab, M 9:05-4:25. H. D. Van Etten and staff.

Designed to provide students with insight into the physiological bases for mechanisms of pathogenesis. Emphasis is placed on evaluating current literature.]

[531 Special Problems in Mycology or Plant Pathology] Fall and spring. 3-5 credits. For graduate students only. Registration by permission. Labs, 3 to 5 weekly lab periods of 3 hours each. Staff members.

For work in mycology, modern techniques and experimental approach are stressed. For work in plant pathology for minor thesis or problems, or for students wishing to develop familiarity with modern techniques in some phase of the science. For work in plant nematology, research projects in five areas are stressed.

541 Philosophy of Plant Pathology Spring. 2 credits. S-U grades only. Offered in alternate years. For Ph.D. students majoring in plant pathology. Prerequisites: 501 and at least two other courses from 502, 505, 506, 507 and 508, or permission of instructor.

Conferences, M W 8-10. D. F. Bateman. A conference with advanced graduate students examining the concepts of plant pathology as they relate to basic and applied research problems, teaching, and extension.

556 Advanced Plant Nematology Fall and spring. 3 credits. For graduate students only. Prerequisite: 506.

Hours to be arranged. W. F. Mai. Graduate students with special interest in plant nematology will conduct four research projects in areas such as taxonomy, morphology, permanent mounting, soil and plant sampling procedures, procedures for extracting nematodes from soil and plant tissues, culturing host-parasite relationships between nematodes and microorganisms, and evaluation of control practices. This research is intended to broaden training in plant nematology and so the projects selected may not duplicate thesis research.

579 Advanced Mycology Spring. 4 credits. Offered in alternate years. Prerequisites: 309 or its equivalent, a course in genetics, and permission of the instructor.

Lec M 10:10; lab, M W 1:25-4:25 and one additional three-hour period to be arranged. R. P. Korf. A detailed study of the biology and taxonomy of the major groups of plant pathogenic fungi (rusts, smuts, Fungi imperfecti, Peronosporales) with emphasis on mechanisms of variation in fungi. Optional field trips (expenses paid by department).

599 Taxonomy of Fungi Fall. 4 credits. Offered in alternate years. Prerequisites: 309 or its equivalent, a course in genetics, a course in plant or animal taxonomy, and permission of instructor.

Lec, M W 10:10; lab, M W 1:25-4:25. R. P. Korf. Emphasis is placed on the principles of taxonomy and nomenclature, critical evaluation of keys and monographs, and practice in identification. The Dicomycetes are treated in detail. Required field trips. Expenses paid by department.

645 Plant Virology Fall and spring. Credit to be arranged. S-U grades only. For graduate students with special interests in the particular area. Prerequisite: permission of the instructor.

Day and time to be arranged. W. F. Rochow and M. Zaitlin. Weekly discussions of current topics in special areas of plant pathology and mycology. Students will be required to do extensive reading of current literature and to present oral and written reports.

646 Plant Nematology Fall and spring. Credit to be arranged. S-U grades only. For graduate students with special interests in the particular area. Prerequisite: permission of the instructor.

Day and time to be arranged. W. F. Mai and M. B. Harrison. Weekly discussions of current topics in special areas of plant pathology and mycology. Students will be required to do extensive reading of current literature and to present oral and written reports.

647 Bacterial Plant Pathogens Fall and spring. Credit to be arranged. S-U grades only. For graduate students with special interests in the particular area. Prerequisite: permission of the instructor.

Day and time to be arranged. R. S. Dickey. Weekly discussions of current topics in special areas of plant pathology and mycology. Students will be required to do extensive reading of current literature and to present oral and written reports.

648 Physiology of Plant Disease S-U grades only.

H. D. Van Etten, R. L. Millar, O. C. Yoder, D. F. Bateman.

649 Mycology S-U grades only. 2 credits. R. P. Korf.

Fall: Aphyllophorales, Jelly fungi. Spring: Mycetoza, Plasmiodiophoromycetes.

650 Diseases of Vegetable Crops S-U grades only.

J. W. Lorbeer, R. E. Wilkinson.

651 Diseases of Fruit Crops Fall. 1 credit. S-U grades only.

Autotutorial with periodic discussions to be arranged. P. A. Arneson. Intended for graduate students and advanced undergraduates with a particular interest in fruit. The course will cover the economic importance, causal agent, symptoms, disease cycle, and control measures for the major diseases of fruit in the northeast.

653 Dendropathology S-U grades only. W. A. Sinclair.

654 Diseases of Florist Crops S-U grades only. R. K. Horst.

655 Plant Diseases in Tropical Agricultural Development S-U grades only. H. D. Thurston.

656 Cytology of Plant Diseases 1 credit. S-U grades only. J. R. Aist, H. W. Israel.

657 Plant Disease Epidemiology S-U grades only. W. E. Fry.

661 Seminar Fall and spring. 1 credit. S-U grades only. Required of all department majors. T 4:30-5:30. Staff.

671 Plant Pathology Colloquium Fall and spring. 1 credit. S-U grades only. First and third Th of each month, 8-10 p.m. Staff and graduate students

See also:

Special Studies of Tropical Plant Pathology (Int Agricultural 602)

Topics in Ultrastructure of Plant Cells (Bio S 642)

Pomology

W. J. Kender, chairman; G. D. Blanpied, L. L. Creasy, J. N. Cummins, L. J. Edgerton, D. C. Elfving, F. W. Liu, G. H. Oberly, D. K. Ourecky, L. E. Powell, N. J. Shaulis, J. P. Tomkins

General Horticulture (Veg 103) Intended for students who want a general course in horticulture covering flowers, fruits, and vegetables.

101 Tree Fruits Fall. 3 credits. Should be preceded or accompanied by an introductory course in biological sciences. Cannot be taken for credit after 104.

Lec, T Th 8; lab, M or W 2-4:25. L. J. Edgerton. A study of the general principles and practices of tree-fruit culture and their relation to the underlying sciences. Topics to be covered include propagation, varieties, orchard management, and growth and fruiting habits. Practical work is presented in grafting, pruning, site and soil selection, and planting.

104 Essentials of Fruit Growing Spring 3 credits. Cannot be taken for credit after 101.
Lec, T Th 8; lab, T or W 2-4:25. J. P. Tomkins.
A course intended for the student who wishes to learn how to grow fruits in the Northeast. Included will be tree fruits, grapes, small fruits, and nuts. The student who wants a course in commercial aspects of fruit production should take 101.

[208 Economic Fruits of the World Spring, 3 credits. Offered in alternate years. Prerequisite: an introductory course in biological science, or permission of instructor. Not offered 1978-79.
Lec, M W 10:10; lab, F 2-4:25. F. W. Liu.
The more important subtropical and tropical fruits such as citrus, banana, pineapple, mango, coffee, and cacao are considered. Morphology, physiology, and adaptation to climate are stressed rather than details of culture. A broad view of world pomology is given.]

[302 (308) Fruit Tree Nursery Operation Spring, 1 credit. Offered in alternate years. Prerequisite: 101, 104, or permission of instructor. Not offered 1978-79.
Lec, M W 9:05; lab, M 2-4:25. Meets first four and one-half weeks of term. J. N. Cummins.
This course is intended to familiarize the fruit producer with the operations and problems of the fruit tree nursery operator. Topics include production objectives, management decisions, and cultural aspects of nursery operation. Techniques of grafting, budding, pest identification, inspection, and grading of fruit tree planting stocks will be included.]

304 Orchard Management I Spring, 3 credits. Prerequisite: 101 or 104.
Lec, M W 8; lab, Th 1:25-4:25. D. C. Elfving and L. E. Powell.
A treatment of problems of concern to fruit growers such as site selection, planting and pruning systems, water relations, cold hardiness, dormancy, flowering, and fruiting. Physiological and practical aspects will be emphasized.

305 Orchard Management II Fall, 3 credits. Prerequisite: 101 or 104; it is desirable that 304 precede this course.
Lec, M W 8; lab, Th 1:25-4:25. G. H. Oberly and L. L. Creasy.
A continuation of the principles of pomology from Pomology 304. Subjects will include the later stages of fruit maturation, quality, harvesting, aspects of tree nutrition, protection from pests, and regulatory policies affecting fruit production and sale.

[306 Small Fruits Spring, 2 credits. Offered in alternate years. Prerequisite: 101, 104, or permission of instructor. Not offered 1978-79.
Lec, M W 9:05; lab, M 2-4:25. Last nine weeks of term. J. P. Tomkins.
A study of the general principles and practices in the commercial culture of strawberries, brambles, blueberries, currants, gooseberries, elderberries, and cranberries.]

[307 Viticulture Fall, 2 credits. Offered in alternate years. Prerequisite: 101, 104, or permission of instructor. Not offered 1978-79.
Lec, T Th 9:05; lab, T 2-4:25. Last nine weeks of term. N. J. Shaulis.
Viticulture, with emphasis on the viticulture of the Great Lakes region, as a series of interrelated decisions on varieties, sites, vine management, and vine protection will be presented. Those decisions are based on ampelography, meteorology, soils, vine and grape anatomy and physiology, as well as protection of the vine and grapes from injuries, primarily diseases and insects.]

310 Postharvest Physiology and Storage of Fruits and Vegetables Fall, 3 credits. Prerequisite: one course in pomology or vegetable crops, or permission of instructor.
Lec, M W 9:05; lab, F 2-4:25. F. W. Liu.

The chemistry and physiology of fruits and vegetables as they affect quality and marketability are studied. Maturity indices, handling methods, and storage practices are considered. Practical work includes observations of the effect of handling and storage methods on quality and condition of fruits and vegetables. One Saturday field trip is required. Expenses paid by department.

311 (315) Fruit Crop Systematics Fall, 1 credit. Offered in alternate years. Prerequisite: 101, 104, or permission of instructor.
Lec, T Th 9:05; lab, T 2-4:25. Meets first four and one-half weeks of term. G. H. Oberly.
The classification of fruit species is considered from a botanical and production viewpoint. The course deals with the identification and naming of fruit species and varieties and their botanical classification.

313 (311) Utilization of Fruit Crops Fall, 1 credit. Offered in alternate years. Prerequisite: 101, 104, or permission of instructor.
Lec, T Th 9:05; lab, T 1:25-4:25. Meets during the middle four and one-half weeks of term. F. W. Liu.
A consideration of the fate of fruits produced for consumption after processing. The coverage of fruit products will be generally limited to those commercially grown and processed in New York State. Although the discussion will include methods of canning, freezing, dehydration, and other types of processing, emphasis will be on the quality requirement and proper handling of raw materials and how they affect the quality of end products.

315 (313) Fruit Variety Improvement Fall, 1 credit. Offered in alternate years. Prerequisite: 101, 104, or permission of instructor.
Lec, T Th 9:05; lab, T 2-4:25. Meets the last four and one-half weeks of term. D. K. Ourecky.
The techniques and limitations of producing new varieties of perennial fruit crops are considered.

400 Undergraduate Seminar Spring, 1 credit. S-U grades only. May be taken twice for credit. Prerequisite: course in pomology.
Hours to be arranged. Staff.
Seminar topics and speakers selected and arranged by the students on subject areas related to pomology.

402 Special Topics in Experimental Pomology Spring, 3 credits. Offered in alternate years. Open to undergraduates by permission.
Hours to be arranged. Staff.
Selected topics are considered with respect to the current literature and/or experimental techniques. Topics reflect the research interests of the professors who participate.

[604 Growth and Development of Woody Plants Spring, 2 credits. Offered in alternate years. Prerequisite: introductory plant physiology. Not offered 1978-79.
T Th 9:05. L. E. Powell.
An advanced course dealing with physiological, morphological, and biochemical changes during development, beginning with the seed and advancing through the mature reproductive plant. Hormonal control mechanisms are emphasized.]

610 Research Fall or spring, 2 or more credits. S-U grades optional. Prerequisite: course in advanced pomology.
Staff.
Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade.

700 Graduate Seminar Fall, 1 credit. S-U grades only.
Hours to be arranged. Staff.
Reports by students on current research or literature in experimental pomology or related areas.

Rural Sociology

E. Walter Coward, Jr., chairman; M. L. Barnett, W. W. Bauder, F. H. Buttell, H. R. Capener, J. M. Cohen, G. J. Cummings, P. R. Eberts, E. C. Erickson, J. D. Francis, M. K. Miller, J. C. Preston, B. M. Scott, F. W. Young

100 Introduction To Sociology Fall or spring, 3 credits.
Lec, T Th 10:10; disc, M or F 9:05, 10:10, 11:15, 12:20, 1:25, 2:30. M. K. Miller, F. H. Buttell.

A general introduction to theory and methods of sociology. Major topics will include small groups and interpersonal relations, social stratification and inequality, organizations and bureaucracy, and social and cultural change. Discussions will focus on selected issues and recent research, mainly in the United States.

105 Rural Sociology and World Development Problems Spring, 3 credits.
M W F 10:10. J. M. Cohen.

Examination of the implications of development problems in three related contexts: (1) problems common to all societies, developed and developing; (2) problems found only in particular settings; (3) problems that appear occasionally, often with devastating social effects. Topics include: overdevelopment and underdevelopment; small-scale farming in the late developing nations; the sociology of famine and the green revolution; family and corporate farming in the United States; rural poverty in America; appropriate technology, agribusiness, and the multinational corporation; the survival of small communities in industrial society; rural to urban migration; and revolution and violence.

134 Recreation Leadership and Leisure Education Spring, 3 credits. Enrollment limited to 25. Permission of instructor required.
Lec, T 1:25; lab, W 7:30-9:10 p.m. B. M. Scott.
Background and theoretical framework for recreation leadership and leisure education which provides the setting for recreation programming and leadership. Lectures, weekly laboratory in recreation leadership, and field assignments.

213 Introductory Research Methods Spring, 3 credits.
M W F 11:15. F. W. Young.
The first part of the course deals with strategies of concept formation. The second is devoted to empirical research using survey techniques, hypothesis formation, statistical inference, and techniques of analysis. The third will be concerned with model building and with legitimacy of evidence. Students will gain experience in analyzing data sets or using their own sources of information, using computer programs.

300 Proseminar: Issues and Problems in Rural Society Fall, 1 credit. S-U grades only.
Th 12:20-1:35. J. M. Cohen.
The proseminar is designed to introduce the student to subject matter of concern to both applied and academic rural sociologists. The proseminar will focus on such subjects as migrant workers, agribusiness, rural poverty, rural to urban migration, rural development, agricultural research and people, community development, small farmers in the lesser developed nations. These topics will be explored through the use of films and group discussion.

324 Social Organization and the Environment Spring, 3 credits.
M W F 9:05. H. R. Capener.
A discussion of principles involved in the interaction of man and his physical environment as viewed from a human ecological and ecosystem perspective. Special emphasis will be given to the function of social organization in man-environment exchanges. Principles will be illustrated by referring to both

developing and developed societies. The course will provide a conceptual framework for understanding and addressing recurring environmental issues.

355 Rural Development and Cultural Change. Spring. 3 credits.

T Th 10:10–11:25. M. L. Barnett.
Analysis of planned social change programs in predominantly agricultural societies. Focusing on problems of administration, socioeconomic development, and the introduction of new practices.

356 Rural Society in America Fall. 3 credits. S-U grades optional.

M W F 9:05. H. R. Capener.
The focus will be on gaining a greater understanding and appreciation of the rural sector of American society. From sociological and historical perspectives the nature of changes in rural society will be examined, including the impact of technology on agriculture, other extractive industries, natural resources, the environment, regional variation, the rural-urban dominance theme, comparative life styles, cultural orientations, value patterns, and a look to the future.

[357 Subsistence Agriculture in Transition Spring. 3 credits. Not offered 1978–79.

Lec. T Th 10:10–11:25. M. L. Barnett.
An analysis of selected types of peasant communities, drawn from differing ecological conditions. Social structure, systems of farming and land tenure arrangements, and motivational characteristics of subsistence farmers in the context of socioeconomic change. Theoretical and policy aspects of modernization and traditional agriculture and programming for agricultural development.]

358 Sociology of Agriculture Spring. 3 credits. Th 2:30–4:25. E. C. Erickson.

The course examines the basic position of agriculture in rural societies with special emphasis on North America. One major focus will be on the impact of organizational structure on how agriculture operates. Another will be on the causes and consequences of technological change on agriculture in terms of size, economic efficiency, quantity, and quality. Unintended consequences will also be explored.

380 Independent Honors Research in Social Science Fall or spring. 1-6 credits. Open only to candidates who have met the requirements for the honors program. A maximum of six credits may be earned in the honors program.
Staff.

404 Advanced Principles Of Sociology (Also Soc 404) Fall. 4 credits.

T Th 10:10–12:05. P. R. Eberts.
An advanced undergraduate seminar for senior majors in sociology and rural sociology. The course will focus on: (1) the central concepts of the sociological tradition; (2) major classical theorists (Marx, Weber, Durkheim, Toqueville) and contemporary counterparts; (3) application of the classical ideas in contemporary research.

426 Policy Research: Uses, Methods, Case Studies (Also Soc 426) Spring. 3 credits.

T Th at times to be arranged. M. K. Miller and S. B. Caldwell.
Design, structure and techniques of policy research. Consideration of general model form, experimental and non-experimental design, micro and macro forecasting models, and generalizability of findings. Stress will be on utilization of results through examination of actual case studies.

[432 Community Structure And Planned Change Fall. 3 credits. Not offered 1978–79.

Lec. T Th 9:05; disc. to be arranged. J. C. Preston.
This course will examine the major concepts, trends, and issues in community structure and social change with emphasis on domestic rural community

development. Areas to be examined include the nature of change and development, organizational analysis, strategies of change, local government structure and options, and community power structure and decision-making processes.]

436 Small Towns Spring. 2 or 3 credits.

T 2:30–4:25. G. J. Cummings.
A study of options open to small communities for enhancing quality of life. The institutions of local government and education will be examined in terms of their past performance and potential contributions in dealing with problems associated with living in places having relatively small populations.

[443 Political Structure and Development Fall. 3 credits. S-U grades optional. Open to upperclass and graduate students. Prerequisite: 100 or equivalent. Not offered 1978–79.

T Th 10:10–11:25. P. R. Eberts.
Comparative analyses of social control issues in the political economies of Western democracies relating to development issues with special attention on the United States. Control will be viewed relative to pluralism in productive, allocative, and staffing processes of society. Occupational categories, communities of different size, and institutions responsible for maintaining social order and development will be examined.]

454 Rural Development Policy Analysis Spring. Offered in alternate years. Offered 1979. 3 credits.

T Th 8–9:55. J. C. Preston.
This course will focus on the study of public policies and programs affecting domestic rural development. This will include the use of social indicators in policy formulation and change along with the study of selected policies and programs intended to aid rural areas.

462 Organization of Rural Health Care Fall. 3 credits.

M W F 2:30. G. J. Cummings.
A review and analysis of alternative organizational models designed for making advances in medical knowledge accessible to people living in rural areas. Policies and organizational approaches from selected countries, including the United States, will be compared in terms of effects on health status.

471 Informal Study Fall or spring. 1–3 credits. S-U grades optional. May be repeated for credit.
Staff.

Undergraduates must attach to their pre-registration material written permission from the faculty member who will supervise the work and assign the grade. Informal study may include a readings course, research experience, or public service experience.

606 Contemporary Sociological Theories of Development Fall. 3 credits.

M W F 11:15. F. W. Young.
A review of theory, empirical studies, and policy prescriptions as applied to communities and regions, especially those in less developed countries. Diffusionism, human ecology, the Weberian tradition, central place, dependency, and symbolic structural theory are compared.

618 Research Design I Fall. 4 credits.

M W F 10:10; lab, to be arranged. J. D. Francis.
First of a two-semester sequence (may be taken individually) in graduate methods. This course discusses problems of measurement, the design of measuring instruments, and problems of reliability and validity. Some common forms of measuring instruments will be discussed, including multidimensional techniques. Students are expected to use actual data for labs.

619 Research Design II Spring. 4 credits.

Prerequisite: an introductory methods course or a statistics course.
M W F 10:10. J. D. Francis.
Second part of the sequence in graduate methods

will deal with sampling frames, some pragmatic sampling techniques, and some discussion of statistical analysis procedures appropriate under each. An intermediate level treatment of the following topics: nonexperimental designs, regression analysis, analysis of variance, analysis of covariance, and causal models. A classic piece of sociological research will be one source of illustration and a component of the laboratory exercises. Students are expected to use actual data to familiarize themselves with data handling and processing.

[641 Political Economy Of Rural And Regional Development Spring. 3 credits. S-U grades optional. Prerequisite: upperclass or graduate student status. Not offered 1978–79.

T Th 10:10–11:25. P. R. Eberts.
An interdisciplinary course focusing on social, political, and economic factors in regional development. Theories from demography, ecology, social organization, and planning will be used to examine the emergence of new forms of social organization and their implications for contemporary America.]

[642 Macro Systems Theory and Policy Analysis Spring. 3 credits. S-U grades optional. Not offered 1978–79.

F 12:20–2:15; disc. to be arranged. P. R. Eberts.
Analysis of major theoretical and research problems related to the application of systems theory to society's changing organizational process. Major theories will be examined, paying particular attention to their compatibility with modern analytic techniques such as simulations and projections in analyzing current issues in macro political economy.]

[645 Social Theory Fall. 3 credits.

T Th 2:30–3:45. J. M. Cohen. Not offered 1978–79.
A comparative study of basic concepts and theories of twentieth-century sociology. The conceptual frameworks focused on are systems theory, structural functionalism, conflict theory, interaction theory, exchange theory, and ethnomethodology. The course will center on explanation and prediction in the analysis of rural societies and on the relationship between theory and methodology.]

[650 Social Organization of Agriculture Spring. 3 credits. Not offered 1978–79.

Th 1:25–4:25. E. C. Erickson.
Concentrating on a small number of significant commercial crops, the seminar will examine the institutions and relationships involved in the production process: research, credit, distribution of inputs, the farm operation, processing, transportation, and marketing. Patterns at the farm and community level will include topics such as settlement, land tenure, ethnic groups, class structures, methods of cooperation, small farmers, labor problems, and information networks. Ecological and physical constraints on production will be considered. Special emphasis will be put on the influence of national and international structures—political, social and economic—on the production process, including the role of government and quasi-government units. The course will also examine the historical circumstances giving rise to the present crop systems. Consideration of what rearrangements of the political, social, and economic structures, both domestic and international, are required for change in crop systems, improvement in production, and increased social welfare.]

[712 Factor Analysis and Multidimensional Scaling Fall. 4 credits. Prerequisite: previous course work in scaling and statistics. Not offered 1978–79.

M W F 10:10; lab, to be arranged. J. D. Francis.
Topics discussed including philosophy of factor analysis, factor analysis models, factoring design, factoring techniques, and comparison with factor

analysis models. Multidimensional scaling and discriminant analyses are also discussed. As matrix algebra is an integral part of these procedures, class time will be devoted to this topic.]

715 Macrosocial Accounting Spring. 3 credits. Th 1:25-4. F. W. Young.

A survey of methods and results for describing a whole country by comparing its subnational units. Topics: varieties of available data and their uses, macrosurveys, basic structural dimensions, selected techniques, the "rural development inventory." Students compile a "country file" and learn the various applications of this approach.

[717 Regression And Path Analysis Spring. 4 credits. Prerequisite: two courses in statistics and one in methods. Not offered 1978-79.

M W F 10:10; lab to be arranged. J. D. Francis. The first part of the course will consist of a review of multiple and nonlinear regression. Two-stage least squares models will be discussed for sociological data along with a discussion of nonmetric regression. The latter half of the course will deal with recursive and nonrecursive path models.]

[723 Social Movements in Agrarian Society Spring. 3 credits. Not offered 1978-79.

T 1:25-4. F. W. Young. The recent research explosion in this area will be approached in terms of the several fundamental explanatory formats, a comparison of class-based and regionally-based movements, and research on the United States and the Third World.]

751 Applications of Sociology to Development Programs Fall. 3 credits. Open to graduate students only.

T Th 1:25-4:25. E. C. Erickson. Consideration of problems of implementing change strategies at national, regional, and institutional levels, especially as they relate to rural development. Attention will focus also on institutional constraints on the sociologist as a researcher, as a strategist, and as a participant and on the different contexts within which developmental change occurs.

754 Sociotechnical Aspects Of Irrigation Spring. 2-3 credits.

Hours to be arranged. M. L. Barnett, E. W. Coward, Jr., G. Levine. Examines irrigated agriculture and its relation to agricultural development. Emphasis on social processes within irrigation systems and interactions with the social setting. The seminar will provide an opportunity to examine systematically the institutional and organizational policy issues associated with the design and operation of systems of irrigated agriculture.

771 Special Seminar Fall or spring. Credit to be arranged. Prerequisite: graduate standing or permission of instructor.

791 Teaching Experience Fall or spring. 1-3 credits. S-U grades only. Prerequisite: graduate standing.

Staff. Participation in the ongoing teaching program of the department.

792 Public Service Experience Fall or spring. Credit to be arranged. Prerequisite: graduate standing.

Staff. Participation in the ongoing public service activities of the department.

***871-874 Informal Study** Fall or spring. Credit to be arranged. Prerequisite: candidate for master's or Ph.D. degree and permission of the graduate field member concerned.

871 Rural Sociology

872 Development Sociology

873 Organization Behavior and Social Action

874 Methods of Sociological Research

881 Research Fall or spring. Credit to be arranged. Prerequisite: candidate for master's or Ph.D. degree and permission of the graduate field member concerned.

Program on Science, Technology, and Society

See section Independent Interdisciplinary Centers and Programs

Statistics and Biometry*

F. B. Cady, W. T. Federer, D. S. Robson, S. R. Searle, D. L. Solomon

200 Statistics and the World We Live In Spring. 3 credits.

Lec, T Th 10:10-11:25; 1 disc M 10:10, 1:25, 2:30, T 9:05, 1:25, 2:30. W. T. Federer.

Focus is on a better consumer understanding of statistical design, data collection, and information. Concepts of statistics, measurements and measuring instruments, data collection, principles of scientific investigation, survey design, questionnaire construction, experiment design, treatment design, graphs, tables, probability, averages, measures of variation, common distributions, confidence intervals, sample size, international and national statistics, and some simple statistical methodology are presented.

408 Theory of Probability Fall. 3 credits.

Prerequisites: Math 106, 108, or 112, or permission of instructor.

M W F 10:10. Professor to be appointed. An introduction to probability theory: combinatorics, random variables and their probability distributions, generating functions, and limit theory. Biological and statistical applications will be the focus of the presentation. The course can serve as either a terminal course in probability or as a foundation for a course in the theory of statistics.

409 Theory of Statistics Spring. 3 credits.

Prerequisite: 408 or equivalent. M W F 10:10. Professor to be appointed. The concepts developed in 408 are applied to provide an introduction to the classical theory of parametric statistical inference. Topics covered include data reduction and the concept of sufficiency, parameter estimation, hypothesis testing, and linear regression. Students seeking training in statistical methodology should consider courses 601-607.

416 Matrix Algebra I Fall. 2 credits. Prerequisite: a year of college algebra.

Lec, M W F 8; disc M 1:25-2:15, Sept. 4-Oct. 20 (first seven weeks). S. R. Searle.

Definitions, basic operations and arithmetic, determinants, and the inverse matrix. Emphasis is given to understanding basic ideas.

417 Matrix Algebra II Fall. 2 credits.

Prerequisite: 416 or permission of the instructor; no auditors.

Lec, M W F 8; disc M 1:25-2:15, Oct. 23-Dec. 8 (second seven weeks). S. R. Searle.

*Part of the Department of Plant Breeding and Biometry

Rank, linear dependence, canonical forms, linear equations, generalized inverses, characteristic roots and vectors. Emphasis is placed on developing skills for applying matrix algebra.

600 Biometry Seminar Fall or spring. 1 credit. S-U grades only.

Th 3:35. Biometrics Unit staff.

601 Statistical Methods I Fall. 4 credits.

Prerequisite: graduate standing or permission of instructor.

Lec, M W F 9:05 or 11:15; lab, M 12:20-1:50, 2:30-4, 7:30-9, T 12:20-1:50, 2:30-4.

D. L. Solomon.

Statistical methods, both parametric and nonparametric, are developed and used to analyze data arising from a wide variety of biological situations. Topics include point and interval estimation, hypothesis testing, inference for a single population, comparisons between two populations, regression and correlation analysis, and one-way analysis of variance. Emphasis is placed on basic principles and criteria for selection of statistical techniques.

602 Statistical Methods II Spring. 4 credits.

Prerequisite: 601 or equivalent.

Lec, M W F 9:05 or 11:15; lab, M 12:20-1:50, 2:30-4, 7:30-9, T 12:20-1:50, 2:30-4. F. B. Cady.

Design and analysis of experiments, especially completely randomized, randomized block, nested designs and two-factor factorial experiments, multiple linear regression, including least squares estimation, tests for lack of fit, regression approach to analysis of variance, analysis of covariance, and stepwise regression for variable selection.

605 Applied Regression Analysis Fall. 1 credit.

Prerequisite: 604 in 1975, 1976, 1977, or 1978; or 602 in subsequent years.

T Th 12:20-1:35, Sept. 4-Oct. 4. F. B. Cady. Data analysis using standard multiple regression programs will be emphasized with special attention given to interpretation of partial regression coefficients and R^2 . Comparison of variable selection procedures. Biased estimation. Variable selection for prediction. Regression approach to nonorthogonal analysis of variance situations. Case study for complex data set.

606 Sampling Biological Populations Fall.

1 credit. Prerequisite: 601 or equivalent.

T Th 12:20-1:35, Oct. 6-Nov. 7. D. S. Robson. Standard methods of socioeconomic sample survey design and estimation will be presented, including stratified-random sampling, cluster sampling, double sampling, and variable probability sampling. Special emphasis given to methods of particular utility or specifically designed for biological sampling. Examples will be taken from forestry, fisheries, and other biological areas.

[607 Nonparametric and Distribution-Free

Statistical Methods Spring. 1 credit. Prerequisite: 601 or equivalent. Not offered 1978-79.

Nonparametric and distribution-free alternatives to normal-theory testing procedures will be presented. Analysis of variance of ranked data and nonparametric regression analysis will be emphasized. Other topics include analysis of categorical data, nonparametric multiple comparisons, goodness-of-fit testing, and randomization tests.]

662 Mathematical Ecology Spring. 3 credits.

Offered in alternate years. Prerequisites: one year of calculus, one course in statistics.

M W F 1:25. D. L. Solomon and S. A. Levin. Mathematical and statistical analysis of populations and communities: theory and methods. Spatial and temporal pattern analysis, deterministic and stochastic models of population dynamics. Model

formulation, parameter estimation, simulation, and analytical techniques. Diversity measures, life tables, ordination, and gradient techniques.

699 Special Problems in Statistics and Biometry

Fall, spring, or summer. 1 credit or more by arrangement with instructor. Spring: 3 credits. Prerequisites: 409, 416, 602, and 717 or permission of instructor.

Time to be arranged. D. S. Robson and staff. Topics in advanced biometry: including bioassay, non-linear estimation, tag-recapture, life tables, categorical data analysis.

[713 Design of Experiments I

Fall. 4 credits. Prerequisites: 417 and 602, or the equivalent. Not offered 1978-79.

Principles and techniques of experimentation, theoretical concepts, extensions and variations of the completely randomized, randomized complete block and latin square designs, the factorial experiment and confounding, interval estimation for ranked means, transformations, unequal variances, additivity, residual analyses, sample size, variance component analyses, unequal number analyses, the place of orthogonality, balance and confounding in design, and advanced statistical methodology.]

714 Treatment Design and Related Experiment Designs

Fall. 4 credits. Offered in alternate years. Prerequisites: 602 and 416-417.

T Th 8-9:50; disc to be arranged. W. T. Federer. Treatment design, the selection of treatments for an experiment, is divided into factorial, response surfaces, mixtures, and combinations of these. Single degree of freedom contrast matrices, factorial design theory for prime powers and non-prime powers, confounding, split plot, split block, complex confounded designs, lattice designs derivable from pseudo-factorial theory, fractional replication, response surface designs, and designs and analyses for mixtures, including diallel crossing designs, are covered. Statistical analyses involving residual analyses and real data will be included. Emphasis is on concepts and applications rather than mathematical manipulations.

717 Linear Models

Fall. 3 credits. Offered in alternate years. S-U grades only. Prerequisites: 605, 417 and 409, or Math 472.

T Th 10:10-11:25; disc T 11:25-12:05. S. R. Searle. Introduction to multinomial variables and distribution of quadratic forms; linear statistical models, estimable functions and testable hypotheses, regression models, experimental design models, variance component models, and combinations thereof.

[719 Multivariate Analysis

Spring. 3 credits. Offered in alternate years. S-U grades only. Prerequisites: 417, 605 and 409, or Math 472. Not offered in 1978-79.

S. R. Searle. Basic topics in multivariate analysis are covered: multi-normal variables, estimation, Wishart distribution, generalized T^2 and generalized variance, principal components, canonical correlations, and factor analysis, with considerable emphasis placed on establishing and understanding of the detailed development of multivariate procedures.]

[720 Statistical Design Theory

Fall. 3 credits. S-U grades only. Prerequisites: Math 431-432, course in design theory. Not offered 1978-79.

W. T. Federer. Primarily for those doing research on statistical design topics. Areas to be discussed are generalizations of balanced and partially balanced block design theory, F-square and latin square geometries, variance and other optimality criteria, fractional replication, and other topics of interest to participants. Many unsolved statistical design problems will be posed.]

890-990 Research Fall or spring. Credit to be arranged. S-U grades only. Research at the M.S. (890) or Ph.D. (990) level. Prerequisites: candidate for a graduate degree and permission of the graduate field member concerned.

Vegetable Crops

R. D. Sweet, chairman; E. E. Ewing, J. R. Hicks, W. C. Kelly, P. M. Ludford, P. L. Minotti, H. M. Munger, R. F. Sandsted, R. Sheldrake, Jr., L. D. Topoleski, D. H. Wallace

103 General Horticulture

Spring. 4 credits.

Limited to 25 students per lab section.

Lec, M W F 8; lab, M T W Th or F 2-4:25.

R. Sheldrake. Includes flower, fruit, and vegetable growing. Primarily for students who want a general knowledge of the subject or who wish to specialize in horticulture but have a limited background in practical experience or in training in plant science.

123 Organic Gardening

Spring. 2 credits. Limited to 20 students per section. Prerequisite: permission of instructor.

M T W or Th 1:25-4:25. W. C. Kelly.

For students not enrolled in the College of Agriculture and Life Sciences. Students must be prepared to lead a discussion and write a paper on some aspect of home gardening or amateur horticulture. Organic methods of gardening will be discussed and demonstrated, but other methods are not excluded from the discussions.

210 Vegetable Types and Identification

Fall. 2 credits. T 10:10-12:05 or 2-4. L. D. Topoleski. Designed to acquaint the student with the vegetable species grown in the Northeast and the pests and disorders encountered in their production. Subjects covered include identification of economically destructive weeds, diseases and insects of vegetables, identification of vegetable and weed seeds, seedlings, nutrient deficiencies, and vegetable judging, grading, and grade defects.

211 Commercial Vegetable Crops

Fall. 4 credits. Prerequisite: 103 and Agron 200. Limited to 50 students.

Lec, M W F 11:15; lab, W or F 2-4:25. E. E. Ewing. Intended for those interested in the commercial vegetable industry from the viewpoint of production, processing, marketing, or the related service industries. Topics included are techniques, problems and trends in the culture, harvesting, and storage of the major vegetable crops, including potatoes. Field trips are taken on Wednesdays in September, each starting at 11:15 a.m. and returning at approximately 6 p.m.

312 Postharvest Handling and Marketing Vegetables

Fall. 3 credits. Lec, T Th 9:05; lab, T 2-4:25. J. R. Hicks. Procedures used in marketing and shipping vegetables including grade standards, methods of grading, packaging, harvesting methods, cooling principles, storage techniques, and market preparation. Field trips will be taken in early fall.

401 Vegetable Crop Physiology

Fall. 5 credits. Prerequisites: 211 and Bio S 242 or their equivalent.

Lec, M W F 11:15; lab, M 2-4:25; disc, Th or F 1, 2, or 3. W. C. Kelly.

Subjects discussed include mineral nutrition as influenced by fertilization programs and crop sequence; nutrient interactions and induced deficiencies; growth and development; flowering; fruit setting; growth correlation; senescence; sex expression; photoperiodism; vernalization; and environmental factors affecting growth.

[413 Kinds and Varieties of Vegetables Fall. 3 credits. Offered in alternate years. Prerequisite: 211 or permission of instructor. Not offered 1978-79. Lab, W F 2-4:25.

Designed to help students achieve proficiency in the evaluation of vegetable varieties through study of their origins, characteristics, adaptation, and usage. An important part of the course is the study of crops in the field. The vegetable seed industry is also discussed.]

421 Plant-Plant Interactions

Spring. 3 credits. Prerequisites: Agron 200 and any other crop production course. Bio S 242 desirable.

Lec M W 8; disc F 8 and as arranged. P. L. Minotti. The manner in which plants affect the growth of other plants is examined using literature on both competition and allelopathy to illustrate principles. Emphasis is on crop situations rather than natural plant communities. Competition in monoculture is considered as well as weed-crop and crop-associate crop interactions. Greenhouse "mini-experiments" illustrating selected aspects of competition between weeds and vegetables are conducted by students.

499 Undergraduate Research Fall or spring. 1 or more credits, by arrangement. Written permission from staff member directing the work must be obtained before registration.

Hours to be arranged. Staff. Special problems may be elected in any line of vegetable work.

601 Seminar Fall or spring. 1 credit. S-U grades only. Required of graduate students majoring or minoring in this department. Limited to graduate students.

Th 4:30. Staff.

[612 Postharvest Physiology of Horticultural Crops Spring. 2 credits. Offered in alternate years. Prerequisite: permission of instructor. Not offered 1978-79.

T Th 8. P. M. Ludford. Physiological and biochemical aspects of growth and maturation, ripening and senescence of harvested horticultural plant parts. Topics will include morphological and compositional changes in ripening and during storage life, some physiological disorders, aspects of hormone action and interaction, and a consideration of control.]

620 Teaching Experience Fall or spring. 1 or more credits by arrangement with instructor.

Hours to be arranged. Staff. Participation in the teaching program of the department.

630 Research Methods in Applied Plant Science Spring. 3 credits. Offered in alternate years.

Prerequisite: permission of instructor. T Th 9:05-11. W. C. Kelly.

The planning of applied research programs. The advantages and limitations of conventional experimental designs as they apply to specific research problems. Discussions include a critical interpretation of experimental results from the literature.

801 Master's Thesis Research Fall or spring. Credit and time to be arranged. Staff.

901 Doctoral Thesis Research Fall or spring. Credit and time to be arranged. Staff.

See also:

Special Topics in Plant Science Extension (PI B 629)

College of Architecture, Art, and Planning

Architecture

Architectural Design

A studio fee of \$10 is charged each semester for every design course.

Sequence Courses

101 Design I Fall. 3 credits. Studio and lecture. Open to department students only.
M 3:35–5:30, W F 2–5. Staff.

An introduction to design as a conceptual discipline directed at the analysis, interpretation, synthesis, and transformation of the physical environment. Exercises aimed at developing an understanding of the issues, elements, and processes of environmental design.

102 Design II Spring. 3 credits. Studio and lecture. Open to department students only.
M 3:35–5:30, W F 2–5. Staff.

A continuation of 101. Human, social, technical, and aesthetic factors related to space and form. Design problems ranging from the immediate environment of the individual to that of small social groups.

201–202 Design III and IV Fall or spring. 4 credits each term. Studio and seminar. Must be accompanied by Arch 231–232. Open to department students only.
M W F 2–6. Staff.

301–302 Design V and VI Fall or spring. 6 credits each term. Studio and seminar. Open to department students only.
M W F 2–6. Staff.

401–402 Design VII and VIII Fall or spring. 6 credits each term. Studio and seminar.
M W F 2–6. Staff.
Programs offered are architectural design, urban design, or architectural technology and environmental science each term.

501 Design IX Fall or spring. 8 credits. Studio.
M W F 2–6. Staff.

502 Design X–Thesis Fall or spring. 8 credits. Studio.
M W F 2–6. Staff.
All students who are candidates for the degree of Bachelor of Architecture will be required to complete satisfactorily a thesis during one term of the last year in residence. Students accepted for admission to the graduate studio are exempt from the thesis requirement.

503–504 Design IX–Thesis I and Design X–Thesis II Fall or spring. 8 credits each term. Studio.
M W F 2–6. Staff.

Upon approval by the department students may elect to spend two terms working on the thesis.

510 Thesis Introduction Fall or spring. 2 credits. Lecture and seminar.
T 1:25–3:20. Staff.

Required of all architecture students in the year preceding their thesis. Lectures, seminars, and independent research leading to complete development of the student's thesis program. General instruction in the definition, programming, and development of a thesis will be followed by tutorial work with the student's advisory committee.

601–602 Special Program Fall or spring. 9 credits each term. Participation in graduate studio (713–714, 715–716) intended primarily for students applying to a graduate program in the College.
Hours to be arranged. Staff.

111–112 Elective Design Studio 111, fall; 112, spring. 3 credits each term. Registration restricted to out-of-department students. Permission of department office required. To be coordinated by Department of Architecture Office.
M 3:25–5:30, W F 2–5. Staff.

200, 300, 400, 500 Elective Design Fall or spring. Credit as assigned. Open by permission to transfer students who have not been assigned to a sequence course. Permission of department office required. The student will be assigned to work with a class of appropriate level.
M W F 2–6. Staff.

Nonsequence Courses

310 Special Problems in Architectural Design Fall or spring. Independent study. Registration and credit by arrangement.
Hours to be arranged. Staff.

[611–612 Urban Housing Developments 611, fall; 612, spring. 2 credits each term. Seminar. Limited to fourth- and fifth-year students in architecture and graduate students. Prerequisite: permission of instructor. Not offered 1978–79.
Hours to be arranged. O. M. Ungers.
Concentrates on large-scale housing developments, particularly in relation to size, density, and problems of infrastructure.]

[613 Transportation Fall. 2 credits. Seminar. Prerequisite: permission of instructor. Not offered fall 1978.
Th 3:30–5:30. P. Cohen, A. Meyburg.
A seminar concerning the impact of various transportation forms upon the environment involving architects, engineers, planners, and human ecologists. Readings and discussions of past, current, and future transportation modes will focus on the aesthetic and physical aspects.]

[614 Low-Cost Housing Spring. 3 credits. Seminar. Prerequisite: permission of instructor. Not offered 1978–79.
T Th 1:25–2:15. F. O. Slate, P. Cohen, C. B. Daniels, H. W. Richardson.
The major objectives of this course are to present aspects of low-cost housing involving engineering technology, architecture, physical planning, economics, and sociology.]

618–619 Seminar in Urban and Regional Design 618, fall; 619, spring. 3 credits each term. Open to fifth-year and graduate students.
Hours to be arranged. O. M. Ungers, staff, visitors.
Deals with a broad range of issues and problems of urban and regional development and the context in which the designer functions. Selected case studies are presented by the participants and visitors.

Graduate Courses

711–712 Problems in Architectural Design 711, fall; 712, spring. 9 credits each term. Studio and seminar.
Hours to be arranged. O. M. Ungers.
The basic first-year design course for graduate students whose major concentration is architectural design.

713–714 Problems in Urban Design 713, fall; 714, spring. 9 credits each term. Studio and seminar.
Hours to be arranged. C. Rowe.
The basic first-year design course for graduate students whose major concentration is urban design.

715–716 Problems in Regional Design 715, fall; 716, spring. 9 credits each term. Studio and seminar.
Hours to be arranged. Staff.
The basic first-year design course for graduate students whose major concentration is regional design.

811 Thesis or Research in Architectural Design Fall or spring. 9 credits.
Hours to be arranged. O. M. Ungers.
Second-year design course for graduate students whose major concentration is architectural design.

812 Thesis or Research in Urban Design Fall or spring. 9 credits.
Hours to be arranged. C. Rowe.
Second-year design course for graduate students whose major concentration is urban design.

813 Thesis or Research in Regional Design Fall or spring. 9 credits.
Hours to be arranged. Staff.
Second-year design course for graduate students whose major concentration is regional design.

Structures

Sequence Courses

221 Mathematical Techniques Fall. 3 credits. Two lectures and one recitation.
T Th 10:10–11. Mathematics department staff.
Introduction to mathematical concepts and operations used in architecture.

222 Structural Concepts Fall or spring. 4 credits. Lectures and seminars. Prerequisite: Arch 221 or approved equivalent.
T Th 9:05–11. Staff.
Fundamental concepts of structural behavior. Statics and strength of materials.

321 Structural Systems I Fall. 3 credits. Lectures and seminars. Prerequisites: Arch 221 and 222.
T Th 11:15–1:10. Staff.
Structural design concepts and procedures for steel building construction.

322 Structural Systems II Spring. 3 credits. Prerequisite: Arch 222.
T Th 11:15–1:10. Staff.
Structural design concepts and procedures for reinforced concrete building construction.

Nonsequence Courses

323 Advanced Steel Building Design Fall. 3 credits. Seminar. Prerequisites: Arch 321 and permission of instructor.
Hours to be arranged. F. W. Saul.
Design and investigation of advanced systems of steel building structure, plastic design of continuous beams, rigid frames, and highrise buildings.

[324 Surface Structures Spring. 3 credits. Seminar. Permission of instructor required. Not offered 1978–79.
D. P. Greenberg.

The qualitative and quantitative analysis and design of thin shell architectural structures, including shells of revolution, cylindrical shells, hypars, and folded plates. Suspension structures. The architectural implications and problems of curvilinear forms. Construction techniques.]

326 Building Substructure Spring. 3 credits. Seminar. Prerequisites: Arch 322 or concurrent registration and permission of instructor.
Hours to be arranged. F. W. Saul.
The principles of soil mechanics and subsurface exploration. Design of building foundations—footings, piles, and subgrade walls.

328 Advanced Reinforced Concrete Building Systems Spring, 3 credits. Seminar. Prerequisites: Arch 322 and permission of instructor.

Hours to be arranged. Staff.
Review of methods and specifications for the design and construction of reinforced concrete building systems. Two-way framing systems. Precast concrete construction. Discussion of ultimate strength and yield line theories. Quality control of reinforced concrete. Exploration of new techniques in concrete construction. Other selected topics.

Architectural Principles, Theories, and Methods

Sequence Courses

131 Introduction to Architecture Fall, 2 credits. Lecture. Open to out-of-College students.

M 1:25–3:20. A. Kira.
An introduction to the built and natural environments as cultural context. The field of architecture as an environmental design discipline and its relation to other fields.

231 Architectural Elements and Principles Fall, 3 credits. Studio and lecture. Architecture students must register for this course with Architecture 201.

T Th 1:30–3:25. M. Harms and Staff.
Theory of the order, perception, and function of architectural space. Discourse on the nature of architectural systems and an examination of the multiplicity of ways they can be used to solve architectural problems. Demonstrative exercises.

232 Design Methods and Programming Spring, 3 credits. Studio and lecture. Architecture students must register for this course with Architecture 202.

T Th 1:30–3:25. A. Mackenzie, W. Goehner.
Basic methods for developing architectural programs. Emphasizes programming as a conceptual as well as a descriptive task. Basic methods of design. Stresses analytic and synthetic skills. Demonstrative exercises.

630–631 Advanced Seminar in Architecture 630, fall; 631, spring, 1 credit each term. Required of all fifth-year architecture students. Open to graduate students.

Hours to be arranged. Staff and visiting critics.

Nonsequence Courses

333 Computer Applications Spring, 3 credits. Prerequisites: one term of calculus, (Arch 221 or equivalent), one term of FORTRAN programming, Comp Sci 100 and 106, or equivalent.

Hours to be arranged. D. P. Greenberg.
The course is designed to acquaint the student with current uses and potentials of digital computers in the architecture profession. Topics include architectural and planning models, structural analyses, energy simulation, critical path scheduling, and computer graphics.

334 Computer Graphics Fall, 3 credits. Prerequisites: two terms of calculus, Comp Sci 211, or equivalent.

T Th 10:10–11. D. P. Greenberg.
Introduction to the principles of interactive computer graphics, including input techniques, display devices, display files, interactive graphic techniques, two- and three-dimensional computer graphics, perspective transformations, hidden line and hidden surface algorithms, and color picture generation.

335–336 Theory of Architecture 335, fall; 336, spring, 3 credits per term. Lecture. Prerequisite: Arch 231–232 or permission of instructor. 335 not offered fall 1978.

T Th 4:40–6:30 p.m. L. Hodgden.

437–438 Special Projects in Computer Graphics

437, fall; 438, spring, 4 credits each term. Prerequisites: Arch 334, concurrent registration in Com S 314, or equivalent. Enrollment limited to third-year students or above. Permission of instructor required.

Hours to be arranged. D. P. Greenberg.
Advanced work in computer graphics input and display techniques, including storage tube, dynamic vector, and color raster displays.

[531–532 Computer-Aided Structural Design

531, fall; 532, spring, 4 credits each term. Prerequisites: Arch 334, CEE G301 and CEE G302 Structural Engineering, concurrent registration in CEE G612 Advanced Structural Analysis. Enrollment limited to fourth-year students and above. Permission of instructor required. Not offered 1978–79.

D. P. Greenberg.
Advanced topics involving interactive computer graphics and advanced structural analysis techniques.]

[533–534 Computer-Aided Environmental

Design 533, fall; 534, spring, 4 credits each term. Prerequisites: Arch 334 and 362, one year of college physics. Enrollment limited to fourth-year students and above. Permission of instructor required. Not offered 1978–79.

D. P. Greenberg.
Advanced topics involving interactive computer graphic and advanced environmental design techniques. Topics may include acoustics, lighting, and energy analyses.]

633–634 Introduction to Comparative Theories in Inquiry 633, fall; 634, spring, 3 credits each term. Seminar. Third-year students and above.

Hours to be arranged. D. M. Simons.
The study of approaches to problem inquiry: the formal procedures of the fields of architecture, natural sciences, and applied sciences and the aesthetic and rational intelligences exemplified in these. Discussions of significant writings from the various fields.

[635 Rationalist and Idealist Concepts of

Architecture Spring, 3 credits. Open to undergraduate and graduate students. Prerequisite: permission of instructor. Not offered 1978–79.

W 8–10 p.m. W. G. Lesnikowski.
Comparative study of philosophical and aesthetic concepts of rationalism and idealism in nineteenth- and twentieth-century architecture. Concepts of organic architecture, unity, dualism, core and centrum, symbolism, regular and irregular forms, morphological patterns. Lectures and research into problems of architectural aesthetics.]

639 Principles of Design Process Fall,

3 credits. Seminar. Third-year architecture students and above. Out-of-college students by permission of instructor.

M W 10:10–12:05. A. Mackenzie.
Analysis of the major theories and techniques of design developed during the past fifteen years, with special emphasis on application to the solution of whole problems in architectural design. Students are required to complete exercises and a paper or a project.

Note: **667–668 Architectural in its Cultural Context I and II** is accepted as a theory course.

Architectural History

Sequence Courses

141–142 History of Architecture I and II 141, fall; 142, spring, 3 credits each term. Lecture. Students in other colleges may take either or both terms for credit.

T Th 11:15–1:10. C. F. Otto and staff.
History of architecture as social and cultural

expression of Western civilization. Selected examples from Mesopotamia to the eighteenth century are considered in the fall; history of modern architecture is discussed in the spring. Slide lectures, readings, short papers, and examinations.

Nonsequence Courses

244 History of Preindustrial Building Spring, 4 credits. Lecture.

Hours to be arranged. W. W. Cummer.
The development of traditional architectural elements and forms; materials, methods, and design expression. Lectures, readings, and papers or exercises.

[340 Architecture of the Ancient Near East Spring, 3 credits. Lecture. Prerequisite: Arch 141 or permission of instructor. Not offered 1978–79.

W. W. Cummer.
Architecture of the oldest historic civilizations associated with Western tradition, with emphasis on Egypt, Mesopotamia, and Anatolia.]

341 Architecture of the Classical World Fall, 3 credits. Prerequisite: Arch 141 or permission of instructor.

Hours to be arranged. W. W. Cummer.
Architecture of the ancient Mediterranean civilizations, with emphasis on Greece and Rome.

343 Introduction to the History of Urban Planning (also CRP 400) Fall, 3 credits.

J. W. Reys, W. W. Cummer, S. W. Jacobs.
Survey of urban planning in Western civilization from the Greeks and Romans, through medieval, Renaissance, and modern Europe, to colonial and nineteenth-century America. Lecture, discussion sessions, readings, and term paper.

[344 Islamic Architecture 3 credits. Lecture. Prerequisite: permission of the instructor. Not offered 1978–79.]

[346 The Renaissance Fall, 3 credits. Lecture. Prerequisites: Arch 141–142 and permission of instructor. Not offered 1978–79.

T Th 9:05–11. C. F. Otto.
European architecture and city planning of the fifteenth and sixteenth centuries.]

347 The Baroque Fall, 3 credits. Lecture. Prerequisites: Arch 141–142 and permission of instructor.

T Th 9:05–11. C. F. Otto.
European architecture and city planning of the seventeenth and eighteenth centuries.

348 American Architecture Fall or spring, 3 credits. Lecture. Prerequisite: Arch 141 and 142 or permission of instructor.

M W 10:10–12:05. S. Jacobs.
Building in the United States from colonial time to 1860, in the fall; after 1860, in the spring.

[349 Modern European Architecture Fall, 3 credits. Prerequisite: permission of instructor. Not offered 1978–79.

T Th 9:05–11. C. F. Otto.
A survey of nineteenth- and twentieth-century architecture and city planning in Europe.]

442 Historical Seminars in Architecture Fall or spring, 2 credits. Prerequisite: permission of instructor.

Hours to be arranged. Staff.
Using historical evidence as a basis, students will prepare papers discussing problems relating to design or architecture.

445 Special Investigations in the History of Architecture Fall or spring. Variable credit. Independent study. Prerequisite: permission of instructor.

Hours to be arranged. Staff.

447 History Workshop Fall or spring. Variable credit. Seminar.
Hours to be arranged. Staff.

448 Historical Lectures in Architecture Fall or spring. Variable credit. Lecture. Prerequisite: permission of instructor.
Hours to be arranged. Staff.
A series of one or two lectures per week on topics related to architectural history.

540 Architectural Problems in Archaeological Fieldwork Spring. 3 credits. Seminar.
Hours to be arranged. W. W. Cummer.
A review and critique of students' participation in the excavation of ancient cities or historic sites during the previous summer. For students in architecture and archaeology.

541 Surveying for Archaeologists Fall. 3 credits. Not offered 1978-79.
Hours to be arranged. W. W. Cummer and staff.
The excavation architect on an archaeological team. Methods of site survey, recording ancient buildings, and preparation of working, analytic, and restored drawings. For students in architecture or archaeology who anticipate joining a summer excavation.]

542 Methods of Archival Research (also CRP 404) Spring. 3 credits. Lecture
Th 10:10-12:05. K. C. Parsons.
Examination of methods by using archival materials for research in the history of architecture and urban development, using manuscripts, drawings, correspondence, and documents in the Cornell University archives and regional history collections.

544 Case Studies in Preservation Planning Spring. 2 credits. Seminar.
M 2:30-4:25. S. W. Jacobs, staff, visiting lecturers.
A review and critique of preservation planning projects selected to indicate the range of current approaches.

545 Design and Conservation (also CRP 844) Fall. 2 credits. Seminar.
Th 2:30-4:25. S. W. Jacobs, B. Jones.
Introductory course for preservation planning. The rationale for and methods of using existing cultural and aesthetic resources in the planning and design of regions and cities.

546 Documentation for Preservation Planning (also CRP 845) Spring. 2 credits. Seminar.
Hours to be arranged. S. W. Jacobs, staff, visiting lecturers.
Methods of collecting, recording, processing, and analyzing historical architectural and planning materials.

547 Preservation Planning Workshop Fall or spring. 2 credits. Seminar.
Hours to be arranged. S. W. Jacobs and visiting lecturers.
Seminar with visiting professionals, readings, and reports.

548 Problems in Modern Architecture Spring. 2 credits. Lecture. Prerequisite: permission of instructor.
Hours to be arranged. Staff.

640 Seminar in Architecture of the Ancient Near East Fall. 4 credits. Prerequisite: Arch 340 or permission of instructor. Not offered 1978-79.
W. W. Cummer.
Problems in Near Eastern architectural history.]

641 Seminar in Architecture of the Classical World Spring. 4 credits. Prerequisite: Arch 341 or permission of instructor.
Hours to be arranged. W. W. Cummer.
Problems in Greek and Roman architectural history,

645 Building Material Conservation Spring. 3 credits. Lecture. Open to upperclass and graduate students.
T 11:15-1:10. Staff.

A survey of the development of building materials in the United States, chiefly during the nineteenth and early twentieth centuries, and a review of the measures, which might be taken to conserve them.

646 Seminar in the Renaissance Spring. 4 credits. Seminar. Prerequisite: Arch 346 or permission of instructor.
Hours to be arranged. C. F. Otto.
Historical problems of European architecture and city planning of the fifteenth and sixteenth centuries.

647 Seminar in the Baroque Spring. 4 credits. Seminar. Prerequisite: Arch 349 or permission of instructor.
Hours to be arranged. C. F. Otto.
Historical problems in European architecture and city planning of the seventeenth and eighteenth centuries.

648 Seminar in the History of American Architecture Spring. 4 credits. Seminar. Prerequisite: permission of instructor.
Hours to be arranged. S. W. Jacobs.
Investigation by means of readings, lectures, and reports of historical problems in architecture of the nineteenth and twentieth centuries in the United States.

649 Seminar in the History of Modern Architecture Fall. 4 credits. Seminar. Prerequisite: permission of instructor.
Hours to be arranged. Staff.
Problems in modern art and architecture.

Graduate Courses

740 Informal Study in the History of Architecture Fall or spring. Variable credit. Independent study. Prerequisite: permission of instructor.
Hours to be arranged. Staff.

741 Introductory Seminar in the History of Architecture and Urban Development Fall. 2 credits. Seminar. Not offered 1978-79.
M 2:30-4:25. S. W. Jacobs, C. F. Otto, staff.
Motives, methods, and resources for scholarly work in history of architecture and history of urban development. Discussions, readings, and reports. Required for graduate students entering the field, and undergraduates in BFA history of architecture program.]

840 Thesis in Architectural History Fall or spring. Variable credit.
Hours to be arranged. Staff.
Independent study for the master's degree.

940 Dissertation in Architectural History Fall or spring. Variable credit.
Hours to be arranged. Staff.
Independent research by candidates for the Ph.D. degree.

Design Communications

Sequence Courses

151 Design Fundamentals I Fall. 2 credits. Studio and lecture.
T Th 3:35-5:30. Staff.
Fundamentals of visual and conceptual organization. Dynamics of perception; spatial organization and its representation. Demonstrative problems of an analytic and conceptual nature.

152 Design Fundamentals II Spring. 2 credits. Studio and lecture.
T Th 3:35-5:30. Staff.

Theory of visual and conceptual organization, spatial perception, spatial organization and its representation; demonstrative problems of an analytic and conceptual nature.

[251 Advanced Visual Communications Fall or spring. 3 credits. Lecture. Not offered 1978-79.
Staff.
Introduction to photographic tools and methods and their application to architectural presentation and design simulation.]

Nonsequence courses

250 Beginning Photography (also Art 161) Fall or spring. 3 credits. Lecture/studio.
T Th 3:25-6:30. S. Bowman and staff.
A lecture-studio course in black and white photography for beginners. Emphasis on basic camera skill, darkroom techniques, and understanding of photographic imagery. Students must provide their own camera. Darkroom fee: \$20.

350 Intermediate Photography (also Art 262) Spring. 3 credits. Studio. Prerequisite: Arch 250 or permission of instructor.
Hours to be arranged. Staff.
A studio course in black and white photography at the intermediate level. Emphasis on expanding camera and darkroom skills, image, content, and creative use of black and white photography. Students must provide their own camera. Darkroom fee: \$20.

[351 Photo Tools for Architects Fall or spring. 3 credits. Lecture/studio. Prerequisite: Arch 152 or 250 or permission of instructor. Not offered 1978-79.
A lecture-studio in the use of photography in architecture. Emphasis on architectural photography, photography as a graphic tool, photographic techniques in design, and photographic methods in presentation. Students must provide their own camera. Darkroom fee: \$20.]

352 Color Photography (also Art 261) Fall. 3 credits. Studio. Prerequisite: Arch 250 or permission of instructor.
T Th 9:05-12:05. S. Bowman.
A studio course in color photography. Emphasis on camera skill, basic color darkroom techniques, image content, and creative use of color photography. Students must provide their own camera. Darkroom fee: \$20.

[353 Photo Processes (also Art 263) Fall or spring. 3 credits. Studio. Prerequisite: Arch 250 or permission of instructor. Not offered 1978-79.
A studio course in early photo and nonsilver processes. Emphasis on camera skill, basic techniques and processes, image content, and creative use of photo processes. Students must provide their own camera. Darkroom fee: \$20.]

[354 Fundamentals of Motion Film Fall. 3 credits. Lecture/studio. Prerequisite: Arch 250 or permission of instructor. Not offered 1978-79.
A lecture-studio course in basic principles of motion film in 16mm format, black and white and color, including use of camera and basic editing techniques. Darkroom fee: \$20.]

[355 Graphic Design Studio Fall or spring. 3 credits. Lecture/studio. Prerequisite: Arch 152 or permission of instructor. Not offered 1978-79.
An introduction lecture-studio course in design and preparation of materials for reproduction in print media. Studio in typography, available printing processes, and photomechanical methods of reproduction.]

356 Architectural Simulation Techniques Spring. 3 credits. Lecture/studio. Prerequisite: Arch 152 or permission of instructor.
Hours to be arranged. G. Hascup.

A lecture-studio course in two- and three-dimensional simulation techniques in architecture. Emphasis on simulation of environment, space, materials, and lighting as visual tools for architectural design.

[357 Large Format Architectural Photography] Spring. 3 credits. Lecture/studio. Prerequisites: Arch 250 and one 300-level photography course or permission of instructor. Not offered 1978-79. A lecture-studio course dealing with the special uses of large format view camera photography. Emphasis on the creative use of the view camera in architectural photography. Darkroom fee: \$20.]

[450 Advanced Photography (also Art 261)] Fall. 3 credits. Studio. Prerequisite: Arch 350 or permission of instructor. Not offered 1978-79. T Th 9:05-12:05. S. Bowman.

A studio course in black and white photography. Emphasis on advanced camera and darkroom skills, image content, and creative use of black and white photography. Darkroom fee: \$20.]

[451 Advanced Graphic Design] Spring. 3 credits. Lecture/studio. Prerequisite: Arch 355 or permission of instructor. Not offered 1978-79. An advanced lecture-studio course in design and preparation of materials for reproduction in print media. Emphasis on specialized projects dealing with graphic processes. Darkroom fee: \$20.]

[452 Media Environments Studio] Spring. 3 credits. Studio. Prerequisite: Arch 250 or permission of instructor. Not offered 1978-79. W 6-10 p.m. Staff.

A studio course dealing with programmed multiple projection presentations as communication systems, including the use of multiscreen slides, motion film, and sound in the creation of media environment. Darkroom fee: \$20.]

[457 Special Project in Photography] Fall or spring. Variable credit. Independent study. Prerequisite: permission of instructor in design communications. Hours to be arranged. S. Bowman. An independent study course for exploration of a special project. Written proposal required. Darkroom fee: \$20.

[458 Special Project in Design Communication] Fall or spring. Variable credit. Independent study. Prerequisite: permission of instructor in design communications. Not offered 1978-79. Hours to be arranged. Staff. An independent study course for exploration of a special project. Written proposal required.]

[459 Thesis Project in Design Communication] Fall or spring. 6 credits. Independent study. Prerequisite: design communications majors only. Not offered 1978-79. Hours to be arranged. Staff. A special study in design communication leading to a thesis project. Written proposal required.]

Architectural Science and Technology

Sequence Courses

162 Introduction to Social Sciences in Design Spring. 2 credits. Lecture. M W F 9:05-9:55. R. D. MacDougall. An introduction to concepts and methods in the social sciences for architects; how approaches from anthropology, environmental psychology, and sociology can be used in the study and design of the built environment.

261 Introduction to Environmental Science Fall. 2 credits. Lecture. M W 9:05-9:55. P. J. Trowbridge, staff, visiting lecturer.

An introduction to the basic principles involved in inventory and analysis techniques as they relate to design implementation in the outdoor environment. Case studies depicting application of these principles at all scales of land planning and design will be presented.

262 Building Technology, Materials, and Methods Spring. 3 credits. Lecture. Prerequisites: Arch 162 and 261.

M W F 10:10-11:00. R. Crump. Properties of materials—their use and application to the design of buildings and building systems. Discussion of various methods of building construction and assembly.

361 Environmental Controls I Fall or spring. 3 credits each term. Lecture. Prerequisite: Arch 262. W F 11:15-12:05. R. Crump.

Basic properties and principles of sound and light. Sound phenomena, noise control, absorption, acoustical design. Light, color, and form. Natural lighting possibilities and constraints. Artificial lighting with good and bad examples.

362 Environmental Controls II Fall or spring. 2 credits each term. Lecture. Prerequisite: Arch 361. M W F 10:10-11:00. R. Crump.

Basic properties and principles of air movement and temperature. Criteria for health, comfort, and efficiency. Water use and return as an ecological factor.

Nonsequence Courses

371 Environmental Technology Workshop I Fall. 2 credits. Studio. Must be preceded or accompanied by Arch 361.

Hours to be arranged. R. Crump. The tasks of the acoustical consultant, the electrical engineer, and the illumination consultant in relation to the architect's work. Acoustical and lighting design studies using full-scale mock-ups and specific building type studies. Cost factors.

372 Environmental Technology Workshop II Spring. 2 credits. Studio. Prerequisite (or concurrent registration): Arch 362.

Hours to be arranged. R. Crump. The mechanical engineer's task and its relation to the architectural design process. Mechanical equipment and plumbing design studies of specific building types. Full-scale and model studies of the role of air movement and temperature in building design. Cost factors.

561-562 Special Problems in Architectural Science 561, fall; 562, spring. Variable credit. Independent study. Prerequisite: permission of science staff instructor.

Hours to be arranged. Staff.

662 Environmental Control Systems Spring. 3 credits. Lecture/seminar. Prerequisite: Arch 362. Hours to be arranged. R. Crump.

A study of the influences of environment on the design of buildings and urban developments. Lectures and problems involving the relation and integration of environmental phenomena and psychophysical factors in the design of control systems.

[666 Human Factors in Architecture] Spring. 3 credits. Lecture. Open to upperclass and graduate students and to students in related design fields by permission of instructor. Not offered 1978-79. A. Kira.

Introduction to "Ergonomics" as it relates to problems of architectural design and detailing. Normal and special population groups, applications of anthropometric data, activity space requirements, controls, and hardware. Emphasis on architectural applications from the viewpoint of user requirements.]

667-668 Architecture in its Cultural Context I and II 667, fall; 668, spring. 4 credits each term. Seminar. Prerequisite: permission of instructor.

T 1:25-3:20. R. D. MacDougall. Fall term, theory; spring term, method and problem solving. An examination of the relationship between architecture and other aspects of culture. Emphasis on the motivations for particular architectural forms, and especially on theories of architecture. Examples from the United States and Asia.

Graduate Courses

761-762 Architectural Science Laboratory 761, fall; 762, spring. Variable credit. Open to graduate students only.

Hours to be arranged. Staff. Projects, exercises, and research in the architectural sciences.

763-764 Thesis or Research in Architectural Science 763, fall; 764, spring. Variable credit.

Hours to be arranged. Independent study. Open to graduate students only.

The Profession of Architecture

Sequence Course

481-482 Professional Practice 481, fall; 482, spring. 2 credits each term. Lecture.

Th 1:25-3:20. Staff. An examination of organizational and management theories and practices for delivering professional design services. Included are an assessment of the building industry and its influence on practice; an analysis of the basic management functions within professional firms; and the legal concerns facing practitioners today. Lectures and seminar/workshop sessions with selected guest participants will use case studies as a major instructional vehicle.

Architectural Drawing

191 Analytical Drawing I Fall. 2 credits. Studio. T Th 9:05-11.

Freehand drawing with emphasis on line and perspective representation of form and space.

192 Analytical Drawing II Spring. 2 credits. Studio. Prerequisite: Arch 191. T Th 9:05-11. Staff.

Freehand drawing as a means of conceiving and expressing spatial form; line weight, shades and shadows, and figure drawing.

Art

Most courses in the Department of Art are open to students in any college of the University who have fulfilled the prerequisites and who have the consent of the instructor.

Fees are charged for all Department of Art courses. For freshman and sophomore fine arts majors, the fee is \$10 each semester. Students from outside the department are charged \$5 a course.

Courses in Theory and Criticism

110 Color, Form, and Space Fall or spring. 3 credits. M W 10:10-11. N. Daly.

A study of traditional and contemporary ways of drawing and painting. An analysis of color theory and pictorial space.

111 Introductory Art Seminar Fall. 1 credit. Freshman B.F.A. candidates only. Students will meet for one hour each week with a

different member of the faculty. The varying artistic interests of the staff will be presented and discussed.

610 Seminar in Art Criticism Fall or spring. 2 credits. May be repeated for credit. Four terms required of Master of Fine Arts candidates. Open to other graduate students.

W 4-6 p.m. J. Seley, H. Steinbach.
A study of critical opinions, historical and modern, and their relation to problems in the theory of art.

Studio Courses in Painting

121-122 Introductory Painting 121, fall; 122, spring. 3 credits each term.
Sec 1, M W F 1:25-4:25; Sec 2 and 3, T Th 1:25-4:25.

An introduction to the problems of artistic expression through the study of pictorial composition; proportion, space, shapes, and color as applied to abstract and representational design.

221-222 Second-Year Painting 221, fall; 222, spring. 3 credits each term. Prerequisite: Art 121 or 122 or permission of instructor.

T Th 1:25-4:25. B. Cooke.
Study of traditional and contemporary media.

321 Third-Year Painting Fall. 4 credits. Prerequisite: nine to twelve studio hours, depending on major.

T Th 10:10-1. H. Steinbach.
Continued study of the principles of painting and the selection and expressive use of materials and media. Group discussions and individual criticism.

322 Third-Year Painting Spring. 4 credits. Prerequisite: Art 321.
Staff.

Continued study of the principles of painting and the selection and expressive use of materials and media. Group discussions and individual criticism.

421 Fourth-Year Painting Fall. 4 credits. Prerequisite: Art 322.

T Th 10:10-1. H. Steinbach.
Further study of the art of painting through both assigned and independent projects, executed in various media. Instruction through group discussions and individual criticism.

422 Senior Thesis in Painting Spring. 4 credits. Prerequisite: Art 421.
Staff.

Advanced painting project to demonstrate creative ability and technical proficiency.

721-722, 821-822 Graduate Painting 721 and 821, fall; 722 and 822, spring. Credit as assigned. May be repeated for credit. For Master of Fine Arts students in painting.

Staff.
Students are responsible, under direction, for planning their own projects and selecting the media in which they are to work. All members of the staff are available for individual consultation.

Studio Courses in Graphic Arts

131 Introduction to the Graphic Arts Fall or spring. 3 credits.

Fall, M W F 9:05-11. P. Thompson.
Students will explore the techniques of making impressions from the raised surface of the relief print, the lowered surface of the intaglio print, and the flat (planographic) surface of the lithograph.

132 Introductory Silk-Screen Printing Fall or spring. 3 credits.

Fall, T Th 9:05-12. S. Poleskie.
A basic introduction to the various methods used in fine art silk-screen printing. Students will explore the use of lacquer film, paper stencil, tusche and glue, and other commonly used procedures of serigraphy.

230 Advanced Intaglio Printing Fall or spring. 3 credits. Prerequisite: Art 131, 132, or permission of instructor.

Fall, M W F 1:25-3:20. P. Thompson.
Continuation of the study and practice of methods of printing from below the surface with emphasis on engraving, lift ground, experimental techniques, and color.

232 Plate Lithography Spring. 3 credits. Prerequisite: Art 131, 132, or permission of instructor.

A. Singer.
The special problems relating to the use of the aluminum lithographic plate will be studied. Particular importance will be placed upon the role of the plate in color printing.

233 Stone Lithography Fall. 3 credits. Prerequisite: Art 131, 132, or permission of instructor.

T Th 9:05-12. A. Singer.
The theory and practice of planography, utilizing limestone block. The basic lithographic techniques of crayon, wash, and transfer will be studied.

330 Advanced Silk-Screen Printing Fall or spring. 3 credits. Prerequisite: Art 132.

Fall, T Th 1:25-4:25. S. Poleskie and staff.
Continuation of Art 132 including photographic stencils, three-dimensional printing, and printing on metal, plastic, and textiles.

331 Advanced Printmaking Fall. 4 credits. Prerequisite: six hours of graphic art courses.

M W F 1:25-3:20. P. Thompson.
Study of the art of graphics through both assigned and independent projects. Work may be concentrated in any one of the graphic media or in a combination of media.

332 Advanced Printmaking Spring. 4 credits. Prerequisite: six hours of graphic art courses.

P. Thompson.
Continuation and expansion of Art 331.

431 Senior Printmaking Fall. 4 credits. Prerequisite: four courses in printmaking.

By arrangement. Staff.
Further study of the art of graphics through both assigned and independent projects executed in various media. Instruction through group discussions and individual criticism.

432 Senior Thesis in Printmaking Spring. 4 credits. Prerequisite: four courses in printmaking.

By arrangement. Staff.
Advanced printmaking project to demonstrate creative ability and technical proficiency.

731-732, 831-832 Graduate Printmaking 731 and 831, fall; 732 and 832, spring. Credit as assigned.

May be repeated for credit. For Master of Fine Arts candidates in graphic arts. Prerequisite: permission of instructor.

Staff.
Students are responsible, under direction, for planning their own projects and selecting the media in which they will work. Members of the staff are available for consultation; discussion sessions of work in progress are held.

Studio Courses in Sculpture

141-142 Introductory Sculpture 141, fall; 142, spring. 3 credits each term.

141: Sec 1, M W F 10:10-12:05. 142: Sec 2, T Th 9:05-12:05. 142: Staff.

A series of studio problems introducing the student to the basic considerations of artistic expression through three-dimensional design. Modeling in plasteline, building directly in plaster, and casting in plaster.

241-242 Second-Year Sculpture 241, fall; 242, spring. 3 credits each term. Prerequisites: nonmajors, none; majors, Art 141-142.

M W F Sec 1, 1:25-3:20; Sec 2, T Th 1:25-4:25. Staff.
Various materials including clay, plaster, wood, and stone will be used for exercises involving figurative modeling, abstract carving, and other aspects of three-dimensional form and design.

341 Third-Year Sculpture Fall. 4 credits. Prerequisite: Art 242.

Sec 1, M W F 1:25-3:20; Sec 2, T Th 1:25-4:25. Staff.
Continued study of the principles of sculpture and the selection and expressive use of materials and media. Group discussions and individual criticism.

342 Third-Year Sculpture Spring. 4 credits. Prerequisite: Art 341.

Staff.
Continuation and expansion of Art 341.

441 Fourth-Year Sculpture Fall. 4 credits. Prerequisite: Art 342.

Sec 1, M W F 1:25-3:20; Sec 2, T Th 1:25-4:25. Staff.

Further study of the art of sculpture through both assigned and independent projects executed in various media. Instruction through group discussions and individual criticism.

442 Senior Thesis in Sculpture Spring. 4 credits. Prerequisite: Art 441.

Staff.
Advanced sculpture project to demonstrate creative ability and technical proficiency.

741-742, 841-842 Graduate Sculpture 741 and 841, fall; 742 and 842, spring. Credit as assigned.

May be repeated for credit. For Master of Fine Arts students in sculpture.

Staff.
Students are responsible, under direction, for planning their own projects and selecting the media in which they are to work. All members of the staff are available for individual consultation. Weekly discussion sessions of works in progress are held.

Studio Courses in Photography

161-162 Introductory Photography 161, fall; 162, spring. 3 credits each term.

Fall: T Th 3:25-6:30. S. Bowman and staff.
A basic lecture-studio course in black and white photography for beginners. Emphasis is on basic camera skills, darkroom techniques, and understanding of photographic imagery. Darkroom fee: \$20.

261 Second-Year Photography Fall. 3 credits. Prerequisite: Art 161 or 162 or permission of instructor.

T Th 9:05-12:05. S. Bowman.
A studio course in color photographic processes, including color toning and hand coloring of black and white prints, and color printing. Emphasis is on camera skill, color techniques, image content, and creative use of color photography. Darkroom fee: \$20.

262 Second-Year Photography Spring. 3 credits. Prerequisite: Art 161 or 162 or permission of instructor.

Staff.
A studio course in black and white or color photography. Emphasis is on advanced camera and darkroom skills, image content, and creative use of black and white photography. Darkroom fee: \$20.

[263 Photo Processes 3 credits. Not offered 1978-79.]

361-362 Third-Year Photography 361, fall; 362, spring. 4 credits each term. Prerequisite: Art 261 and 262 or permission of instructor.

Fall: T Th 2:30-5:25. S. Bowman.

A studio course for photography majors and other qualified students. Continued study of creative use of photography with emphasis upon specialized individual projects.

461-462 Fourth-Year Photography 461, fall; 462, spring. 4 credits each term. Prerequisite: Art 361 and 362 or permission of instructor. Offered only for students who entered in the fall of 1977.

Fall: T Th 2:30-5:25. S. Bowman.

A studio course for photography majors and other qualified students. Continued study of creative use of photography leading to thesis exhibition.

Studio Courses in Drawing

151-152 First-Year Drawing 151, fall; 152, spring. 3 credits each term.

Fall: Sec 1, M W F 9:05-11; Sec 2, T Th 9:05-11, plus 2 hours to be arranged; Sec 3, T Th 9-12:05.

A basic drawing course in the study of form and techniques. Contemporary and historical examples of figure drawing are analyzed in discussion.

251-252 Second-Year Drawing 251, fall; 252, spring. 3 credits each term. Prerequisite: Art 151, 152, or permission of instructor.

Fall: Sec 1, T Th 1:25-4:25; Sec 2, T Th 8-9:55, plus 2 hours to be arranged. Staff.

A continuation of the basic studies undertaken in Art 151, but with a closer analysis of the structure of the figure and a wider exploitation of its purely pictorial qualities.

[351 Third-Year Drawing Fall. 3 credits. Prerequisites: Art 151, 152, 251, 252. Staff. Not offered 1978-79.]

Graduate Thesis

712 Graduate Thesis Spring. Credit as assigned. Staff.

For graduate students in their last term in the programs in painting, sculpture, and graphics.

Special Studio Courses

270 Special Studio Fall or spring. Credit as assigned. May be repeated for credit. Permission of instructor required. Staff.

For transfer students and others whose standing in the professional sequence is to be determined. May be in painting, sculpture, graphics or photography.

370 Studio Concentration Fall or spring. Credit as assigned. May be repeated for credit. Permission of instructor is required. Staff.

For B.F.A. degree candidates who wish a greater concentration in drawing, painting, sculpture, graphics, or photography in the upperclass years.

470 Studio Concentration Fall or spring. Credit as assigned. May be repeated for credit. Permission of instructor required.

For B.F.A. degree candidates who wish a greater concentration in drawing, painting, sculpture, graphics, or photography in the upperclass years.

City and Regional Planning

Note: Most courses in the Department of City and Regional Planning are open to students in any college of the University who have fulfilled the prerequisites and have the consent of the instructor.

Objectives and Degrees

Planning seeks to guide the development of the social, natural, and built environments in order that people's needs and aspirations may be better satisfied. Work in the department focuses around a wide variety of issues that are usually subsumed under the titles of urban development planning, regional development planning, and social policy planning and includes study in a number of subject areas as described in the courses listed below.

Urban planning is concerned primarily with the urban environment, the social and economic forces that affect this environment, and the processes of plan making and administration. Regional planning and analysis is concerned primarily with socioeconomic issues and functional planning at the regional level, the forces that generate economic growth, and the ways in which resources can best be used in regional development. Social policy planning is concerned with the social decision processes involved in both city and regional planning. The department as a whole is broadly concerned with social decision-making processes: the formation of public policies, the design and evaluation of programs and projects, the development of institutions, and the creation of legislative and administrative implementation devices. These concerns reflect a general view of planning that can be applied to a variety of activities, ranging from the more traditional aspects of planning to new developments along more specialized functions. This view of planning entails the use of theoretical and analytical tools developed for the study of social, economic, and physical systems and the relationships among them. Within this broad framework, students have considerable flexibility in pursuing their own areas of interest. It is possible to develop programs of study that may vary across a wide spectrum, from those that have a very general approach to planning to those with a more specialized focus.

The programs of study in city and regional planning, which are primarily at the graduate level, have two major objectives: (1) professional education for participation in planning the economic, physical, and social development of urban areas and regions; and (2) more advanced specialized education for those who seek careers in teaching and research, as well as in policymaking positions. The degrees offered are Master of Regional Planning, Doctor of Philosophy, and Master of Professional Studies (International Development).

Curriculum and Requirements

The curriculum has been designed to provide students with the opportunity to gain knowledge across a range of disciplines while at the same time permitting them to concentrate and study in-depth in one or more areas of activity within the field. A limited number of foundation courses are required early in the program, designed to present a comprehensive view of the field and provide some basic knowledge and skills in one or more areas within the field while continuing to broaden their education related to planning through the selection of courses drawn from relevant disciplines.

Course Numbers

There are two components to city and regional planning course numbers: (a) Courses numbered from 500-599 and 600-699 are generally considered to be introductory and/or first-year courses; those numbered from 700-799 and 800-899 are generally considered to be more advanced courses. Upperclass undergraduate courses are numbered from 400-499. (Undergraduates with the necessary prerequisites and permission of the instructor may enroll in courses numbered 500 and above.) (b) Courses are grouped (by the tens digit of the course number) to represent the underlying

structure of the planning curriculum as follows: theory and quantitative methods (0, 1, 2), program areas (3, 4, 5), and interprogram topics (6, 7, 8, 9).

The department attempts to offer courses according to the following schedule. However, because of changing circumstances over which we have no control, students should check with the department course schedule at the beginning of each semester for the latest changes.

Urban and Regional Theory

400 Introduction to Urban and Regional Theory Spring. 4 credits.

T Th 9:05-9:55. N. Gilgosh, W. W. Goldsmith. A first-year graduate course, open to juniors and seniors. This course reviews attempts by the various social sciences to understand the contemporary city and its problems, particularly as seen by planners. The course will be eclectic, drawing material from urban and regional economics, human ecology, urban sociology, and small bits from psychology, anthropology, and geography in order to explain the location, size, form, and functioning of cities. Readings and seminar will examine in depth traditional and contemporary critical theory as it applies to physical, social, and economic problems of the modern city.

500 Urban and Regional Theory Spring. 4 credits.

T Th 9:05-9:55. N. Gilgosh, W. W. Goldsmith. This course reviews attempts by the various social sciences to understand the contemporary city and its problems, particularly as seen by planners. The course will be eclectic, drawing material from urban and regional economics, human ecology, urban sociology, and small bits from psychology, anthropology, and geography in order to explain the location, size, form, and functioning of cities. Readings and seminars will examine in depth traditional and contemporary critical theory as it applies to physical, social, and economic problems of the modern city.

600 Urban Economic Analysis Fall. 3 credits. Prerequisite: 500 or equivalent.

W 7:30-9:30 p.m. S. Czamanski. Examination of the city as an economic entity with spatial characteristics. Urban phenomena are analyzed from an economic point of view, using economic analysis tools. Areas to be examined include patterns and determinants of urbanization, urban structure and location of activities, urban land and housing markets, the role of urban transportation, and urban public policy.

708 Fieldwork/Workshop in Urban and Regional Theory Fall or spring. Credit as assigned. Staff.

Work on problems in urban and regional theory in a field and/or laboratory setting.

709 Special Topics in Urban and Regional Theory Fall or spring. Credit as assigned. Staff.

800 Advanced Seminar in Urban and Regional Theory I Fall. 3 credits. Prerequisite: 500.

M 3:35-5:30. B. G. Jones. Seminar in the theory of urban spatial organization. Economic, technological, and social factors leading to urbanization and various kinds of spatial organizations will be explored. Major theoretical contributions to the understanding of intraregional and intraurban distribution of population and economic activity will be reviewed.

801 Advanced Seminar in Urban and Regional Theory II Spring. 3 credits. Prerequisite: 800.

M 3:35-5:30. B. G. Jones. A continuation of CRP 800, concentrating on recent developments.

809 Informal Study in Urban and Regional Theory Fall or spring. Credit as assigned. Staff.

Planning Theory and Politics

510 Introduction to Planning Theory Spring. 3 credits.

T 1:25-3:20. P. Clavel.
Normative and behavioral models of decision making for the provision of public goods and services. Theories of individual decision and choice are reviewed, followed by applications in institutional contexts stressing the impact of alternative organizational and political models on social decision processes.

511 Introduction to Planning Fall. 4 credits.
M W F 10:10-11:00. P. Clavel, J. Reys.

A lecture/seminar course on the origins, history, programs, and contemporary issues of city and regional planning in the United States. Conceptions of the state, the role of planners in public action, and the dominant methods and values of planners will be discussed and criticized.

612 Urban Politics and Planning Spring. 3 credits.

I. R. Stewart.
A consideration of the political dimension of planning and renewal activities. Emphasis on government mandate and structure, as well as interest group and power relationships as they are related to development decision-making processes. Theory and case-study analyses.

710 Politics of the Planning Process Spring. 4 credits.
P. Clavel.

Analysis of planning and political institutions in selected subjects and policy areas, relating national and subnational levels. Subjects will be drawn from such areas as environmental control and use policy, industrial development, transportation, and community development. Theories of planning and politics are compared for their analytical usefulness in these areas.

711 Planning and Organizational Theory Fall. 4 credits.
T 1:25-3:20. P. Clavel.

A seminar examining organizational and administrative models relevant to plan formation and implementation. Applications are made to such programs as community development, regional administration, urban renewal, and land-use control.

718 Fieldwork/Workshop in Planning Theory and Politics Fall or spring. Credit as assigned. Staff.

Work on problems in planning theory and politics in a field and/or laboratory setting.

719 Special Topics in Planning Theory and Politics Fall or spring. Credit as assigned. Staff.

810 Advanced Planning Theory Fall. 3 credits. Prerequisite: 500 or 710.
F, 3:35-5:30. B. G. Jones.

A survey of the works of scholars who have contributed to current thinking about planning theory. The course deals with alternative assumptions concerning models of man and theoretical concepts concerning the nature of planning today.

819 Informal Study in Planning Theory and Politics Fall or spring. Credit as assigned. Staff.

Quantitative Methods and Systems Analysis

520 Mathematical Concepts for Planning Fall. 1, 2, 3, or 4 credits. Prerequisite: permission of instructor.

M W 2:30-4:25. Staff.
An introductory course for students having little or no background in college mathematics. Basic concepts in matrix algebra, calculus, and probability will be covered in self-contained units of one credit each. Students may register for any or all of these topics. Mathematics 201, Mathematics for the Social Sciences, and Sociology 420, Mathematics for Sociologists, are acceptable substitutes.

521 Introduction to Computers in Planning Fall. 3 credits.

T Th 11:15-12:05; lab Th 3:45-4:25. P. Brandford.
An introduction to the use of computers in the problem-solving and planning processes. Students will run programs on the Cornell computer using PL/1 or another appropriate programming language. Brief introduction to computer systems and the use of library routines. Advantages and limitations of using computers will be considered.

620 Planning Analysis Spring. 4 credits. Prerequisite: 621.

M W F 10:10-11:00; lab T 2:30-4:25. B. G. Jones.
A survey of commonly used techniques for analyzing various aspects of subnational socioeconomic systems emphasizing planning applications.

621 Statistical Analysis for Planning Spring. 3 credits. Prerequisites: 520 or equivalent and permission of instructor.

T Th 9:05-9:55; lab T 4:30-5:30. Staff.
An introduction to basic methods of statistical analysis with an emphasis on their use in the decision-making process in planning. Material in decision theory, sampling, estimation, hypothesis testing, and prediction will be introduced.

622 Planning Information Systems Fall. 3 credits. Prerequisite: 521 or equivalent.

T Th 3:35-4:25; lab to be announced. S. Saltzman.
Considers the design and use of computer-based information systems for planning and policy analysis, including conventional data processing and advanced data base systems. Technical aspects in the design and structure of such information systems are introduced along with a variety of applications.

623 Methods of Social Policy Planning Fall. 3 credits. Prerequisite: planning analysis and statistics or equivalent.

N. Gilgosh.
A seminar which examines methodologies suitable for social planning problems. Many of the methodologies, survey research, population projections, measures of spatial concentration, segregation indices, social area analysis, and social indicators have been drawn from other social science disciplines but will be applied to policy and planning issues. Multivariate statistical techniques will allow students an opportunity to apply the methodologies to a topic of their own interest.

720 Quantitative Techniques for Policy Analysis and Program Management Fall. 4 credits.

M W 9:05-9:55; lab M 1:25-3:20. D. Lewis.
An examination of selected analytical techniques used in the planning and evaluation of public policy and public investments. Topics covered include simulation modeling, benefit-cost and cost effectiveness analysis (including capital budgeting), and optimization strategies.

721 Simulation in Planning and Policy Analysis Fall or spring. 3 credits. Prerequisites: 621 and 521 or equivalent.
S. Saltzman.

The design and use of simulation models in planning and policy analysis. Various approaches drawn from discrete stochastic simulation, econometric simulation, microanalytic simulation, and urban dynamics will be evaluated. Applications in design, land use, regional development, and social policy will be considered. Students will run their own programs on the Cornell computer.

722 Decision Analysis for Policy Planning and Program Management Spring. 4 credits.

M W F 9:05-9:55; lab W 12:20-2:15. D. Lewis, S. Saltzman.
An examination of selected techniques for analyzing complex dynamic decision problems in the planning context. Topics covered include dynamic programming (deterministic and probabilistic), integer programming, and process simulation (queueing models).

728 Fieldwork/Workshop in Systems Planning and Analysis Fall or spring. Credit as assigned. Staff.

Work on applied systems planning problems in a field and/or laboratory setting.

729 Special Topics in Quantitative Methods and Analysis Fall or spring. Credit as assigned. Staff.

820 Seminar in Methods for Planning and Policy Analysis Fall or spring. 3 credits. Prerequisite: permission of instructor. Staff.

A review and critical analysis of various analytical and computer methods of actual and potential use in planning and in the analysis of public policy. The material covered will vary each semester, depending upon the interests of the members of the seminar.

829 Informal Studies in Quantitative Methods and Analysis Fall or spring. Credit as assigned. Staff.

Regional Development Planning

[430 Regional Economic Development] Fall. 4 credits. Prerequisite: 500. Not offered 1978-79. Staff.

A focus on problems of and theories about development of lagging, underdeveloped, or poor regions in industrial nations, with emphasis on planning implementation.]

530 Introduction to Regional Development Planning Fall. 3 credits. Prerequisite: 500. Staff.

An introduction to the history, theories, methods, and processes of regional development planning. Will also focus on planning for specialized functions in various public agencies.

630 Regional Development Administration Fall or spring. 4 credits.
T 1:25-3:20. P. Clavel.

A seminar on administrative institutions relevant to regional development policies, with attention to the United States, Western Europe, and the Third World countries. Approaches to theory, measurement, and spatial distribution of institutions are covered with reference to the design of effective programs.

738 Fieldwork/Workshop in Regional Development Planning Fall or spring. Credit as assigned. Staff.

Work on applied problems in regional development planning in a field and/or laboratory setting.

739 Special Topics in Regional Development Planning Fall or spring. Credit as assigned. Staff.

830 Seminar in Regional Interindustry Analysis and Programming Spring. 4 credits. Prerequisites: basic economics, elementary matrix algebra.

M 7:30–9:30 p.m. S. Czamanski.
Advanced treatment of regional industrial structure, methods of construction and applications of input-output, linear programming, saturation, and dynamic optimization. Examples of recent applications of the techniques discussed to the solution of actual regional problems will be analyzed.

[831 Techniques of Regional Accounting] Fall. 3 credits. Prerequisites: 620 and Econ 312 or equivalent. Not offered 1978–79. Staff.

Methods of construction of the regional social accounts and their application to regional planning. Measuring levels of activity within regions, such as income and product accounts, is emphasized as well as methods of estimating flows between regions, such as balance of payment accounts.]

832 Location Theory Fall. 3 credits. Prerequisites: 500, 620, and Econ 311–312, or equivalent.

Th 12:30–3:20. W. Isard.
Traditional Weberian location doctrine; transport orientation, labor orientation, agglomeration, and urban rent theory will be examined. Interregional trade and market and supply area analysis will be treated. Particular attention paid to Loschian and Christaller systems of urban places..

833 Methods of Regional Analysis Spring. 3 credits.

Th 1:25–4:25. W. Isard.
Advanced applications of interregional and regional input-output and linear programming techniques to development problems. Applications of spatial interaction and growth (intertemporal) models to the analysis of urban and multiregional systems, with particular reference to environmental quality management.

839 Informal Study in Regional Development Planning Fall or spring. Credit as assigned. Staff.

Social Policy Planning

440 The Impact and Control of Technological Change (Cosponsored by the Program on Science, Technology, and Society) Spring. 4 credits. Visiting speakers and sections.

T Th 2:30–4:25. Staff.
Social, environmental, and economic implications of technological change in the context of present policies and strategies of control. Several specific cases will be considered in detail, followed by investigation of the problems of a modern technological society. Alternative political-economic solutions will be explored.

541 The Politics of Technical Decisions I

(Cosponsored by the Program on Science, Technology, and Society) Fall. 4 credits.
W 2:30–4:25. D. Nelkin, J. Milch.
Political aspects of decision making in areas traditionally regarded as technical. Subjects will include the origins and characteristics of "technical politics," the role of experts in government, and the problem of expertise in a democratic system. We shall explore alternatives to current decision-making procedures.

542 The Politics of Technical Decisions II

(Cosponsored by the Program on Science, Technology, and Society) Spring. 4 credits. Prerequisite: 541 or permission of instructors. Hours to be arranged. D. Nelkin, J. Milch.
Continuation of 541, focusing on decision making in

several technical policy areas. Students will develop individual or group research projects focusing on policy decisions with a significant technical component and considerable public impact.

640 Critical Social Theory in Planning Fall. 4 credits. Prerequisite: for seniors and graduate students with consent of the instructor.

F 2:30–4:25. W. Goldsmith.
For students already familiar with "radical" social theory. A review of Marxist methods and analysis of controversies in critical theory: problems of capital accumulation, the role of the state, the role of the intellectual, and alternative paths to socialism, focusing on the industrialized West.

744 Urban Financial Planning and Management Spring. 3 credits.

R. Schramm.
This course introduces the theory and practice of financial management and planning in urban government, including budgeting, capital expenditures, management of short-term assets, borrowing, taxation, and intergovernmental finance. Case studies and problem sets that place the student in a decision-making context are emphasized.

745 Urban Fiscal Analysis Fall. 3 credits. Prerequisite: 744 or course in public finance.

W 2:30–4:25. R. Schramm.
This course introduces government financial information (fund accounting, financial statements, and budgets) and uses this information and other data to identify major fiscal problems faced by the city and their causes. Alternative solutions to urban fiscal problems are evaluated using this analysis.

748 Fieldwork/Workshop in Social Policy Planning Fall or spring. Credit as assigned.

Staff.
Work on applied problems in social policy planning in a field and/or laboratory setting.

749 Special Topics in Social Policy Planning

Fall or spring. Credit as assigned. Staff.

849 Informal Study in Social Policy Planning

Fall or spring. Credit as assigned. Staff.

Urban Development Planning

[551 Suburbanization and Metropolitan America] Fall. 3 credits. Prerequisite: permission of instructor. Not offered 1978–79.

I. R. Stewart.
This seminar concentrates on the major issues in suburban development, metropolitan growth analysis, and the role of new communities in accommodating expected future population.]

552 Urban Land-Use Planning I Spring. 3 credits.

T 12:20–2:15. S. Stein.
Surveys, analyses, and plan-making techniques for guiding physical expansion and renewal of urban areas; location requirements, space needs, interrelationships of land uses. Emphasis on residential, commercial, and industrial activities and community facilities; housing and neighborhood conditions.

553 Urban Land-Use Planning II Spring. 2 credits. Prerequisite: 552 or permission of instructor.

F 11:15–1:10. S. Stein.
In-depth explorations of some or all of the following: neighborhoods, central business districts, shorelines and waterfronts, new towns, planned-unit developments, high-density housing, highway-oriented uses, and others. Lectures, seminars, and field exercises.

554 Introduction to Environmental Planning Design Fall. 3 credits. For graduate planning students; others by permission of instructors.

M W 11:15–1:10. K. Grey, S. Stein.
Planning and design of built environments as an aesthetic reflection of comparative values and needs. Lectures, seminars, readings, and design exercises will explore basic concepts and issues related to architecture, landscape, urban design, and urban planning.

555 Environmental Planning and Design Workshop Spring. 4 credits. Prerequisite: 554 or permission of instructor.

M W 11:15–1:10. K. Grey.
Studio-lecture course examining planning and design problems related to the built environment. An understanding of the design process will be developed and graphic communication techniques explored. No previous graphics experience required.

651 Urban Land Policy and Programs Fall. 3 credits. Prerequisite: 653 or permission of instructor.

M 1:25–3:15. J. W. Reps.
Consideration of major problems of urban land control and management and possible solutions. Subjects for discussion include taxation, compensation and betterment, large-scale public land acquisition, subsidies and incentives, and acquisition of developmental rights.

652 The Urban Development Process Spring. 2 credits. Prerequisite: 511 or permission of instructor. Enrollment limited.

M 3:35–5:30. J. W. Reps.
Examination of the goals, strategies, methods, and achievements of major participants in the urban land and building market: land owners, speculators, real estate brokers, developers, bankers, lawyers, nonprofit builders, and government agencies.

653 Legal Aspects of Land-Use Planning Spring. 3 credits. Prerequisite: 511 or permission of instructor.

W 2:30–4:25. B. Kelly.
Survey of leading cases and legal concepts in land-use planning, with particular attention to zoning, subdivision control; condemnation and growth control issues.

654 Environmental Planning and Design—Special Problems Fall or spring. Credit as assigned.

Staff.
656 Critical Areas Protection Fall. 3 credits. M W F 9:05–9:55. R. Booth.
State government attempts to protect critical areas such as tidal wetlands, key agricultural lands, and flood plains with planning and regulatory techniques. Analysis of significant management, implementation, and legal issues.

657 Planning and Development Workshop Fall or spring. 4 credits. Staff.

658 Regulation of Projects of State Concern Spring. 3 credits.

R. Booth.
State government attempts to regulate the planning and development of projects deemed to be of state-wide concern, such as key power generation and transmission facilities and large industrial development. Analysis of significant management, implementation, and legal issues.

750 Urban Land Policy and Programs—Special Problems Fall or spring. Credit as assigned. Staff.

751 Professional Practice Seminar Spring, 2 credits.
S. Stein.

Exploration of various aspects of urban planning practice in both the public and private sectors, including the roles and careers for professional planners; the planning function within the structure of government; consulting; funding and budgets; professional societies; professional ethics; related professionals; and other topics.

758 Fieldwork/Workshop in Urban Development Planning Fall or spring. Credit as assigned.
Staff.

Work on applied problems in urban development planning in a field and/or laboratory setting.

759 Special Topics in Urban Development Planning Fall or spring. Credit as assigned.
Staff.

859 Informal Study in Urban Development Planning Fall or spring. Credit as assigned.
Staff.

Special Interprogram Topics: History and Preservation

460 Introduction to the History of Urban Planning (also Arch 343) Fall, 3 credits.
T Th 9:05–9:55; lab W 2:30–3:20. W. W. Cummer, S. W. Jacobs, J. W. Reys.

Survey of urban planning in Western civilization, from the Greeks and Romans through medieval, renaissance, and modern Europe, to colonial and nineteenth-century America. Lectures, discussion sessions, readings, and term paper.

461 Methods of Archival Research (also Arch 542) Spring, 3 credits.
T 10:10–12:05. K. C. Parsons.

Examination of methods of using archival materials, including those documents in the Cornell Archives and Regional History collection, for research in the history of architecture and urban development.

560 Documentation for Preservation Planning (also Arch 546) Fall or spring, 2 credits.
Th 2:30–4:25. S. W. Jacobs, staff, visiting lecturers.

Methods of collecting, recording, processing, and analyzing architectural and cultural survey materials.

561 Historic Preservation Planning Workshop Fall, 4 credits.
T 3:35–5:30. S. Stein.

Preparation of surveys, analyses, plans, and programs for preservation of historic areas of small, medium, and large communities. Fieldwork emphasized, working with real "clients" in their communities.

562 Design and Conservation (also Arch 545) Fall, 2 credits.
Th 2:30–4:25. B. G. Jones, S. W. Jacobs.

The rationale for and methods of using existing cultural and aesthetic resources in the planning and design of regions and cities.

660 Seminar in the History of American City Planning Fall or spring, 3 credits. Prerequisites: 460, Arch 343, or permission of instructor.
J. W. Reys.

661 Historic Preservation Planning Workshop—Advanced Fall or spring. Credit variable. Prerequisite: 561.
T 3:35–5:30. S. Stein.

In-depth exploration of special problems in historic preservation planning focusing on specific issues in existing towns, villages, cities, or regions.

662 Seminar in American Urban History Spring, 3 credits. Prerequisite: permission of instructor.

I. R. Stewart.

Seminar in the historical evolution of the American city. Emphasis on factors in urban growth, the process of urbanization, urban reform movement, and intellectual and social responses to the city.

768 Fieldwork/Workshop in History and Preservation Fall or spring. Credit as assigned.
Staff.

Work on applied problems in history and preservation planning in a field and/or laboratory setting.

769 Special Topics in History and Preservation Fall or spring. Credit as assigned.
Staff.

869 Informal Study in History and Preservation Fall or spring. Credit as assigned.
Staff.

Special Interprogram Topics: International Studies

670 Regional Planning and Development in Developing Nations Fall, 4 credits. Prerequisite: second-year graduate standing.
F 2:30–4:25. W. W. Goldsmith.

Extensive case studies of development planning will be analyzed. Focus will be on a Marxist critique of the process of regional development through urbanization and in particular the concepts of equity and efficiency, external economies, export linkages, and internal self-sufficiency and integration. Resource development, national integration, human development, and migration problems will be discussed.

770 Planning Techniques for Developing Regions and Small Nations Spring, 4 credits. Prerequisite: 670.

W. W. Goldsmith.

Simulation of the work of a consulting team's proposals and analyses of policies for development of various sectors and problem areas, such as manufacturing, agriculture, health, education and services, infrastructure, urbanization, and exports. The final product will be a set of plans. Requirements include minimal reading, extensive research on a topic of interest, an interim report, and a written final report.*

771 Seminar in Science and Technology Policy in Developing Nations Spring, 3 credits.
D. Lewis.

An examination of the issues facing developing countries as they endeavor to use technology in the pursuit of their national goals. Topics covered include alternative choices of technology and the associated impacts, the role of multinational corporations, government policymaking institutions, manpower development and utilization strategies, and policy instruments.

772 Seminar in Policy Planning in Developing Nations: Technology Transfer and Adaption Fall, 3 credits.

F 10:10–12:05. D. Lewis.

An exploration of the international transfer of technology to developing nations and the policies used to guide this process. Topics covered include the role of foreign aid and multinational corporations, economic rationale for choice of appropriate technology, and social benefit-cost analysis. Case studies emphasized.

773 Seminar in Project Planning in Developing Countries Spring, 3 credits.
M 1:25–3:20. D. Lewis.

An examination of the problems and issues involved in the process of planning and implementing development projects in developing countries. The

role of the planner is explored from several different disciplinary points of view through a series of case studies selected from agriculture, industry, rural development, and urban planning. Countries typically represented include: Egypt, Ethiopia, India, Jordan, Korea, Mexico, Nepal, and the Commonwealth of Puerto Rico.

778 Fieldwork/Workshop in Planning for Developing Regions Fall or spring. Credit as assigned.
Staff.

Work on applied problems in planning for developing regions in a field and/or laboratory setting.

779 Special Topics in Planning for Developing Regions Fall or spring. Credit as assigned.
Staff.

879 Informal Studies in Planning for Developing Regions Fall or spring. Credit as assigned.
Staff.

Special Interprogram Topics: Environment/Health, Housing, and Institutional Planning

585 Introduction to Environmental Health Issues Spring, 3 credits.
F 2:30–4:25. B. G. Jones.

An examination of concepts and issues in environmental health, particularly as they relate to planning for health and medical care delivery systems, economic development, and other policy issues.

685 Environmental Epidemiology Spring, 3 credits. Prerequisite: 520.

W F 11:15–12:05. P. Brandford.

Introduction to epidemiological methods. Emphasis on the detection of changes in health status associated with changes in environmental conditions and the significance of these findings for environmental health planning.

686 Environmental Law, Policy, and Management Fall, 3 credits.
M W F 11:15–12:05. R. Booth.

Examination of selected environmental law topics from a policy management standpoint. Topics to include environmental impact statement preparation and analysis, pollution control laws, and government regulatory procedures.

687 Environmental Management Workshop Spring, 3 credits.
R. Booth.

Research and analysis of environmental management topics of current interest at the state or local government level. Field work emphasized in order to produce reports, recommendations, and/or draft legislation that will contribute to solving current issues.

785 Planning and Evaluation of Environmental Health Programs and Projects Spring, 3 credits. Prerequisite: second-year graduate standing.
P. Brandford.

The major focus of this seminar shall be an examination of the use of quantitative methods and economic analysis as aids to social decision making for action in the area of environmental health. Applications of these methods to the study of particular problems of environmental health.

786 Environmental Health Planning Fall, 2 credits. Prerequisite: second-year graduate standing.

F 11:15–1:10. P. Brandford.
Introduction to concepts and issues in environmental health planning. Topics covered include the planning problems involved in the control of water quality, liquid and solid waste disposal, air quality, and housing quality.

787 Health Systems Planning Fall. 3 credits.
T Th 9:05–9:55. P. Brandford.

This seminar is intended to increase understanding of issues, institutions, politics, economics, and social elements involved with planning and administration of health problems. Special emphasis will be placed on planning techniques and methodologies. Visiting practitioners in the field will be invited to make presentations.

788 Fieldwork/Workshop in City and Regional Planning Fall or spring. Credit as assigned.
Staff.

Work on applied planning problems in a field and/or laboratory setting.

789 Special Topics in City and Regional Planning Fall or spring. Credit as assigned.
Staff.

888 Informal Studies in Environmental Health Planning Fall or spring. Credit as assigned.
Staff.

889 Informal Studies in City and Regional Planning Fall or spring. Credit as assigned.
Staff.

790 Professional Planning Colloquium I Fall. 1 credit.
Staff.

791 Professional Planning Colloquium II Spring. 1 credit.
Staff.

792 Master's Thesis, Project, or Research Paper I Fall. Credit as assigned.
Staff.

793 Master's Thesis, Project, or Research Paper II Spring. Credit as assigned.
Staff.

794 Summer Internship in Planning Summer. 3 credits. Instruction limited to July and August. Graduate students in planning and others by permission.
Staff, visiting lecturers.

Summer internship in a metropolitan area. Full-time work at current salaries, supplemented with evening lectures and discussions two evenings a week and field trips. Program offering dependent on economic conditions and availability of internship jobs.

890 Planning Research Seminar I Fall. 1 credit.
Staff.

Primarily for doctoral candidates in city and regional planning; others welcome. Presentation and discussion of current problem areas and research by advanced doctoral students, faculty, and visitors.

891 Planning Research Seminar II Spring. 1 credit.
Staff.

892 Doctoral Dissertation I Fall. Credit as assigned.
Staff.

893 Doctoral Dissertation II Spring. Credit as assigned.
Staff.

Floriculture and Ornamental Horticulture) and the College of Architecture, Art, and Planning. The program is accredited by the American Society of Landscape Architects and offers three professional program alternatives: a four-year undergraduate program leading to a Bachelor of Science degree with specialization in landscape architecture, a three-year graduate program and a two-year graduate program, both leading to a Master of Landscape Architecture degree.

Landscape Architectural Design

Sequence Courses

***231 Design I: Basic Landscape Architectural Design** Fall. 5 credits. T. H. Johnson.

***232 Design II: Basic Landscape Architectural Design** Spring. 5 credits. M. I. Adleman.

***331 Design III: Intermediate Landscape Architectural Design** Fall. 5 credits.
P. J. Trowbridge.

***332 Design IV: Intermediate Landscape Architectural Design** Spring. 5 credits.
T. H. Johnson.

***431 Design V: Advanced Landscape Architectural Design** Fall. 4 credits.
M. I. Adleman.

***432 Design VI: Advanced Landscape Architectural Design** Spring. 5 credits.
P. J. Trowbridge.

581 Landscape Planning and Design Workshop Fall. 5 credits. Open to graduate students in landscape architecture, architecture, city and regional planning, and fifth-year architecture students.

Lec M 12:20; studio M W F 1:25–4:25. L. J. Mirin. Analysis, planning, and design response to problems of environmental impact. Traditional and advanced techniques of landscape architecture applied to study of natural and cultural systems and processes.

889 Thesis Research and Preparation in Landscape Architecture Fall or spring. Credit and time to be arranged. Prerequisite: candidate for Master of Landscape Architecture degree and permission of the graduate field members concerned.
Staff.

Nonsequence Courses

***102 Introduction to Landscape Design** Fall or spring. 3 credits. R. L. Dwelle.

***201 Residential Landscape Design I** Fall. 3 credits. R. L. Dwelle.

***202 Residential Landscape Design II** Spring. 3 credits. R. L. Dwelle.

***491 Plants and Design** Fall. 1 credit.
M. I. Adleman.

***555 Special Projects in Landscape Architecture** Fall or spring. 1 or 2 credits as assigned. Staff.

583 Urban Landscape Planning and Design Fall. 3 credits. L. J. Mirin.

Lectures, discussion, exercises, and field trips examining the principles and techniques of landscape architectural development and conservation of urban open space. Areas studied include arboriculture, street graphics, recreation, design controls, and public space and housing.

689 Informal Study in Landscape Planning and Design Fall or spring. 1 to 3 credits.
L. J. Mirin.

Work on special topics by individuals or small groups.

See also: ***Drawing for Landscape Architects (Flor 109, Drwg 109)**
***Perspective for Landscape Architects (Flor 110, Drwg 110)**

Landscape Architecture Principles, Theory, and History

***211 Introduction to Environmental Design** Fall. 2 credits. P. J. Trowbridge.

***212 Introduction to Environmental Design Discussion Section** Fall. 1 credit.
P. J. Trowbridge.

***451 or 452 Professional Practice I or II** Fall or spring. 2 credits. R. W. Crump.

481 Contemporary Issues in Landscape Architecture Fall. 2 credits.

Lec T 11:15. L. J. Mirin. Recent technological, methodological, and legislative developments are assessed in terms of their probable impact on the practice of landscape architecture.

***572 Regional Landscape Inventories and Information Systems: An International Perspective** Fall. 3 credits. A. S. Lieberman.

***573 Analysis and Use of Vegetation in Comprehensive Land Planning** Spring. 3 credits.
A. S. Lieberman.

585 Historic Development of Landscape Architecture Spring. 3 credits.

Lec Th 11:10. L. J. Mirin. The landscape architectural tradition, from classical times to the present, is examined as a reflection of diverse influences which have generated physical modifications of outdoor space. Recognition of the principles and techniques inherent in noted examples of the altered environment is emphasized.

Landscape Materials and Construction

***242 Site Construction I** Spring. 4 credits.
P. J. Trowbridge.

***341 Site Construction II** Fall. 4 credits.
T. H. Johnson.

See also: **Woody Plant Materials of Landscape Use. (Flor 313)**

*Courses offered through the College of Agriculture and Life Sciences

Landscape Architecture

M. I. Adleman, E. J. Carter, R. L. Dwelle,
T. H. Johnson, A. S. Lieberman, L. J. Mirin,
P. J. Trowbridge

The Landscape Architecture Program at Cornell is sponsored by the College of Agriculture and Life Sciences (in association with the Department of

College of Arts and Sciences

Introduction

The College of Arts and Sciences at Cornell is a liberal arts college, a university college, and a graduate school and research center. As a liberal arts college, it offers undergraduates the opportunity to increase their understanding of themselves and the world and prepares them for further, more specialized study.

As a university college, it is part of a wider university community which provides strength and diversity that are not available in an isolated, solely undergraduate institution. Here, students can draw upon the more highly specialized knowledge and facilities of the professional colleges to supplement their liberal studies. Because the College also serves students in other colleges of the University, its academic program is broad and flexible.

Finally, as a graduate school and research center, the College attracts a faculty whose active involvement in research and writing requires first-rate academic facilities, and whose energetic participation in undergraduate teaching brings to their students the most current and creative ideas in modern scholarship. It is this combination of functions that gives the College its distinctive character.

The Program of Study

The Arts College curriculum gives students opportunity for breadth, experiment, and discovery in study and for focus on at least one field. To encourage students to take maximum advantage of the College's many offerings and programs, the College has set requirements in the following areas: (1) Freshman Seminars, (2) foreign language, (3) distribution, (4) the major, (5) electives, (6) physical education, (7) residence, and (8) credit. These requirements provide the backbone of an undergraduate education in the College.

Freshman Seminars

Each semester of their first year in the College, freshmen choose a Freshman Seminar from among more than thirty courses offered by more than a dozen departments. The primary purpose of the Freshman Seminar requirement is to help students improve their ability to write. This means developing every skill, from spelling and grammar to syntax and style; from the expansion of vocabulary to better organization of arguments. The stress is not merely on acquiring techniques, but on improving an intellectual process.

The enrollment in each section is limited so that every student may actively participate in the seminar, and so that the instructors may give individual help in writing. All of the sections stress writing, although the frequency and length of the assignments may vary. Special arrangements for foreign students are explained in the *College Guide*.

Foreign Language

The College language requirement can be met by attaining qualification in two languages or proficiency in one. Three years of language study in high school or, in most languages, a 560 score on the reading portion of the College Entrance

Examination Board Achievement examination, or completion of the 102 or 123 language course (or equivalent) at Cornell, will count as qualification.

Proficiency in most languages is achieved by completing a 200-level language course at Cornell or its equivalent. The 200-level courses have a 560 CEEB reading score as a prerequisite. For information about meeting the language requirement through the study of Hebrew or Classical languages, please consult the appropriate department or see the *College Guide*.

Native speakers of a language other than English can fulfill the language requirement by demonstrating their proficiency in both the spoken and written forms of that language in an interview with an appropriate faculty member. They may also receive as much as six credits in their native language, which can be counted toward the degree.

Distribution

Designed to ensure the breadth desirable in a liberal education, the distribution requirement rules that students must complete at least six credits in related courses in one subject in each of four groups: Group I, physical or biological sciences; Group II, social sciences or history; Group III, humanities or expressive arts; Group IV, mathematics or an area not used to fulfill the requirement in Group I, II, or III.

The physical sciences at Cornell are astronomy, chemistry, geological sciences, and physics. Social sciences include anthropology, economics, government, linguistics, psychology, and sociology and some courses in Africana studies and in women's studies. Philosophy courses, some archaeology courses, and all literature courses, whether offered by the Department of English, Classics, or Comparative Literature, or in a foreign literature department, are counted as humanities. The expressive arts are music, history of art, theatre arts, and writing courses in English and Africana studies. The ways in which the distribution requirements can be met in the various departments are explained by each department before its course listings in this *Announcement*.

In general, the same course may not be used to fulfill more than one college requirement. A few exceptions to this rule and a complete listing of courses that can be used to meet the distribution requirements are contained in the *College Guide*.

The Major

The major requirement is designed to direct students to focus on one field, or more if they choose. By their fourth semester, students select a major program to which they devote approximately half their time during their last two years. Prerequisites for admission and the requirements for each major are detailed by the individual departments, listed alphabetically under Courses of Study in this *Announcement*.

Majors are offered by each of the departments, except astronomy, comparative literature, and computer science. There are also majors in Africana studies, American studies, archaeology, biology and society, dance, German area studies, Russian and Soviet studies, and social relations. In addition, the College offers the Independent Major, an interdisciplinary program which students design themselves, and the College Scholar Program, for students whose interests are unusually diverse. These programs are described in the section Special Programs and Interdisciplinary Studies.

Related Opportunities

Honors Program. Almost all departments offer honors programs for students who have demonstrated exceptional ability in the discipline and who seek an opportunity to explore branches of their subject not represented in the regular

curriculum or to gain experience in original investigation. The honors programs are described by the individual departments in the next section of this *Announcement*.

Concentrations. Although not required, students may complete more than one major or elect a special concentration, some of which require as few as four courses. Special concentrations are available in ancient Mediterranean studies, Jewish studies, Latin American studies, law and society, medieval studies, religious studies, social psychology, South Asian studies, and Southeast Asian studies. Other curricular opportunities include early concentrations in German literature and in Russian literature, an intensive language program in Chinese and Japanese (FALCON), and an intensive English program for foreign students. Other courses of special interest are offered by the Society for the Humanities and the Women's Studies Program. Concentrations are described under Special Programs and Interdisciplinary Studies.

Teacher Preparation. The College provides undergraduate and graduate programs in the teaching of English.

Fieldwork. The fieldwork option permits students to receive academic credit for work experiences related to their major. A three-member faculty committee assesses the student's preparation for the project, arranges for ongoing supervision, and evaluates the outcome. Students on approved fieldwork projects pay Cornell tuition, often at a reduced level.

Independent Study. Students with interests that are not treated in regularly scheduled courses may devise their own courses. Independent study enables students to investigate such topics through reading and/or laboratory work in programs worked out with a professor.

Student-Initiated Courses. Another way to accommodate one's interest in the College is through arranging student-initiated courses. Information about these options is available at the Office of Special Programs, 159 Goldwin Smith Hall.

In Absentia Study. Some students may wish to enrich their programs by studying *in absentia*, either abroad or at an American institution which offers programs not available at Cornell. A request to study *in absentia* must have the support of the faculty adviser and the approval of each course by the appropriate department chairperson. For more information about *in absentia* procedures and fees, see the *College Guide*. The College charges \$15.00 for each semester of *in absentia* study.

Electives

Students must complete fifteen credits in courses offered outside the major department which are not used to satisfy other requirements.

Physical Education

Students are required to take physical education in each term of their freshman year. The College does not count physical education credit towards the 120 credits required for graduation.

Residence

Candidates for the Bachelor of Arts degree normally spend eight terms in residence. However, students who have advanced placement credit or other additional Cornell credit can graduate in six or seven terms if their faculty adviser and major department chairperson approve their plan for acceleration. Students other than transfers are normally expected to earn at least ninety credits during regular terms at Cornell. Transfer students spend a minimum of three regular terms and one six-

week summer session in residence at Cornell earning at least sixty credits during those terms. For more information about acceleration, please see the *College Guide*.

Leave of Absence. Students in good standing who take a leave of absence by the end of the seventh week of the semester are welcome to return to the College upon request at least three weeks before the start of a semester. Five years is the maximum length of time students may be on leave and return without special permission. A conditional leave, which requires students to stay on leave for at least a year, is granted to students who are not in good standing or who, in unusual circumstances, are allowed to take a leave of absence after the seventh week of the term. For information about withdrawals, and about credit earned while on leave of absence, see the *College Guide*.

Double Registration Programs. Programs which also involve accelerated study are the double registration programs. In these programs students who have completed 105 credits before their senior year, with at least 92 of those credits in Arts College courses, can, with the approval of the College and after acceptance by the second school, register simultaneously during their senior year in the College of Arts and Sciences and in either the Cornell Law School, the Cornell Medical College, or the State University of New York Upstate Medical Center in Syracuse. The students may then receive the Cornell A.B. degree at the end of the fourth year, and the J.D. or M.D. degree at the end of an additional two or three years respectively.

Dual Degree Programs. It is also possible to enter a five-year dual degree program with either the Department of Art in the College of Architecture, Art, and Planning at Cornell or the Cornell College of Engineering. Information about all these programs can be found in the *College Guide*.

Credit

A total of 120 credits, with at least 100 of these credits earned in courses taught in the College of Arts and Sciences, must be completed to earn the Bachelor of Arts degree. Some courses taught in other colleges of the University, including those certified by the major adviser as part of a student's major program, may be counted toward the 100-credit requirement. Courses taken outside Cornell, during summers, or while on leave of absence, will not count as "Arts credit" unless approved as part of an *in absentia* plan or as part of the major requirement.

Advanced Placement. Advanced placement and advanced placement credit are available to entering students who have high scores in biology, chemistry, mathematics, modern languages, or physics, on either the CEEB advanced placement examinations or on departmental examinations given at Cornell during orientation week. The Departments of History and History of Art and some of the modern foreign literature departments honor the scores of the CEEB advanced placement tests but do not give departmental examinations. The Department of English offers no departmental exam but has its own criteria for determining advanced placement and credit: performance on the CEEB English Composition or Literature achievement test, grades in high school English courses, and scores on the CEEB advanced placement examination, if available. Economics, psychology, and sociology award credit and placement for high scores on the College Level Examination Program (CLEP) examinations. The brochure, *Advanced Placement of Freshmen*, contains details and will be sent to all accepted freshmen in April. It is also available on request from the Office of Admissions, 410 Thurston Avenue.

All advanced placement and advanced placement credit are recommended by the individual departments. With few exceptions, the award of credit is not conditional upon further study of that subject at Cornell.

Advising

To make the best use of college requirements and options, students need the advice and support of their faculty advisers. Faculty advisers, and student advisers as well, are assigned to new students before they come to Cornell. During orientation week, students meet with their advisers to plan their first term's program, and they continue to consult with them until they have been accepted into a major program.

After acceptance into a major program, students are assigned a major adviser with whom they make many of their most important decisions at Cornell. The adviser must approve the student's course of study and eventually certify the completion of the major. The major adviser should be consulted by the student about all academic plans, including such aspects as acceleration and graduate study. The adviser's support is especially important when a student petitions for an exception to the requirements for the degree.

The Academic Advising Center, 134 Goldwin Smith Hall, serves as a resource center for faculty and student advisers and for students themselves, and welcomes all questions regarding the College. Through the advisers at the center and the faculty and student advisers, the College encourages its students to take maximum advantage of the many College programs and the University's diverse facilities.

Transferring Within Cornell

Students who wish to transfer from one Cornell college to another should speak to an admissions counselor at the new college. Students wishing to transfer to the College of Arts and Sciences must fulfill the following requirements: in the term immediately preceding transfer they must complete at least twelve credits of Arts College courses with a minimum average of 2.7, no incompletes, no grade below C, and no S-U grades unless required by the instructor.

American Studies

S. C. Strout, chairman; M. J. Colacurcio, R. H. Elias, R. L. Moore, R. Polenber, F. Somkin

The Cornell major in American studies is basically a program of coordinated study in the history and literature of the United States. It is not a "double major." The prerequisites are minimal: one course in British or American history at the 100 or 200 level and one course in British or American literature at the 200 level. But the major itself is structured and demanding, and students who expect to become American studies majors should apply to the chairman as early as possible.

In consultation with their advisers, American studies majors elect thirty-two credits of work in the history and literature of all three large periods into which an account of the nation's development can be divided, defined for the purposes of the program as colonial, nineteenth century, and twentieth century. In order to gain both depth and breadth, they select as an area of concentration either a single period or the connections between two of the periods, and take either sixteen credits in one period and eight credits in each of the other two, or twelve credits in each of the two periods whose connections constitute the

focus of study and eight credits in the third. In addition, they take one of the specially designated interdisciplinary seminars at the 400 or 600 level. This may mean taking an additional four credits, but when the subject matter is appropriate, such a seminar may count toward the satisfaction of the period requirements. Students may divide the work between history and literature in whatever proportion serves their interests, provided that they take no more than two-thirds of their credits in any one department.

Beyond the basic requirements in American history and American literature, twelve credits above the elementary level are required in allied subjects. Eight credits of work are in the history and/or literature of another (related) culture; and four credits are in American thought, society, or culture studied from the perspective of another discipline, such as anthropology, economics, government, history of art, and sociology. (This last four-credit requirement may be satisfied outside the College.)

Candidates for honors must maintain an average of B-plus in courses pertinent to the major. To be eligible for a degree with honors in American studies a student must in the senior year (a) either write an honors essay for American Studies 493 (Honors Essay Tutorial) or submit to the American Studies committee three term papers written for courses in the major, and (b) take an oral examination in the declared area of special interest.

Courses in American history that will satisfy the thirty-two-credit requirement described in the second paragraph are offered by the Department of History; those in American literature are offered by the Department of English, the Department of Theatre Arts, and the Africana Studies and Research Center. Occasionally, a course that fits an individual student's program may be offered elsewhere (in the Society for the Humanities, for example); substitution will depend on the adviser's approval. A list of courses designated as interdisciplinary seminars may be obtained from the chairman.

Anthropology

A. T. Kirsch, acting chairman; R. Ascher, J. A. Boon, R. A. Borker, D. R. DeGlopper, V. R. Dyson-Hudson, C. J. Greenhouse, D. J. Greenwood, J. S. Henderson, C. F. Hockett, B. J. Isbell, K. A. R. Kennedy, B. Lambert, T. F. Lynch, C. Morris, J. V. Murra, J. T. Siegel, R. J. Smith

Two majors are offered by the department: (1) a major in anthropology and (2) a major in social relations.

Major in Anthropology

Anthropology includes four subdisciplinary specializations: archaeological, biological, linguistic, and sociocultural anthropology. Aside from these specializations, anthropologists have also concentrated on a number of topics and problems, as well as on the study of the diverse peoples living in all regions of the world. The listing of courses (Categories I-X) reflects these subdisciplinary specializations as well as the range of topics, problems, and world areas with which anthropologists at Cornell deal.

The major in anthropology must (1) take the two introductory courses (101 and 102), preferably during the freshman or sophomore years (Freshman Seminars in anthropology do not fulfill this requirement); and (2) take Anthropology 300, The Discipline of Anthropology during the fall term of the junior year. In addition, the major is expected to develop some area(s) of concentration within the discipline in consultation with his or her faculty adviser. To ensure some degree of exposure to the breadth and diversity of anthropology, the major must (3) take courses at the 200 level or above in at least two of the four subdisciplines (Category III-

Archaeological Courses, Category IV—Biological and Ecological Anthropology, Category V—Linguistic Anthropology, Category VI—Sociocultural Anthropology; (4) at least one course at the 200 level or above in theory or history of the field (Category VII); and (5) at least one course which concentrates on some world area (Category VIII). A total of 32 credits of course work in anthropology beyond the introductory level is required of all majors; however, up to 8 credits of course work in cognate disciplines (see Category IX) may be offered for the major with permission of the student's faculty adviser.

Major in Social Relations

The major in social relations is described on p. 137.

Human Biology Program

Human biology is a program of study offered by the Department of Anthropology in order to train students in a broad variety of subjects within the area of human biology. Such subjects include human evolution, ecology, genetics, behavior, anatomy, physiology, nutrition, etc. The program is offered as a concentration to undergraduate students.

Application

All inquiries about the concentration should be directed to the Department of Anthropology. Applicants will be assigned a biological anthropologist to serve as a temporary adviser, with whom they may discuss their plans.

Requirements

The requirements for the concentration in human biology are designed to ensure sufficient background in the physical sciences and mathematics to enable the student to pursue a wide range of interests in the area of modern biology. In the freshman year, two semesters of biology (Biological Sciences 101–103 and 102–104), two semesters of general chemistry (Chemistry 207–208), and two semesters of calculus (Mathematics 111–112, 111–122, or 107–108) will normally be completed. One lecture course in organic chemistry and one organic chemistry laboratory (Chemistry 253–251, or 357–358 and 301 or 251), a course in genetics (Biological Sciences 281), and a course in biochemistry (Biological Sciences 430 or 330–331) are requirements which can be completed by the middle of the sophomore year. Two semesters of physics (Physics 101–102 or 207–208) are required and should be completed early in the student's program.

The concentration in human biology requires a total of fourteen credits selected from the following: Anthropology 101, 102, 204, 221, 372, 373, 374, 375, 471, 476, and Biological Sciences 274, 360, and 477 (Section of Ecology, Evolution, and Systematics). Biological science courses included in the concentration requirement may not be used simultaneously to fulfill the breadth requirement.

Breadth requirements, designed to ensure that the student in human biology is familiar with areas of biology outside the concentration, specify that each student must pass a course in two of the following categories: (1) developmental biology (Biological Sciences 347); (2) ecology and evolution (Biological Sciences 461, 476); (3) geology (Geological Sciences 101); (4) microbiology (Microbiology 290A); (5) morphology (Biological Sciences 310, 313, 336, 345); (6) neurobiology and behavior (Biological Sciences 321, 421); (7) physical sciences and mathematics (Chemistry 287, 289, 300; Mathematics 214, 215, 216, 221; Statistics 510); (8) physiology (Biological Sciences 242 or 341, 410, 414); (9) taxonomy (Biological Sciences 316, 343); (10) nutrition (Nutritional Sciences 115, 231, 347).

Facilities

Cornell has a modern physical anthropology laboratory with a collection of osteological and fossil cast materials. Facilities for serology, anthropometry, primate dissection, and work physiology studies are available. Calculators and a statistical and reference library are maintained in the laboratory as well as drafting and photographic equipment.

Special Programs

Specialized individual study programs are offered in Anthropology 497–498 (Topics in Anthropology), open to a limited number of juniors and seniors. Consent of the instructor is required. Undergraduates should also note that most 600–level courses are open to them if consent of the instructor is obtained.

The Department of Anthropology holds colloquia throughout the academic year. Faculty from Cornell and other universities participate in discussions of current research and problems in anthropology. Students are encouraged to attend.

The Honors Program

Anthropology majors interested in the honors program should consult the director of undergraduate studies before the beginning of their senior year and apply for admission to the program. Candidates for the degree of Bachelor of Arts with honors in anthropology must complete a thesis in the spring term of the senior year (see Anthropology 491–492). The decision to award honors and in what degree is based on the quality of the thesis and the student's overall record.

Distribution Requirement

The distribution requirement in social sciences can be met by any two courses in the Department of Anthropology, or by Archaeology 100 and any anthropology course listed under Archaeology (see p. 51). Courses listed but not taught by members of the department do not satisfy the distribution requirement.

I. Introductory Level Courses (Including Freshman Seminars)

101 Introduction to Anthropology: The Evolutionary Perspective Fall, 4 credits.

M W F 11:15. K. A. R. Kennedy. A survey of the processes and history of man's evolution. The mechanisms of evolutionary change and adaptation to the environment are examined from the standpoint of both archaeology and human biology.

102 Introduction to Anthropology: The Cultural Perspective Spring, 4 credits.

M W F 11:15. B. J. Isbell. Cultural anthropology is the study of the cultural diversity of our species. What are the norms and extremes of ways of life of human communities? What is the human common denominator? What are the key differences between human and nonhuman?

[109 Classics in Social Theory Fall, 3 credits. Not offered 1978–79.]

143 China in Western Eyes: 1300–1978 Fall, 3 credits.

M W 9:05. D. R. DeGlopper. Six centuries of Occidental travellers to China and what they thought they saw there.

150 The Discovery of America Spring, 3 credits.

Th 2:30–4:25. T. F. Lynch. The discovery of the New World, beginning with American Indian origins in Asia and ending with the intellectual discovery by European adventurers, chroniclers, and travelers. Special attention will be

given to Norse exploration and settlement in the North Atlantic, the first Spanish encounters with the American land and people, and the exchange of flora and fauna.

[160 Margaret Mead and the Anthropological Tradition Spring, 3 credits. Not offered 1978–79.]

205 Ethnographic Films Fall, 2 credits. W 7:30–9 p.m. A. T. Kirsch.

Human cultural and social variability is explored through a series of ethnographic films, and readings and lectures relating to these films. The films are chosen to show peoples living in a variety of ecological situations and at different levels of social complexity in various parts of the world (i.e., Africa, Asia, Australia, the Americas). Readings and lectures will use the concepts and theories of cultural anthropology to interpret the significance of the different modes of life shown in the films.

11. Courses Intended Primarily for Majors

300 The Discipline of Anthropology Fall, 4 credits. Limited to and required of persons admitted to the anthropology major. This course is taken in the junior year.

T Th 2:30–3:45. R. Ascher with the anthropology faculty.

An overview of the field of anthropology: a systematic treatment of the discipline, the concepts that are used, the persistent questions that are asked, the specializations within the field, and the shared goals and differing viewpoints. The course will help the student to compose a plan of course work in anthropology.

415 Classic Ethnographies Spring, 4 credits. Enrollment limited to undergraduate majors and graduate students in the Department of Anthropology.

Th 2:30–4:25. D. R. DeGlopper. The reading and reanalysis of some major ethnographies.

491 Honors Thesis Fall, 4 credits. Prerequisite: consent of Honors Committee. Designed for majors graduating in midyear.

Time to be arranged. Staff. Independent work under the close guidance of a faculty member selected by the student.

492 Honors Thesis Spring, 4 credits. Prerequisite: consent of Honors Committee.

Time to be arranged. Staff. Independent work under the close guidance of a faculty member selected by the student.

495 Social Relations Seminar (also Soc 497) Spring, 4 credits. Open only to seniors majoring in social relations.

Time to be arranged. Staff.

497–498 Topics in Anthropology 497, fall; 498, spring. Credit individually arranged.

Time to be arranged. Staff. Reading course in topics not covered in regularly scheduled courses; individually arranged.

499 Finding and Reporting Anthropological Data: A Study Course in Field Methods Spring, 2 credits.

M 2:30. C. J. Greenhouse and K. A. R. Kennedy. A survey course about field methods in the several subfields of anthropology with particular attention given to the discussion of research ethics, data compilation, sources of financial support for field research, writing project proposals, health maintenance, and transition to professional life both within and without the academic sphere.

III. Archaeological Courses

(See also courses offered by the Archaeology Major.)

[203 Prehistoric Archaeology] Spring, 4 credits. Not offered 1978-79.]

350 The Earliest Civilizations Fall, 4 credits.
T Th 10:10. J. S. Henderson.

Archaeological approaches to non-Western civilizations. A survey of the beginnings of civilization to Mesopotamia, Egypt, India, and China, and the emergence of complex societies in the New World. The problems of defining and recognizing civilizations archaeologically and explaining their emergence will be discussed.

[352 Interpretation of the Archaeological Record] Fall, 4 credits. Not offered 1978-79.]

[353 Palaeolithic Prehistory of Europe and Western Asia] Fall, 4 credits. Not offered 1978-79.]

354 Archaeology of the Americas I Fall, 4 credits.

M W F 10:10. T. F. Lynch.

A study of the prehistoric cultures of the New World. Major topics will include the entry of man, early adaptations to diverse environments, hunting and gathering people to the ethnographic present, and the beginnings of agriculture.

355 Archaeology of the Americas II Spring, 4 credits.

M W F 10:10. J. S. Henderson.

A consideration of the origins, development, and spread of the native civilizations of North and South America. Prehistoric cultural developments in Mesoamerica and the Andes from the emergence of settled village life to the European discovery of the New World will be emphasized.

[358 Archaeological Research Methods (also Arkeo 358)] Fall, 4 credits. Not offered 1978-79.]

[361 Field Archaeology in South America (also Arkeo 361)] Fall, 10 credits. Not offered 1978-79.]

[405 Analysis and Care of Artifacts] Fall, 4 credits. Not offered 1978-79.]

[435 Investigation of Andean Institutions: Archaeological Strategies] Fall, 4 credits. Not offered 1978-79.]

[493 Seminar in Archaeology: Settlement Archaeology] Fall, 4 credits. Not offered 1978-79.]

494 Seminar in Archaeology: Analytical Methods Spring, 4 credits.

T 2:30-4:25. J. S. Henderson.

A consideration of some recent techniques of archaeological analysis and interpretation and their data requirements.

IV. Biological and Ecological Anthropology

(See also Human Biology Program offerings.)

[204 Biological Anthropology] Spring, 4 credits. Not offered 1978-79.]

221 Human Biology Spring, 4 credits.

M W F 10:10. R. Dyson-Hudson.

A survey of important biological characteristics of the human species, with emphasis on evolution, anatomy, growth and development, and variation. The differences and similarities of humans and other animal species and the functional relationships of human organs and organ systems in both contemporary and evolutionary contexts will be

emphasized. The effects of natural selection and environmental factors on human variation will be discussed.

316 Biological Anthropology in the Performing Arts (also Theatr 316) Fall, 5 credits.

T Th 10:10-12:05. K. A. R. Kennedy.

A laboratory course developed for students of the performing arts. Emphasis is placed upon human locomotor activity. The perspective of the course is evolutionary, with particular attention to the development and variation of movement patterns in man and other primates. Anatomical and functional changes of organs over time and in response to different kinds of extracorporeal stimuli are topics also discussed in some depth. The course is established upon the precept that intelligent use of the body by the dancer, athlete, and performer is dependent upon a sound understanding of the principles of human anatomy.

[372 Human Biological Variation] Spring, 4 credits. Not offered 1978-79.]

373 Concepts of Race and Human Diversity Spring, 4 credits.

T Th 2:30-4. K. A. R. Kennedy.

A study of the development of the notion of biological race in the human species and present attitudes about human diversity resulting from research in human genetics, population adaptability, and cultural ecology.

[374 Human Palaeontology] Fall, 4 credits. Not offered 1978-79.]

375 Ecology and Human Adaptation Fall, 4 credits.

T Th 8:30-10. R. Dyson-Hudson.

An analysis of human interactions with the physical, biological, and social environment based on the principles of general ecology. Changes over time in human interactions with the environment will be discussed as well as differences in adaptive strategies of contemporary human groups living in similar and different environments.

[471 Laboratory and Field Methods in Biological Anthropology I] Fall, 5 credits. Not offered 1978-79.]

[472 Laboratory and Field Methods in Biological Anthropology II] Spring, 5 credits. Not offered 1978-79.]

476 Human Behavior: A Sociobiological Perspective Fall, 4 credits.

T Th 2:30-4. R. Dyson-Hudson.

An attempt to look at human social behavior as possible adaptive responses to past and present environments. General categories of behavior discussed will include aggression, territoriality, dominance and hierarchy, bonding, and sex-role differences.

V. Linguistic Anthropology

(See also offerings in Linguistics, in the Department of Modern Languages and Linguistics.)

202 Language and Culture Fall, 4 credits.

Prerequisite: Anthr 101-102.

M W F 10:10. C. F. Hockett.

A survey of the field of linguistics as a branch of anthropology.

VI. Sociocultural Anthropology

201 Social Anthropology Fall, 4 credits.

M W F 9:05. C. J. Greenhouse.

An introduction to the way anthropologists approach the study of social behavior. Students will gain a broad, cross-cultural perspective on topics such as

law, exchange, belief in supernatural agents, and ritual. Readings consist of firsthand ethnographic accounts.

[224 Folklore] Spring, 4 credits. Not offered 1978-79.]

301 Biology and Society I: The Biocultural Perspective (also Bio S 301) Fall, 3 credits (4 by arrangement with instructor). Prerequisites: one year of introductory biology. This is part of the two-semester core course for the biology and society major and is also available to other students who have fulfilled the necessary prerequisites.

M W F 10:10. D. J. Greenwood.

Viewing human biology, behavior, and institutions as the ongoing products of the interactions between human biological evolution and cultural change, this course documents these interactions with reference to the following topics: the evolution of the capacity for culture; human groups and institutions; language, meaning, and cultural "realities"; and major models of human nature and human institutions.

302 Biology and Society II: Biology, Society, and Human Values (also Bio S 302) Spring, 3 credits (4 by arrangement with instructor).

Prerequisites: Anthr 301 (Bio S 301). This is the second semester of a two-semester core course for the biology and society major and is also available to other students who have taken Anthropology 301 (Bio S 301).

M W F 10:10. D. J. Greenwood and S. M. Brown, Jr.

After documenting the history of the academic and nonacademic institutional contexts of the biological and social sciences, this course takes up the complex intellectual, practical, and ethical issues centering on the relationships between biological and social phenomena. Specific current issues such as pollution, genetic counseling, recombinant DNA research, and others will be taken up and an effort will be made to develop a viable biocultural ethic for dealing with such problems.

305 Psychological Anthropology Fall, 4 credits.
M W F 9:05. B. J. Isbell.

A consideration of problems selected to illustrate the mutual relevance of psychology and anthropology and the interrelations of culture and personality.

313 Urban Anthropology Spring, 4 credits.

M W F 9:05. B. J. Isbell.

An examination of sociocultural structure and process in urban settings, with emphasis on the role of rural migrants, the relationship of urbanism to political and economic development, the role of voluntary associations, and the adjustment of family and kinship groups to urban life. Emphasis on Asian, African, and Latin American urban centers.

314 Applied Anthropology (also R Soc 355) Fall, 4 credits.

T Th 10:10-11:25. M. L. Barnett.

What anthropology knows or suspects about some general processes of cultural change; the application of these insights to practical and ethical problems faced in the planning, conduct, and evaluation of programs of intervention and change.

[318 Oral Tradition and Written Sources in Ethnology and Archaeology] Fall, 4 credits. Not offered 1978-79.]

[320 Meaning Across Cultures] Fall, 4 credits. Not offered 1978-79.]

321 The Anthropology of Women (also Wom S 321) Fall, 4 credits.

M W F 2:30. Staff.

Explores insights anthropology can provide for the study of women. Focus on a number of problems regarding aspects of women's position in society and culture and the ways in which these problems can be approached.

[322 Comparative Religious Systems Spring, 4 credits. Not offered 1978-79.]

323 Kinship and Social Organization Fall, 4 credits.

M W F 11:15. B. Lambert.
The first part of the course is an introduction to family, descent, and marriage systems. The second part is devoted to the study of territory, age, and sex as bases for social structure. Finally we will consider kinship networks in complex societies and the structure of Utopian communities.

326 Economic Anthropology Fall, 4 credits.
M W F 1:25. D. J. Greenwood.

Comparison of capitalist and non-capitalist economies and analysis of the cultural foundations of Western economic changes.

328 Law and Culture Fall, 4 credits. There will be a special section for graduate and law students.

M W F 1:25. C. J. Greenhouse.
Starting with a broad definition of law, the course examines the interrelationships of legal processes (e.g., litigation and witchcraft), their participants (complainants, advocates, and third parties), and their cultural contexts.

329 Politics and Culture Spring, 4 credits.
M W F 10:10. C. J. Greenhouse.

A cross-cultural examination of power: its genesis in specific cultural contexts, its articulations, and its functions. We look at the interrelationships between public decision making and social organization in a variety of settings, e.g., small kin-based communities and large nation-states.

330 Ethnicity and Tribalism Spring, 4 credits.
M W F 2:30. D. R. DeGlopper.

A review of the recent anthropological literature on ethnicity in complex societies, and a reexamination of the concept of the tribe. Material from outside the U.S., especially from Southeast Asia and Africa, will be emphasized.

347 Peasant Cultures Fall, 4 credits.
M W F 11:15. D. R. DeGlopper.

Anthropological approaches to the study of complex, premodern, or peasant societies. The economic, cultural, and social life of peasants; local systems and their integration with larger political and cultural units; change, development, modernization, and revolution.

[414 Anthropology and History (also Hist 404)] Fall, 4 credits. Not offered 1978-79.]

422 Special Problems in the Anthropology of Women (also Wom S 422) Spring, 4 credits.

Th 2:30-4:25. Staff.
Each year this seminar will focus on a particular area of concern within the anthropology of women, building upon the work done in Anthropology/Women's Studies 321. The basic orientation of the course will be research and exploration.

424 Myth, Ritual, and Sign Fall, 4 credits.
T Th 2:30-3:45. J. T. Siegel.

The concern of this course is anthropological understanding of ritual, myth, and other literary productions. Its starting point is the analysis of rites of passage and curing ceremonies in relation to notions of person. It continues by considering more metaphorical usages in social action and the problems of explanation such language engenders.

[426 The Ethnography of Communication Fall, 4 credits. Not offered 1978-79.]

[448 The Anthropology of the Nation State Fall, 4 credits. Not offered 1978-79.]

[451 Anthropological Boundaries Fall, 4 credits. Not offered 1978-79.]

452 Portraits, Profiles, and Life Histories Spring, 4 credits. S-U grades strongly recommended. Enrollment by permission. Limited to 20 students.

T 2:30-4:25. R. Ascher.
The goal is the *creation*, by each student, of a portrait or life history of one other person. Freedom is granted—and experimentation is encouraged—in the form of observation, recording, and presentation. As a point of departure, a study is made of books such as *Ishi*, films such as *Betty*, and portraits by Giacometti and Arbus.

453 Constructions and Visualizations Spring, 4 credits. S-U grades only. Tentative ideas for original projects should be discussed with the instructor prior to admission to the course.

Th 2:30-4:25. R. Ascher.
Anthropology is the study of the human condition. In this course, thoughts about man are expressed through *original* three-dimensional constructions, tapes, drawings, graphics, video, film, and similar media. Writing can be combined with visual expressions, as, for example, in concrete poetry or photographic essays. The course begins with examples of what others accomplished. But the most important aspect of the course is the original student project which, through discussion and criticism, evolves throughout the entire term.

VII. Theory and History of Anthropology

306 Ethnographic Description Spring, 4 credits.
T Th 2:30-3:45. J. T. Siegel.

Anthropology as a discipline depends more on the establishment of its object than on the reinterpretation of central ideas. The topic of this course is the establishment of differences in ethnographic description. How is it that ethnographers determine the characteristics of the populations they study without either assimilating them to what is already known or making them so foreign as to be meaningless? Careful readings of ethnographies will be balanced by students' own exercises in description.

412 Contemporary Anthropological Theory Spring, 4 credits.

M W F 11:15. B. Lambert.
A survey of the assumptions, social anthropologists make concerning the nature of society and culture, and the explanations they have proposed for regularities in social behavior, values, and belief systems. Among the approaches considered are processual analysis, the use of the concept of transaction, the historical method, ethnohistory, and structuralism.

[413 The History of Anthropology in the United States Fall, 4 credits. Not offered 1978-79.]

[417 Structuralism Spring, 4 credits. Not offered 1978-79.]

420 Development of Anthropological Thought Spring, 4 credits. Prerequisites: Intended for but not restricted to junior and senior anthropology majors. Assumes general familiarity with various facets of anthropology.

T Th 11:15. An additional 1-hour discussion section to be arranged. A. T. Kirsch.
Developing a paradigmatic perspective, this course will survey continuities and changes in anthropological theory and method from the mid-nineteenth century to the present.

[425 World Religions and Cultural Pluralism Fall, 4 credits. Not offered 1978-79.]

[464 Contemporary Archaeological Theory Fall, 4 credits. Not offered 1978-79.]

475 Physical Anthropology: History and Theory Spring, 4 credits.

W 7:30-9:30 p.m. K. A. R. Kennedy.
A survey of the historical background of present-day concepts of man's evolutionary variations and adaptations in space and time. The formation of biological anthropology as an area of scientific inquiry within the social sciences.

VIII. Area Courses

230 Ethnology of Native North America Spring, 4 credits.

M W F 9:05. B. Lambert.
A general survey of the ethnography of North America, with emphasis on problems and topics to which the North American materials are most relevant. Selected cultures will be considered in some detail.

[332 Ethnology of Lowland South America Spring, 4 credits. Not offered 1978-79.]

333 Ethnology of the Andean Region Fall, 4 credits.

M W F 2:30. B. J. Isbell.
Cultural continuities in the development of Andean societies. The ecological, archaeological, ethnohistorical and contemporary ethnological record. The Andean heritage as a resource for "modernization."

334 Ethnology of Island Southeast Asia Fall, 4 credits.

T Th 10:10-11:30. J. T. Siegel.
Peoples and cultures of Indonesia and the Philippines will be discussed, focusing on kinship, politics, and language and cultures.

[335 Ethnology of Mainland Southeast Asia Fall, 4 credits. Not offered 1978-79.]

336 Ethnology of Oceania Fall, 4 credits.
M W F 1:25. B. Lambert.

A description of the native cultures of Polynesia, Micronesia, Melanesia, and Australia. The course begins with a survey of ecological adaptations, prehistory, and navigational methods. Most of the semester will be devoted to such topics as social structures, overseas trade, religion, and recent cultural changes.

[337 Ethnology of the Near East Spring, 4 credits. Not offered 1978-79.]

[338 Ethnology of Africa Spring, 4 credits. Not offered 1978-79.]

341 Culture and Society in South Asia Fall, 4 credits.

M W F 10:10. R. D. MacDougall.
An introduction to the main features of South Asian culture, society, and history with emphasis on Hindu India and Buddhist Sri Lanka (Ceylon).

[343 Traditional Chinese Society and Culture Fall, 4 credits. Not offered 1978-79.]

[344 Modern Chinese Society Spring, 4 credits. Not offered 1978-79.]

[345 Japanese Culture and Society Fall, 4 credits. Not offered 1978-79.]

348 Spanish Culture and Society Spring, 4 credits.

M W F 1:25. D. J. Greenwood.
A topical survey of the anthropology of Spain: municipal and regional social structure; customary and national law; ethnicity and regionalism. Attention is given to Catholicism, folk religion, witchcraft, the Inquisition, cryptojudaism, rural exodus, and international tourism.

356 Mesoamerican Thought and Culture Fall. 4 credits.

T 2:30-4:25. J. S. Henderson.

A consideration of the aspects of Mesoamerican culture revealed in pre-Columbian painted books—especially religion, astrology, and concepts of time and space. Historical and ethnohistorical sources will also be discussed.

432 Indians of Mexico and Central America Spring. 4 credits.

M W F 12:20. C. J. Greenhouse and J. S. Henderson.

This course integrates sociocultural and archaeological approaches to the study of indigenous populations in this region. The historical perspective enables us to better assess Indian culture, and its present-day interface with non-Indian culture in the area.

[433 Andean Thought and Culture Fall. 4 credits. Not offered 1978-79.]

[437 Islam and Islamic Societies Spring. 4 credits. Not offered 1978-79.]

IX. Related Courses in Other Departments

Introduction to Archaeology (Arkeo 100)

Popular Archaeology (Arkeo 107)

[Ancient Seafaring (Arkeo 275) Not offered 1978-79.]

History of Archaeology (Arkeo 281)

Individual Study in Archaeology and Related Fields (Arkeo 300)

[Archaeology of the Ancient Near East (Arkeo 310) Not offered 1978-79.]

Human Growth and Development (N S 347)

Early Celtic Art and Mythology (S Hum 413)

Druids, Kings, and Commoners in Gaul and in Ireland (S Hum 414)

Jacobean Ethnology (S Hum 423)

The Motives of Comparative Mythology (S Hum 424)

Theories of Personality (Soc 385)

X. Graduate Seminars

600-level courses are open to undergraduates who have fulfilled the prerequisites or who have obtained consent of the instructor.

Southeast Asia Seminar: Vietnam (Asian 601)

Southeast Asia Seminar: The US and Southeast Asia: The Philippines (Asian 602)

[603 Human Biology and Cultural Behavior Fall. 4 credits. Not offered 1978-79.]

Contemporary Sociological Theories of Development (R Soc 606)

607-608 Special Problems in Anthropology 607, fall; 608, spring. Credit to be arranged. Time to be arranged. Staff.

[610 The Anthropological Study of Art: The Language of Myth (also Class 610) Spring. 4 credits. Not offered 1978-79.]

[611 Principles of Social Anthropological Theory Fall. 4 credits. Not offered 1978-79.]

[612 History of Anthropological Thought Spring. 4 credits. Not offered 1978-79.]

Methods of Assessing Child Growth (N S 612)

[613 Contemporary Anthropological Theory Fall. 4 credits. Not offered 1978-79.]

619 Anthropological Approaches to the Study of Buddhism in Asia Fall. 4 credits.

Time to be arranged. A. T. Kirsch. This seminar will examine the various conceptual and analytical strategies employed by social scientists in the study of Theravada Buddhism in South and Southeast Asia. Problems of religious complexity, the social and psychological correlation of Buddhism, and the role of Buddhism in social change will be explored.

[620 Ethnolinguistics Spring. 4 credits. Not offered 1978-79.]

[626 Problems in Economic Anthropology Fall. 4 credits. Not offered 1978-79.]

[627 Law in the Context of Culture Fall. 4 credits. Not offered 1978-79.]

628 Political Anthropology (also C Lit 628 and Rom S 628) Spring. 4 credits.

W 2:30-4:25. J. T. Siegel and R. Klein. The Heideggerian critique of science and of humanism, with the correlative analysis of technology and its institutions, will serve as the basis for considering the conceptual status of the social sciences—what the French call *les sciences de l'homme*. The course will also consider the influence of the Heideggerian problematic on more recent philosophical and theoretical writing.

[631 Urbanization and Migration in Andean South America Fall. 4 credits. Not offered 1978-79.]

[632 Andean Symbolism Spring. 4 credits. Not offered 1978-79.]

[633 Andean Research Fall. 4 credits. Not offered 1978-79.]

634-635 Southeast Asia: Readings in Special Problems 634, fall; 635, spring. Credit to be arranged.

Time to be arranged. M. L. Barnett, J. A. Boon, A. T. Kirsch.

[640 South Asia Spring. 4 credits. Not offered 1978-79.]

[641-642 South Asia: Readings in Special Problems 641, fall; 642, spring. Not offered 1978-79.]

[648 Comparative Study of Complex Societies Spring. 4 credits. Not offered 1978-79.]

651 Anthropological Boundaries: Graduate Fall. 4 credits. S-U grades optional. Preference is given to graduate students, but the course is open to juniors and seniors, particularly those in anthropology, theatre arts, comparative literature, poetry, creative writing, music, and the visual arts.

W 1:25-3:20. R. Ascher. This course explores the ways in which the creative arts serve as a model for *doing* anthropology. We study the works of anthropologists, native artists who use traditional sources, and western artists who sense a kinship with anthropological questions. Stress is on the novel, cinema, and poetry, but attention is given to still photography, music, drama, and sculpture. About half the course is related to native North America; the other half is split about equally between Africa, Europe, and the recent United States.

[653 Constructions and Visualizations: Graduate Fall. 4 credits. Not offered 1978-79.]

663 Problems in Archaeology: Early Man in America Fall. 4 credits.

T 12:20-2:15. T. F. Lynch. The topic will be considered in historical perspective, as it has been dealt with by archaeologists, anthropologists, and geologists. The emphasis will be on environmental adaptations, rather than chronology, and topics will be drawn from both North and South American archaeology.

664 Problems in Archaeology: The Andes Spring. 4 credits.

T 12:20-2:15. T. F. Lynch. A consideration of the archaeological evidence for the Inca presence towards the northern and southern frontiers of Tawantinsuyu, as well as various other problems in the earlier prehistory of the Andean region.

[666 The Discovery of America Spring. 4 credits. Not offered 1978-79.]

[667 Origins of Mesoamerican Civilization Fall. 4 credits. Not offered 1978-79.]

Architecture in Its Cultural Context (Arch 667-668)

[673 Human Adaptation Fall. 4 credits. Not offered 1978-79.]

[676 Physical Anthropology: Problems, Methods, and Theory Spring. 4 credits. Not offered 1978-79.]

677 Topics in Ecological Anthropology Spring. 4 credits.

W 2:30-4:25. R. Dyson-Hudson. This seminar will examine adaptive relations between specific groups of foragers and agriculturalists and the food-producing sectors of their habitats. We will analyze various monographs and articles with the goal of specifying how environmental and technological aspects of energy flow are related to such variables of human social organization as settlement size, kinship relations, social stratification, and spatial organization. We will also examine how ecological concepts such as "niche" and "population" have been applied to human groups.

[678 Palaeoanthropology: South Asia Spring. 4 credits. Not offered 1978-79.]

[698-699 The Teaching of Anthropology 698, fall; 699, spring. 2 credits. Not offered 1978-79.]

Macrosocial Accounting (R Soc 715)

Sociotechnical Aspects of Irrigation (R Soc 754)

901-902 Field Research 901, fall; 902, spring. Credit to be arranged. Time to be arranged. Staff.

Archaeology

A. L. Bloom (geological sciences), J. E. Coleman, (Classics), W. W. Cummer (architecture), R. T. Farrell (English), J. S. Henderson (anthropology), S. W. Jacobs (architecture), D. M. Jones (archaeology), P. I. Kuniholm (Classics), T. F. Lynch (anthropology), C. Morris (anthropology), J. V. Murra (anthropology), G. W. Olson (agronomy), D. I. Owen (Near Eastern studies), A. Ramage (history of art), J. M. Weinstein (Near Eastern Studies)

Archaeology at Cornell is an interdisciplinary subject. The major draws upon the teaching and research interests of faculty from many departments

in order to present a broad view of the archaeological process. Hence, a student interested in the archaeology major should discuss his or her course of study with a participating faculty member as early as possible. In some areas of specialization, intensive language training should be coordinated with other studies as early as the freshman year.

As prerequisites to the major a student must complete Archaeology 100 and another introductory archaeology course with grades of C or better. Once admitted to the major, the student must take an additional thirty credits in courses from the archaeology list, chosen in consultation with the major advisor. These courses should provide exposure to a broad range of archaeologically known cultures and the methods of revealing and interpreting them. They must be distributed as follows:

- A) At least 20 credits at the 300 level or above
 B) At least 6 credits in each of the categories below:
- 1) Theory and interdisciplinary approaches
 - 2) Old World archaeology
 - 3) New World archaeology

Beyond these 30 credits, a student must elect at least 6 credits in related subjects outside the major, such as computer science, statistics, ethnology and history of appropriate areas, draftsmanship, photography, surveying and map making, interpretation of aerial photographs, paleography, and epigraphy.

Finally, every student should gain some practical experience in archaeological fieldwork on a project authorized by his or her adviser. This requirement may be waived in exceptional circumstances. The Jacob and Hedwig Hirsch bequest provides support for a limited number of students to work at excavations sponsored by Cornell and other approved institutions.

Only students in other Cornell schools and colleges may elect a concentration in archaeology; they are eligible for Hirsch scholarships in support of fieldwork. To concentrate in archaeology, the student must complete Archaeology 100 with a grade of C or better and at least four advanced courses in archaeology, distributed among the three groups stipulated in (B) above.

Distribution Requirement

The distribution requirement can be satisfied in the social sciences, humanities, or expressive arts by taking Archaeology 100 and a second archaeological course chosen from the College of Arts and Sciences courses listed below. Specifically the distribution requirement in the social sciences can be fulfilled with Archaeology 100 and any one of the following: Anthropology 150, 203, 301, 318, 333, 350, 352, 353, 354, 355, 356, 358, 361, 405, 435, 464, 493, 494, 633, 663, 664, 666, 667; in the humanities with Archaeology 100 and any one of the following: Archaeology 275, 281, 310, 311; Classics 220, 221, 232, 233, 320, 321, 326, 629, 630; Near Eastern Studies 243, 244, 249, 282, 285, 344, 385, 387, 481; in the expressive arts with Archaeology 100 and any one of the following: History of Art 211, 212, 220, 221, 321, 322, 323, 324, 325, 423, 424, 431.

100 Introduction to Archaeology Spring.

3 credits.

M 4:15, W F 1:25. D. M. Jones.

An introduction to the history, aims, techniques, and problems of archaeology around the world. The interrelation and mutual contributions of both humanistic and scientific aspects will be emphasized. Guest lectures will help illustrate the variety of archaeological methods, sites, and discoveries.

101 Introduction to Archaeology (Section)

Spring. 1 credit.

M 1:25.

Optional section to be taken concurrently with Archaeology 100. Intended for students enrolled in Archaeology 100 who would like additional discussion and the opportunity to work on individual projects. One excavation will be studied in detail in order to provide a comprehensive picture of what archaeologists do. Some additional reading and study of artifacts. Prospective archaeology majors are expected to participate in this section, although it is open to all interested students.

107 Popular Archaeology (Freshman Seminar)

Fall. 3 credits.

M W F 1:25. S. J. Oberon.

The course will focus on popular conceptions of prehistory that have antagonized the archaeological establishment. Readings will include both scholarly and popular books. Class discussion and papers will emphasize careful and critical analysis of archaeological evidence. Among the topics to be discussed are possible visits to earth by extraterrestrial beings, the Atlantis and Mu myths, the development of New World civilizations, and time capsules.

300 Individual Study in Archaeology and Related Fields

Fall or spring. Credit to be arranged. Prerequisites: Archaeology 100 and permission of instructor.

Hours to be arranged. Staff.

With the guidance of a faculty member, students pursue topics of particular interest.

Theory And Interdisciplinary Approaches

Earth Science (Geological Sciences 103)

Earth Science Laboratory (Geological Sciences 105)

281 History of Archaeology Fall. 3 credits.

T Th 2:30-3:45. D. M. Jones.

Archaeology within the framework of developments in scientific method and thought. Comparison of the different forms in various parts of the world and examination of the cultural and historical contexts which caused these differences. Archaeology's influence upon other disciplines, such as art, architecture, literature, and religious thought will be examined. Topics will include study of the careers of major pioneers and the development of legal controls on excavations.

[301 Archaeological Ceramics Not Offered 1978-79.]

311 Historical Archaeology Fall. 4 credits.

Prerequisite: Archaeology 100 or permission of instructor.

M W F 1:25. D. M. Jones.

A general introduction which will include examples from both Europe and North America. Theory and practical questions will be addressed, including the use and interpretation of archival material. The approaches of the anthropologist and the historian will be treated using actual site reports as examples.

[Oral Tradition and Written Sources in Ethnology and Archaeology (Anthropology 318) Not offered 1978-79.]

Geomorphology (Geological Sciences 345)

The Earliest Civilizations (Anthropology 350)

[Interpretation of the Archaeological Record (Anthropology 352) Not offered 1978-79.]

[358 Archaeological Research Methods (also Anthropology 358) Fall. 4 credits. Not offered 1978-79.]

[Analysis and Care of Artifacts (Anthropology 405) Not offered 1978-79.]

[Ceramics (History of Art 423) Not offered 1978-79.]

[Numismatics (History of Art 424) Not offered 1978-79.]

[Contemporary Archaeological Theory (Anthropology 464) Not offered 1978-79.]

[Seminar in Archaeology: Settlement Patterns (Anthropology 493) Not offered 1978-79.]

Seminar in Archaeology: Analytical Methods (Anthropology 494)

[Use of Soil Information and Maps as Resource Inventories (Agronomy 506) Not offered 1978-79.]

Architectural Problems in Archaeological Fieldwork (Architecture 540)

Surveying for Archaeologists (Architecture 541)

Case Study Preservation Planning (Architecture 544)

Design and Conservation (Architecture 545)

Documentation for Preservation Planning (Architecture 546)

Glacial and Quaternary Geology (Geological Sciences 642)

Old World Archaeology

[Prehistoric Archaeology (Anthropology 203) Not offered 1978-79.]

Introduction to Art History: Art of Egypt and Mesopotamia (History of Art 211)

Introduction to Art History: Art of the Etruscans and Romans (History of Art 212)

Introduction to Classical Archaeology (Classics 220 and History of Art 220)

Minoan-Mycenaean Art and Archaeology (Classics 221 and History of Art 221)

Archaeology in Action I (Classics 232)

Archaeology in Action II (Classics 233)

The History of Ancient Israel I (Near Eastern Studies 243)

The History of Ancient Israel II (Near Eastern Studies 244)

History of Preindustrial Building (Architecture 244)

[275 Ancient Seafaring (also Near Eastern Studies 249) Not offered 1978-79.]

[Ancient Near Eastern Literature (Near Eastern Studies 282) Not offered 1978-79.]

Introduction to Biblical Archaeology (Near Eastern Studies 285)

Dendrochronology of the Aegean (Classics 309)

310⁺ Archaeology of the Ancient Near East (also NES 387) Fall. 4 credits. Prerequisite: Archaeology 100 or permission of instructor. M W F 2:30. J. M. Weinstein.

Ancient civilizations between the Indus and the Mediterranean, from the first stone tool to the palace at Persepolis; Sumerian, Assyrian, Babylonian, Israelite, Phoenician, and Persian remains in terms of indigenous developments and cross-cultural contacts.

Arts and Monuments of Athens (Classics 320 and History of Art 320)

[Archaeology of Cyprus (Classics 321 and History of Art 321) Not offered 1978-79.]

[Arts of the Roman Empire (History of Art 322) Not offered 1978-79.]

[Painting in the Greek and Roman World (History of Art 323) Not offered 1978-79.]

[Architecture in the Greek and Roman World (History of Art 324) Not offered 1978-79.]

[Greek Vase Painting (History of Art 325) Not offered 1978-79.]

[Art and Archaeology of Archaic Greece (Classics 326 and History of Art 326) Not offered 1978-79.]

[The Architecture of the Ancient Near East (Architecture 340) Not offered 1978-79.]

The Architecture of the Classical World (Architecture 341)

[Age of the Patriarchs (Near Eastern Studies 344) Not offered 1978-79.]

Independent Study—Ancient Israel (Near Eastern Studies 348)

Independent Study—Ancient Near East (Near Eastern Studies 349)

[Paleolithic Prehistory of Europe and Western Asia (Anthropology 353) Not offered 1978-79.]

[Interconnections in the Eastern Mediterranean World in Antiquity (Near Eastern Studies 385) Not offered 1978-79.]

[Greek Sculpture (History of Art 431) Not offered 1978-79.]

[Seminar in Syro-Palestinian Archaeology (Near Eastern Studies 481) Not offered 1978-79.]

Seminar in Minoan and Mycenaean Archaeology (Classics 629)

[Seminar in Classical Greek Archaeology (Classics 630) Not offered 1978-79.]

Seminar in the Architecture of the Classical World (Architecture 641)

New World Archaeology

The Discovery of America (Anthropology 150)

312 Archaeology of the European Colonial Movement Spring. 4 credits.
T Th 2:30-3:45. D. M. Jones.

Archaeology of the Americas I (Anthropology 354)

Archaeology of the Americas II (Anthropology 355)

Mesoamerican Thought and Culture (Anthropology 356)

[361 Field Archaeology in South America (also Anthropology 361) Fall. 10 credits. Not offered 1978-79.]

[The Investigations of Andean Institutions: Archaeological Strategies (Anthropology 435) Not offered 1978-79.]

[Seminar in Andean Research (Anthropology 633) Not offered 1978-79.]

Problems in Archaeology: Early Man in America (Anthropology 663)

Problems in Archaeology: The Andes (Anthropology 664)

[The Discovery of America (Anthropology 666) Not offered 1978-79.]

[Origins of Mesoamerican Civilizations (Anthropology 667) Not offered 1978-79.]

Related Courses For Archaeology Majors

[Ethnology of Lowland South America (Anthropology 332) Not offered 1978-79.]

Ethnology of the Andean Area (Anthropology 333)

Ethnology of Oceania (Anthropology 336)

Culture and Society in South Asia (Anthropology 341)

[Human Palaeontology (Anthropology 374) Not offered 1978-79.]

Indians of Mexico and Central America (Anthropology 432)

[Andean Thought and Culture (Anthropology 433) Not offered 1978-79.]

[Laboratory and Field Methods in Biological Anthropology I and II (Anthropology 471 and 472) Not offered 1978-79.]

[Paleoanthropology: South Asia (Anthropology 678) Not offered 1978-79.]

Introduction to Asian Civilizations (History 190)

Latin American History to 1825 (History 210)

[The Emergence of Greek Democracy (History 265) Not offered 1978-79.]

[The Crisis of Greek Civilization (History 266) Not offered 1978-79.]

[American Indian History (History 323-324) Not offered 1978-79.]

History of China up to Modern Times (History 393)

Southeast Asian History to the Fourteenth Century (History 395)

Seminar in Native American Cultural History (History 423)

[Seminar in the History of Indian-White Relations (History 424) Not offered 1978-79.]

[Archaic Greece 776-500 B.C. (History 450) Not offered 1978-79.]

The Roman Revolution (History 461)

[The High Roman Empire (History 462) Not offered 1978-79.]

[Science in Classical Antiquity (History 481-482) Not offered 1978-79.]

[Seminar in Ancient Classical History (History 661) Not offered 1978-79.]

Introduction to Art History: Asian Traditions (History of Art 280)

The Arts of Early China (History of Art 383)

[Studies in Indian and Southeast Asian Art (History of Art 386) Not offered 1978-79.]

[Traditional Arts in Southeast Asia (History of Art 488) Not offered 1978-79.]

Greek Civilization (Classics 211)

Roman Civilization (Classics 212)

Greek Mythology (Classics 236 and Comparative Literature 236)

Early Celtic Art and Mythology (Society for the Humanities 413)

Druids, Kings, and Commoners in Gaul and in Ireland (Society for the Humanities 414)

[Studies in Christian Origins (Comparative Literature 326) Not offered 1978-79.]

Literature of the Old Testament (Comparative Literature 328)

Old Testament Seminar (Comparative Literature 421)

[New Testament Seminar (Comparative Literature 426) Not offered 1978-79.]

The Theory and Practice of Linguistics (Linguistics 101-102)

Comparative Methodology (Linguistics 404)

Hittite (Linguistics 621-622)

Comparative Indo-European Linguistics (Linguistics 631-632)

Introductory Geological Science (Geological Sciences 101)

Introduction to Historical Geology (Geological Sciences 102)

Structural Geology and Sedimentation (Geological Sciences 325)

Historical Geology and Stratigraphy (Geological Sciences 376)

Nature and Properties of Soils (Agronomy 200)

Identification, Appraisal, and Geography of Soils (Agronomy 301)

Geography and Appraisal of Soils of the Tropics (Agronomy 401)

Soil Clay Mineralogy (Agronomy 405)

Morphology, Genesis, and Classification of Soils (Agronomy 603)

Plants and Man (Biological Sciences 246)

Engineering Surveying and Evaluation (Civil and Environmental Engineering A380)

Photogrammetry (Civil and Environmental Engineering A661)

Advanced Physical Environment Evaluation (Civil and Environmental Engineering A686)

Analyses and Interpretation of Aerial Photographs (Civil and Environmental Engineering A687)

Plane Surveying (Agricultural Engineering 221)

Scientific Illustration (Floriculture and Ornamental Horticulture 417)

Beginning Photography (Architecture 250 and Art 161)

Intermediate Photography (Architecture 350 and Art 162)

Color Photography (Architecture 352 and Art 262)

Elementary Statistics (Mathematics 370)

Statistics (Mathematics 472-473)

Computer Science 100, 101, 102, 104, 211 (See department listing in College of Engineering section for sequence and combinations)

Asian Studies

K. Brazell, chairperson; B. R. Anderson, D. E. Ashford, M. L. Barnett, M. G. Bernal, N. C. Bodman, J. A. Boon, C. Breckenridge, J. Chaves, S. Cochran, R. D. Colle, B. deBary, D. R. DeGlopper, A. T. Dotson, E. C. Erickson, R. T. Freeman, J. W. Gair, M. D. Glock, F. H. Golay, A. G. Grapard, A. B. Griswold, E. M. Gunn, D. G. E. Hall, F. E. Huffman, R. B. Jones, E. H. Jordan, G. McT. Kahin, M. Katzenstein, G. B. Kelley, K. A. R. Kennedy, A. T. Kirsch, R. D. MacDougal, D. R. McCann, J. McCoy, T. L. Mei, G. M. Messing, D. P. Mazingo, S. J. O'Connor, T. J. Pempel, C. A. Peterson, J. T. Siegel, R. J. Smith, C. Steenstrup, J. U. Wolff, O. W. Wolters, D. K. Wyatt, M. W. Young

The applicant for admission to the major in Asian studies must have completed at least one course selected from among those listed under the Department of Asian Studies and must be recommended by the instructor in charge of that course. The student must have received a minimum grade of C in this course and in all other courses taken in the department. The candidate for the A.B. degree with a major in Asian studies is required to complete two courses at the 200 level in one of the Asian language offered at Cornell. The major consists of at least 30 additional credits (which may include further language work) selected by the student in consultation with his or her adviser from among the courses listed under the Department of Asian Studies numbered 300 and above. Majors normally concentrate their work in at least one of the disciplines and in one of the following areas: China, Japan, South Asia, Southeast Asia. The student may also consider a double major combining Asian studies with one of the disciplines.

Honors Program

Honors are awarded those students who have completed a successful honors essay and who meet the other requirements established by the department as follows. They must maintain a cumulative average of B+ in Asian studies courses. They should take at least one of the seminars listed below, selected in consultation with their adviser; or they may, with the approval of their adviser, substitute an advanced course in which they complete a considerable body of independent work. Honors candidates will also take Asian Studies 402, in which they write the honors essay, and AS 461. They may also enroll in Asian Studies 401 in the

senior year, but this course is not required. Selection of an essay topic, normally at the end of the junior year, should be made in consultation with two interested professors, one of whom will become the student's essay adviser. At the end of the junior year, students should consult with the professor with whom they plan to write their paper.

Distribution Requirement

The distribution requirement in the humanities may be satisfied in Asian studies by six credits of any 300-level courses which form a sequence, listed under Asia—Literature and Religion.

Concentration in Southeast Asia Studies.

A candidate for the Bachelor of Arts or Bachelor of Science degree at Cornell may take a concentration in Southeast Asia studies by completing fifteen credits of course work, including a history course and three courses or seminars at the intermediate or advanced level, two of which may be Southeast Asian language courses. Students taking a concentration in Southeast Asia studies are members of the Southeast Asia Program and are assigned an adviser from the program faculty. Such students are encouraged to commence work on a Southeast Asian language and to take advantage of summer intensive language training.

Intensive Language Program (FALCON)

For those students desiring to accelerate their acquisition of Chinese, Japanese, or Indonesian, Cornell offers a full-time, intensive language program. FALCON students spend six hours a day, five days a week, for periods up to a full year studying language only and thus are able to complete as many as 1,200 hours of supervised classroom and laboratory work in one year.

Freshman Seminars

101 Japanese Conceptions of Beauty Fall. 3 credits.

T Th 2:30-4. B deBary.
The seminar will examine central aesthetic values of the Japanese tradition as they have been expressed in diverse arts. Emphasis will be placed on the literary arts (poetry, narrative, and dramatic writing), but architecture, brush painting, flower arranging, and other arts will be considered.

[102 Ideas and Images in Japanese Culture] Spring. 3 credits. Offered every other year (alternates with Asian 101). Not offered 1978-79.

T Th 2:30-4. K. Brazell.]

[103 Revolutions and Social Values in Modern Chinese Literature] Fall. 3 credits. Offered every other year (alternates with Asian 104). Not offered 1978-79.

E. M. Gunn.]

104 Three Ways of Thought Spring. 3 credits.

M W F 2:30-4. T. L. Mei.
An introduction to Confucianism, Taoism, and Zen through reading and discussion of basic texts.

See also:

Anthropology 143 China in Western Eyes: 1300-1977 Spring. 3 credits.

M W 9:05. D. R. DeGlopper.

[Government 100 Contemporary Japan] Fall. 3 credits. Not offered 1978-79.

T. J. Pempel.]

History 293 China and the European Psyche Fall. 4 credits.

Th 2:30-4:25. C. A. Peterson.

History 294 Chinese Views of Themselves Spring. 4 credits.

F 1:25-3:30. S. G. Cochran.

Asia—Literature and Religion Courses

The following courses are taught entirely in English and are open to any Cornell student.

250 The Nature of Religious Experience Spring. 4 credits.

T Th 1:25-3. A. G. Grapard.
This course will draw on Eastern and Western religious traditions. It will examine psychological, philosophical, and anthropological approaches to religious experiences.

307 Asian Dance and Dance Drama (also Theatrical) Fall. 3 credits.

Time to be arranged. Staff.
A different dance tradition will be taught each year. (Contact the department for more information.)

351 Introduction to Asian Religions Fall. 4 credits.

M W F 2:30. A. G. Grapard.
An introduction to the thought and practice of Hinduism and Theravada Buddhism.

352 Mahayana Buddhism Spring. 4 credits.

Prerequisite: 351 recommended but not required.
M W F 2:30. A. G. Grapard.
A study of the intellectual, religious, and social development of the Mahayana tradition in East Asia. Both sutras and religious practices will be carefully examined.

[371 Chinese Philosophical Literature] Fall. 4 credits. Not offered 1978-79.

T. L. Mei.]

[372 Chinese Poetry] Spring. 4 credits. Not offered in 1978-79. (Alternates with Asian 374.)

T. L. Mei.]

373 Twentieth-Century Chinese Literature Fall. 4 credits.

M W F 9:05. E. M. Gunn.
A study of the modern vernacular that has reflected and promoted political, social, and cultural change in China.

374 Chinese Narrative Literature Spring. 4 credits.

M W F 9:05. E. M. Gunn.
Readings in translation of selected works in classical Chinese fiction, emphasizing major novels such as the *Dream of the Red Chamber* and *Water Margin*.

375 Japanese Poetry and Drama Fall. 4 credits.

T Th 2:30-4:25. K. Brazell.
A study of selected poets and dramatists in English translation. The course covers works from the eighth through the eighteenth century.

376 Modern Japanese Fiction Spring. 4 credits.

Lec, T 11:15; seminar, Th 11:15-1 or 2:30-3:45.
B. deBary.
A study in English translation of the major novelists and short story writers of the twentieth century.

[377 Japanese Narrative Literature] Fall. 4 credits. Offered every other year (alternates with 375). Not offered 1978-79.

K. Brazell.]

[379 Southeast Asian Literature in Translation] Fall. 4 credits. Not offered in 1978-79.]

386 Folk Literature of East Asia Spring. 4 credits.

Times to be arranged. D. McCann, J. McCoy.

400 Japanese Nō Theater Spring, 4 credits.
Prerequisite: consent of the instructor.
W 2:30–5. K. Brazell.
A study of Nō as a performing art.

414 The Japanese Film Spring, 3 credits.
Lec and disc, M 2:30–4:25 and weekly film
viewing to be arranged. B. deBary.
A study of the Japanese film: its technical and
thematic development.

451 Japanese Religions Fall, 4 credits.
Prerequisite: 352 or permission of the instructor.
T Th 11:15–1. A. G. Grapard.
This study of the history of religion in Japan will
discuss rituals, scriptures, and social context. The
various schools of Japanese Buddhism and Shinto
and their relationships will be analyzed.

[453 Zen Buddhism Fall, 4 credits. Not offered
1978–79.
A. G. Grapard.]

**461 Chinese and Japanese Bibliography and
Reference Works** Fall, 1 credit.
Time to be arranged. C. Steenstrup.
Required of honors students and M.A. candidates.
Others admitted with permission of instructor.

**462 Japanese Historiography and Source
Materials** Spring, 4 credits. Prerequisite:
permission of the instructor.
Time arranged. C. Steenstrup.

Asia—General Courses

401 Asian Studies Honors Course Fall,
4 credits.
Staff.
Intended for seniors who have been admitted to the
honors program. Supervised reading and research
on the problem selected for honors work.

402 Asian Studies Honors: Senior Essay Fall or
spring, 4 credits. Prerequisite: admission to the
honors program.
The student, under faculty direction, will prepare an
honors essay.

403–404 Asian Studies Supervised Reading
Either or both terms. Credit arranged. Prerequisite:
permission of instructor. Open to majors and other
qualified students.
Provides the opportunity to read intensively under
the direction of a member of the staff.

For complete descriptions of courses numbered 600
or above, consult the graduate faculty representative.

650 Seminar on Asian Religions Fall or spring,
2 to 4 credits. Prerequisite: permission of the
instructor.
Time to be arranged. A. G. Grapard.
Topic to be announced annually.

701–702 Seminar in East Asian Literature 701,
fall; 702, spring, 1 to 4 credits.
Time to be arranged. Staff.

703–704 Directed Research 703, fall; 704,
spring. Credit to be arranged.
Time to be arranged. Staff.

See also:

**Economics of Agricultural Development
(Agricultural Economics 464)**

**Food, Population, and Employment (Agricultural
Economics 660)**

**Communication in the Developing Nations
(Communication Arts 624)**

**Comparative Mass Media (Communication Arts
626)**

**Philippine Agricultural Development: Policy and
Administration (International Agriculture 601)**

**Applications of Sociology to Development
Programs (Rural Sociology 751)**

**Architecture in its Cultural Context (Architecture
667–668)**

The seven courses listed above will count as
College of Arts and Sciences credit for Asian studies
majors only.

Urban Anthropology (Anthropology 313)

Sociodrama and Aesthetics (Anthropology 320)

Classic Ethnographies (Anthropology 415)

**Anthropological Approaches to the Study of
Buddhism in Asia (Anthropology 619)**

[Politics of Industrial Societies (Government 348)
Not offered 1978–79.]

[Political Role of the Military (Government 349)
Not offered 1978–79.]

Comparative Revolutions (Government 350)

The United States and Asia (Government 387)

**[Seminar in Comparative Communism
(Government 446)** Not offered 1978–79.]

**[Policymaking in Industrial Societies
(Government 456–457)** Not offered 1978–79.]

**Field Seminar in International Relations
(Government 606)**

**Graduate Seminar in Comparative Communism
(Government 648)**

**Seminar in the International Relations of Asia
(Government 687)**

**Introduction to Asian Civilizations: Origins to
1600 (History 190)**

**Introduction to Asian Civilizations: from 1600
(History 191)**

Supervised Reading (History 703–704)

**Introduction to Art History: Asian Traditions
(History of Art 280)**

Buddhist Art in Asia (History of Art 381)

**[Studies in Indian and Southeast Asian Art
(History of Art 386)** Not offered 1978–79.]

Ceramic Art of Asia (History of Art 482)

Problems in Asian Art (History of Art 580)

Supervised Readings (History of Art 591–592)

China—Area Courses

**[Traditional Chinese Society and Culture
(Anthropology 343)** Not offered 1978–79.]

[Modern Chinese Society (Anthropology 344)
Not offered 1978–79.]

**Chinese Government and Politics (Government
347)**

The Foreign Policy of China (Government 390)

**[Readings on the Great Cultural Revolution
(Government 447)** Not offered 1978–79.]

**[Capitalism and Communism: Chinese and
Japanese Patterns of Development (Government
462)** Not offered 1978–79.]

[Politics of China (Government 645) Not offered
1978–79.]

[Readings from Mao Tse-tung (Government 651)
Not offered 1978–79.]

**[Culture and the Mass Line in China (Government
654)** Not offered 1978–79.]

China and the European Psyche (History 293)

Chinese Views of Themselves (History 294)

Warfare in Premodern Societies (History 360)

**History of China up to Modern Times (History
393)**

History of China in Modern Times (History 394)

**Undergraduate Seminar in Medieval Chinese
History (History 492)**

**Self and Society in Late Imperial and Twentieth-
Century China (History 493)**

**Undergraduate Seminar: The First Chinese
Revolution, 1880–1930 (History 494)**

**Chinese Historiography and Source Materials
(History 691)**

**Problems in Modern Chinese History (History
693–694)**

**Seminar in Medieval Chinese History (History
791–792)**

**Seminar in Modern Chinese History (History
793–794)**

Art of China (History of Art 383)

**Chinese Painting and Ceramics (History of Art
385)**

**[Chinese Art of the T'ang Dynasty (History of Art
483)** Not offered 1978–79.]

Studies in Chinese Painting (History of Art 486)

[Problems in Chinese Art (History of Art 584) Not
offered 1978–79.]

Other courses dealing extensively with China are
Anthropology 322, Government 338, 347, 348, 350,
387, 456–457, 687; History 190, 191; History of Art
280, 580; Architecture 667–668.

China—Language Courses

Basic Course (Chinese 101–102)

Cantonese Basic Course (Chinese 111–112)

Intermediate Chinese I (Chinese 201–202)

Chinese Conversation (Chinese 203–204)

Intermediate Cantonese (Chinese 211–212)

Intermediate Chinese II (Chinese 301)

Intermediate Chinese III (Chinese 302)

**Chinese Conversation—Intermediate (Chinese
303–304)**

[Intermediate Cantonese II (Chinese 311–312
Not offered 1978–79.)

FALCON (full-time intensive course, Chinese
161–162)

History of the Chinese Language (Chinese
401–402)

**Linguistic Structure of Chinese: Phonology and
Morphology** (Chinese 403)

Linguistic Structure of Chinese: Syntax (Chinese
404)

Chinese Dialects (Chinese 405)

Chinese Dialect Seminar (Chinese 607)

Sino-Tibetan Linguistics (Linguistics 662)

Literature

Introduction to Classical Chinese (Chinese
213–214)

Chinese Philosophical Texts (Chinese 313)

Classical Narrative Texts (Chinese 314)

[T'ang and Sung Poetry (Chinese 420) Not
offered 1978–79.]

Readings in Modern Chinese Literature (Chinese
411–412)

Directed Study (Chinese 421–422)

Readings in Literary Criticism (Chinese 424)

Readings in Folk Literature (Chinese 430)

Seminar in Chinese Poetry and Poetics (Chinese
603)

Seminar in Chinese Fiction (Chinese 605)

Seminar in Folk Literature (Chinese 609)

Advanced Directed Reading (Chinese 621–622)

Japan—Area Courses

[Japanese Culture and Society (Anthropology
345) Not offered in 1978–79.]

[Introduction to the Japanese Economy
(Economics 366) Not offered 1978–79.]

[Contemporary Japan (Government 100) Not
offered 1978–79.]

Politics in Contemporary Japan (Government
346)

[Politics of Productivity: Germany and Japan
(Government 430) Not offered 1978–79.]

[Capitalism and Communism: Chinese and
Japanese Patterns of Development (Government
462) Not offered 1978–79.]

Other courses dealing extensively with Japan are
Anthropology 313, 322, Government 348, 387, 456–
457, 605, 687; History 190, 191; History of Art 280,
580; and Architecture 667–668.

Japan—Language Courses

Basic Course (Japanese 101–102)

Accelerated Introductory Japanese (Japanese
121–122)

Intermediate Japanese I (Japanese 201–202)

Japanese Conversation (Japanese 203–204)

Intermediate Japanese II (Japanese 301–302)

Japanese Communicative Competence
(Japanese 303–304)

Advanced Japanese (Japanese 401–402)

Linguistic Structure of Japanese (Japanese 404)

Oral Narration and Public Speaking (Japanese
407–408)

FALCON (full-time intensive course, Japanese
161–162)

Japan—Literature Courses

Introduction to Literary Japanese (Japanese
305–306)

Intermediate Literary Japanese (Japanese
405–406)

Directed Readings (Japanese 421–422)

Seminar in Modern Literature (Japanese 611)

Seminar in Classical Literature (Japanese 612)

Advanced Directed Readings (Japanese
621–622)

South Asia—Area Courses

Culture and Society in South Asia (Anthropology
341)

[South Asia (Anthropology 640) Not offered
1978–79.]

[South Asia: Readings in Special Problems
(Anthropology 641–642) Not offered 1978–79.]

[Palaeoanthropology: South Asia (Anthropology
678) Not offered 1978–79.]

Architecture in its Cultural Context (Architecture
667–668)

Government and Politics of India
(Government 351)

India: A Political Experiment (Government 451)

[Studies in Indian and Southeast Asian Art
(History of Art 386) Not offered 1978–79.]

India as a Linguistic Area (Linguistics 341)

[Dravidian Structures (Linguistics 440). Not
offered 1978–79.]

[Indo-Aryan Structures (Linguistics 442) Not
offered 1978–79.]

Comparative Indo-European Linguistics
(Linguistics 631–632)

Elementary Pali (Linguistics 640)

Elementary Sanskrit (Linguistics 641–642)

Comparative Indo-Aryan (Linguistics 644)

[Comparative Dravidian (Linguistics 646) Not
offered 1978–79.]

**The Idea of India in English Literature from the
Eighteenth Century to the Present** (Society for
the Humanities 420)

Seminar (Linguistics 700)

Directed Research (Linguistics 701–702)

Other courses dealing extensively with South Asia
are Anthropology 322; Asian Studies 250, 351;
Government 338, 387, 605, 687; History 190, 191;
History of Art 280, 386, 580; Agricultural Economics
464; Communication Arts 624, 626; and Rural
Sociology 751.

South Asia—Language Courses

Basic Course (Hindu-Urdu 101–102)

Hindi Reading (201–202)

Composition and Conversation (Hindi 203–204)

Readings in Hindi Literature (Hindi 301–302)

Advanced Composition and Conversation (Hindi
303–304)

Advanced Hindi Readings (Hindi 305–306)

[History of Hindi (Hindi 401) Not offered 1978–
79.]

Seminar in Hindi Linguistics (Hindi 700)

Basic Course in Sinhala (Sinhalese 101–102)

Sinhala Reading (Sinhalese 201–202)

Composition and Conversation (Sinhalese
203–204)

[Basic Course (Tamil 101–102) Not offered 1978–
79.]

[Basic Course (Telugu 101–102) Not offered
1978–79.]

[Telugu Reading (Telugu 201–202) Not offered
1978–79.]

Southeast Asia—Area Courses

Ethnographic Films (Anthropology 205)

Ethnicity and Tribalism (Anthropology 330)

Ethnology of Island Southeast Asia
(Anthropology 334)

[Ethnology of Mainland Southeast Asia
(Anthropology 335) Not offered 1978–79.]

[Special Problems in Anthropology (Anthropology
608) Not offered 1978–79.]

[The Anthropological Study of Art (Anthropology
610) Not offered 1978–79.]

Southeast Asia: Readings in Special Problems
(Anthropology 634–635)

Southeast Asia Seminar: Vietnam (Asian Studies
601) Fall, Credit arranged.
Staff.

Southeast Asia Seminar: The Philippines (Asian
Studies 602) Spring, Credit arranged.
Staff.

Southeast Asia Research Training Seminar
(Asian Studies 676)

[Economic Policy and Development in Southeast
Asia (Economics 365) Not offered 1978–79.]

Process of Economic Development (Economics
371/571)

[Economic Growth in Southeast Asia (Economics
678) Not offered 1978–79.]

[Seminar on Indochina (Government 300) Not offered 1978-79.]

[Government and Politics of Southeast Asia (Government 344) Not offered 1978-79.]

Political Role of the Military (Government 349)

[Political Problems of Southeast Asia (Government 652) Not offered 1978-79.]

Southeast Asian History to the Fourteenth Century (History 395)

Southeast Asian History from the Fifteenth Century (History 396)

Undergraduate Seminar in Southeast Asia in the Nineteenth Century (History 497)

Undergraduate Seminar in Southeast Asian History (History 498)

The Historiography of Southeast Asia (History 695-696)

Seminar in Southeast Asian History (History 795-796)

[Studies in Indian and Southeast Asian Art (History of Art 386) Not offered 1978-79.]

[Traditional Arts in Southeast Asia (History of Art 488) Not offered 1978-79.]

Problems of Art Criticism (History of Art 596)

Administration of Agricultural and Rural Development (International Agriculture 603)

Comparative Thai (Linguistics 578)

Field Methods (Linguistics 600)

Old Javanese (Linguistics 651-652)

[Seminar in Southeast Asian Languages (Linguistics 653-654) Not offered 1978-79.]

Malayo-Polynesian Linguistics (Linguistics 655-656)

Seminar: Mon-Khmer Linguistics (Linguistics 657)

Directed Research (Linguistics 701-702)

[Thai Dialectology (Linguistics 751) Not offered 1978-79.]

Comparative Thai (Linguistics 752)

[Tibeto-Burman Linguistics (Linguistics 753) Not offered 1978-79.]

Gamelan Ensemble (Music 446)

Rural Development and Cultural Change (Rural Sociology 355)

Subsistence Agriculture in Transition (Rural Sociology 357)

Peasants, Water, and Development (Rural Sociology 754)

Other courses dealing extensively with Southeast Asia are: Anthropology 320, 322, 611, 614, 619; Asian Studies 250, 351, 650; Government 338, 348, 350, 387, 605, 687; History 190, 191; History of Art 280, 482, 580; Agricultural Economics 464; Communication Arts 624, 626; International Agriculture 601; Rural Sociology 157; and Architecture 667-668.

Southeast Asia—Language Courses

Basic Course (Burmese 101-102)

Burmese Reading (Burmese 201-202)

Composition and Conversation (Burmese 203-204)

Advanced Burmese Reading (Burmese 301-302)

Basic Course (Cambodian 101-102)

Cambodian Reading (Cambodian 201-202)

Composition and Conversation (Cambodian 203-204)

Advanced Cambodian (Cambodian 301-302)

Directed Individual Study (Cambodian 401-402)

Structure of Cambodian (Cambodian 404)

Basic Course (Cebuano Bisayan 101-102)

Basic Course (Indonesian 101-102)

Indonesian Reading (Indonesian 201-202)

Composition and Conversation (Indonesian 203-204)

Linguistic Structure of Indonesian (Indonesian 300)

Readings in Indonesian and Malay (Indonesian 301-302)

Advanced Indonesian Conversation and Composition (Indonesian 303-304)

Advanced Readings in Indonesian and Malay Literature (Indonesian 305-306)

Linguistic Structure of Indonesian (Indonesian 403-404)

FALCON (full-time intensive course, Indonesian 161-162)

Elementary Javanese (Javanese 131-132)

Intermediate Javanese (Javanese 133-134)

Basic Course (Tagalog 101-102)

Tagalog Reading (Tagalog 201-202)

Linguistic Structure of Tagalog (Tagalog 403-404)

Basic Course (Thai 101-102)

Thai Reading (Thai 201-202)

Composition and Conversation (Thai 203-204)

Advanced Thai (Thai 301-302)

Thai Literature (Thai 305-306)

Directed Individual Study (Thai 401-402)

Basic Course (Vietnamese 101-102)

Vietnamese Reading (Vietnamese 201-202)

Composition and Conversation (Vietnamese 203-204)

Advanced Vietnamese (Vietnamese 301-302)

Directed Individual Study (Vietnamese 401-402)

Astronomy

K. Greisen, chairman; S. Beckwith, J. Burns, F. D. Drake, J. Elliot, P. J. Gierasch, T. Gold, M. O. Harwit, J. R. Houck, R. Lovelace, C. E. Sagan, E. E. Salpeter, S. Shapiro, Y. Terzian, S. Teukolsky, J. Veverka

Concentration

There is no undergraduate astronomy major. Students interested in graduate work in astronomy are advised to major in physics, mathematics, or engineering and take astronomy courses as electives. However, to provide guidance for those with a serious educational or career interest in astronomy, a concentration in this subject is recognized and can be elected as a supplement to a major in any other subject. Such students should consult with Professor Peter Gierasch, the designated adviser, regarding their programs and goals. They will be expected to take a minimum of four one-term courses in astronomy with at least two at the upperclass level; the upperclass courses have prerequisites in physics and mathematics.

Distribution Requirement

The distribution requirement in physical sciences is met by either Astronomy 101 or 111 together with 102 or 112; also by any one of these courses plus Astronomy 215, Physics 203, Geology 101, or Geology 103 plus 105; or by Astronomy 102 or 112 plus Astronomy 332.

101 The Universe Beyond the Solar System

Fall. 4 credits. Prerequisite: high school algebra. Evening exams will be scheduled.

Lec, M W F 11:15; lab, M T or W 7:30-10 p.m. Y. Terzian and F. Drake.

An examination of the universe and our place in it, and the possible existence of life and intelligence elsewhere in the cosmos. The physical nature of stars, galaxies, and quasi-stellar sources. The birth, evolution, and death of stars and the formation of the chemical elements, including discussions of supernovae, pulsars, neutron stars, and black holes. The physical state, composition, and influence of the interstellar material on the evolution of our galaxy. Modern theories of the structure and evolution of the universe.

102 The Solar System and Earth

Spring. 4 credits. Prerequisites: high school algebra and Astronomy 101 or consent of instructor. Evening exams will be scheduled.

Lec, M W F 11:15; lab, M T or W 7:30-10 p.m. P. Gierasch and T. Gold.

Formation of the solar system. Environments and internal structures of planets. Formation and structure of the earth and its atmosphere, and the evolution of the earth's surface and climate. Origin of life. The effects of civilization on our planet.

103 The Universe Beyond the Solar System

Fall. 3 credits. Identical to 101 except for omission of the laboratory. See description above. This course does not satisfy the distribution requirement in physical sciences.

104 The Solar System and Earth

Spring. 3 credits. Identical to 102 except for omission of the laboratory. See description above. This course does not satisfy the distribution requirement in physical sciences.

111 Theories of the World: Stars, Galaxies, and Cosmology

Spring. 4 credits. Intended for engineering and physical sciences freshmen. Prerequisite: introductory calculus or coregistration in Math 111 or 191. Evening exams will be scheduled.

Lec, M WF 10:10; rec, one hour each week at times to be arranged; and some evening observing periods. J. R. Houck.

The formation and evolution of stars. Supernovae, pulsars, quasars, and black holes. The interstellar medium. The structure and evolution of galaxies. Cosmology.

112 Theories of the World: The Solar System, Planets, and Life Fall. 4 credits. Intended for engineering and physical sciences freshmen. Prerequisite: introductory calculus or coregistration in Math 111 or 191. Evening exams will be scheduled.

Lec, M WF 10:10; rec, one hour each week at times to be arranged; and some evening labs to be arranged. J. Veverka.

The origin of the solar system. Celestial mechanics. The physics of planetary atmospheres, surfaces, and interiors. Spacecraft results. Prebiology and the origin of life. The detection of life elsewhere in the universe.

201 Our Home in the Universe Fall. 2 credits. S-U grades only. No prerequisites. T Th 2:30. T. Gold.

A general discussion of man's relation to the physical universe; the nature of space and time as understood in modern physics; the universe of galaxies and stars, and the particular system of planets and satellites encircling one average such star, our sun. The origin and evolution of our solar system, as revealed by modern planetary exploration. The great uncertainties that remain.

215 Information and Knowledge in Science and Engineering (also A&S 200) Fall. 4 credits. No prerequisites.

T Th 10:10–11:35. M. Harwit.

Topics to be covered include: the exact and probabilistic laws of nature; messages, information content, and entropy; the Heisenberg uncertainty principle as a fundamental limitation on what we can know about the behavior of physical systems; coding of messages, cryptography, unbreakable codes, error correcting codes; self-replicating machines; transmission of genetic information in biology; mutations and biological evolution; transmission, storage and processing of information in machines and in animals; robots and artificial intelligence; transmission of information across the universe—astronomical data and communication with intelligent civilizations. Level of *Scientific American*.

332 Elements of Astrophysics Spring. 4 credits. Prerequisites: calculus and elementary physics. M WF 11:15. J. Elliot.

A modern approach to astrophysical topics. Physical laws of radiation. Theories of the solar system. Distance, size, mass, and age of stars, galaxies, and the universe; stellar evolution and nucleosynthesis; interstellar matter and star formation. Supernovae, pulsars, and black holes. Galaxies and quasars. Introduction to cosmology. Intended for students interested in astronomy, physics, and engineering.

431 Introduction to Astrophysics and Space Sciences I Fall. 4 credits. Prerequisites: Physics 214 and 318 or their equivalent; there are no astronomy course prerequisites.

Hours to be arranged. J. R. Houck.

A systematic development of modern astrophysical concepts for physical science majors. The cosmic distance scale; dynamics and masses of astronomical bodies; atomic and electromagnetic processes in space. Introduction to star formation, stellar structure, stellar atmospheres, and the interstellar medium. At the level of *Astrophysical Concepts* by Harwit.

432 Introduction to Astrophysics and Space Science II Spring. 4 credits. Prerequisite: Astro 431 or consent of instructor.

M WF 10:10. M. Harwit.

A continuation of 431. At the level of *Astrophysical Concepts* by Harwit. Interstellar dust and gas, cosmic rays. Stellar systems, clusters. Galaxies and quasars. Cosmology. Exobiology. The emphasis will be on the formation of stars, galaxies, and the solar system.

[433 **The Sun** Not offered 1978–79.]

434 The Evolution of Planets Spring. 4 credits. Prerequisites: Physics 214 and 318 or consent of instructor.

Hours to be arranged. J. Veverka

An introduction to the physical and chemical processes that have been active in altering the environments of planets and satellites from their original to their present state. Theories of the formation of the solar system are reviewed, with special emphasis on chemical differentiation of the primeval solar nebula. A critical assessment is made of how well the various theories account for the clues left in the meteorite record, and how well they explain the current environments of the planets and satellites. The main ideas about the formation and evolution of the terrestrial planets, satellite systems, and asteroids are considered in detail. Some specific topics included are: the history of the earth/moon system; the probable evolution of Jupiter's Galilean satellites; and the comparative histories of Venus, Earth, and Mars.

440 Independent Study in Astronomy Fall or spring. 2–4 credits. Prerequisite: consent of instructor; a knowledge of 332, 431, or 434 is recommended.

Hours to be arranged. Staff.

Individual work on selected topics. A program of study is devised by the student and instructor.

490 Senior Seminar Fall. 2 credits. S-U grades only. Intended primarily for physical science majors in their senior year. Prerequisites: Phys 214 and 318 or their equivalents.

Hours and staff to be arranged.

Selected topics of modern astronomy and astrophysics.

509 General Relativity (also Physics 553) Fall. 4 credits. Prerequisite: knowledge of special relativity at the level of, for example, *Classical Mechanics* by Goldstein.

T Th 8:30–9:55. S. Teukolsky.

A systematic introduction to Einstein's theory, with emphasis on modern coordinate-free methods of computation. Topics include: review of special relativity, modern differential geometry, foundations of general relativity, laws of physics in the presence of a gravitational field, experimental tests of gravitation theories. At the level of *Gravitation* by Misner, Thorne, and Wheeler.

510 Applications of General Relativity (also Physics 554) Spring. 4 credits. Prerequisite: 509. T Th 10:10–11:35. S. Teukolsky.

A continuation of Astronomy 509 with emphasis on applications to astrophysics and cosmology. Topics include: relativistic stars, gravitational collapse and black holes, gravitational waves, cosmology.

511 High Energy Astrophysics Spring. 4 credits. Hours to be arranged. S. Shapiro.

The physics of white dwarfs, neutron stars, and black holes. The formation of compact objects; neutrino and gravitational radiation from supernova collapse. Equilibrium configurations, equations of state, stability criteria and mass limits; the influence of rotation and magnetic fields. Pulsar phenomena. Mass flow in binary systems; spherical and disk accretion; high temperature radiation processes. Compact X-ray sources and X-ray bursts.

[516 **Galactic Structure and Stellar Dynamics** Not offered 1978–79.]

520 Radio Astronomy Fall. 4 credits.

T Th 2–3:30. Evening exams will be scheduled. F. Drake and staff.

Radio astronomy telescopes and electronics; antenna theory; observing procedures and data analysis; concepts of interferometry and aperture synthesis. Radar astronomy techniques. Theories of radio emission; synchrotron emission and thermal emission; applications to the theory of radio sources. Radio astronomy of the solar system.

[521 **Radio Astrophysics** Not offered 1978–79.]

[525 **Observational Techniques of Optical Astronomy** Not offered 1978–79.]

555 Theory of the Interstellar Medium Fall. 4 credits.

M WF 2:30. E. Salpeter.

Summary of observational data; theories of ionization and thermal equilibrium of the gas; grain formation and destruction; cloud structure and star formation; interstellar effects of cosmic rays. (Will probably include some guest lectures by Prof. R. Lovelace.)

[560 **Theory of Stellar Structure and Evolution (also Physics 667)** Not offered 1978–79.]

570 Physics of the Planets Fall. 4 credits.

Hours to be arranged. C. Sagan.

Physics and chemistry of planetary atmospheres, surfaces and interiors; the roles of convective, conductive, and radiative transport; optical, infrared, radio, radar, and space-probe information; applications to exobiology and to the earth as a planet.

[571 **Mechanics of the Solar System** Not offered 1978–79.]

[575 **Radiative Transfer and Planetary Atmospheres** Not offered 1978–79.]

579 Celestial Mechanics (also T&AM 672) Spring. 3 credits.

Two 1¼ hour lectures a week at times to be arranged. J. Burns.

Orbits. 2-body, 3-body, and n-body problems. Hill curves, libration points and stability, capture problems, virial theorem. Osculating elements. Perturbation equations: effects of gravitational potentials, atmospheric drag, and radiation forces on orbits. Secular perturbations, resonance problems.

620 Seminar: Advanced Radio Astronomy Spring. 2 credits.

Hours to be arranged. Y. Terzian, F. Drake, and staff.

Advanced topics in radio astrophysics and radio astronomical data accumulation and processing methods.

[633 **Seminar: Infrared Astronomy** Not offered 1978–79.]

640 Advanced Study and Research Fall or spring. 2–4 credits.

Hours to be arranged. Staff.

Upon sufficient demand, guided reading and seminars arranged from time to time on topics not currently covered in regular courses.

660 Cosmic Electrodynamics (Also A&EP 608) Spring. 2 credits.

Hours to be arranged. R. Lovelace and T. Gold. Selected topics discussed in detail: the solar corona and wind; extra-galactic radio sources; magnetized accretion discs; and modes and instabilities of self-gravitating systems.

[671 **Special Topics in Planetary Astronomy** Not offered 1978–79.]

673 Seminar: Current Problems in Planetary Fluid Dynamics Spring. 2 credits. Prerequisite: Astro 575.
Hours to be arranged. P. Gierasch.

[680 Seminar: Cosmic Rays and High-Energy Electromagnetic Radiation (also Physics 680)] Not offered 1978-79.]

699 Seminar: Current Problems in Theoretical Astrophysics Fall. 2 credits.
Hours to be arranged. S. Shapiro

Biological Sciences

See p. 141.

Chemistry

B. Widom, chairman; A. C. Albrecht, J. M. Burlitch, B. K. Carpenter, J. C. Clardy, W. D. Cooke, E. L. Elson, R. C. Fay, M. E. Fisher, J. H. Freed, B. Ganem, M. J. Goldstein, E. R. Grant, G. G. Hammes, R. Hoffmann, P. L. Houston, R. E. Hughes, F. A. Long, F. W. McLafferty, J. Meinwald, G. H. Morrison, R. F. Porter, L. Que, J. R. Rasmussen, H. A. Scheraga, A. G. Schultz, M. F. Semmelhack, M. J. Sienko, D. A. Usher, J. R. Wiesenfeld, C. F. Wilcox

Chemistry Major

A major in chemistry permits considerable flexibility in the detailed planning of a course program. The required courses can be completed in three years, leaving the senior year open for advanced and independent work in all areas of chemistry: physical, organic, inorganic, analytical, theoretical, bioorganic, biophysical. A major in chemistry can also provide the necessary basis for significant work in related areas, such as molecular biology, chemical physics, geochemistry, chemical engineering, solid-state physics, and medicine.

The courses are arranged as a progression with some courses (including mathematics and physics) prerequisite to those that are more advanced. During the first year, the student should normally register for general chemistry (preferably but not necessarily Chemistry 215), mathematics, a Freshman Seminar course, a foreign language if necessary or, in some instances, physics. Although Chemistry 215-216 is preferred, students may begin their programs with Chemistry 207-208. Chemistry 215-216 is a limited enrollment course for those students with excellent preparation; students who are uncertain as to their preparation should consult the instructor. In the second year the student should complete calculus; take physics and organic chemistry, Quantitative Chemistry 300, if needed, and Experimental Chemistry 301. Physical Chemistry 389 and 390 and Experimental Chemistry 302 and 303 should be completed in the third year. Advanced work in chemistry and related subjects can be pursued in the fourth year and, to some extent, in the earlier years as well. The opportunity for independent research is also available. All students with questions about details of a major program are encouraged to consult with the chairman of the Department of Chemistry or the chairman's representative. Entering students exceptionally well prepared in chemistry may receive advanced placement credit for Chemistry 207-208 and proceed to a more advanced program.

Prerequisites for admission to a major in chemistry are (1) Chemistry 215-216 or 207-208 plus 300; (2) Physics 207; and (3) Mathematics 111 or 191. Students are not encouraged to undertake a major in chemistry unless they have passed those prerequisite courses at a good level of proficiency. A knowledge of simple computer programming is

essential. This may be achieved either by self-study (a syllabus is available) or by taking courses such as Computer Science 100. As a minimum, the following additional courses must then be completed for a major in chemistry: (1) Chemistry 301, 302, 303, 357-358, 389-390; (2) Mathematics 112 plus 214, 215, 216, 217; or 122 plus 221, 222; or 192 plus 293, 294; and (3) Physics 208. This sequence is a core program in chemistry. It is anticipated that the student will, through elective courses, extend it substantially in whatever direction suits his or her own needs and interests. It is particularly important that those going on to do graduate work in chemistry recognize that these requirements are minimal, and such students are strongly urged to supplement their programs, where possible, with Chemistry 404, 405, 605, 606, 607, 668, 681, and German (or Russian). Even students not planning graduate work in chemistry should consider advanced work in physics and mathematics, courses in the biological sciences, and advanced work in chemistry as possible extensions of the basic program.

The Honors Program

The honors program in chemistry offers superior students an opportunity to study independently in seminars and to gain additional experience by engaging in research during the senior year. It is particularly recommended to those who plan graduate work in chemistry. Prospective candidates should complete the introductory organic chemistry and physical chemistry sequences by the end of the junior year. However, failure to have completed those courses in the junior year does not in itself disqualify a student from the honors program. Completion of the program at a high level of performance leads to the degree of Bachelor of Arts with honors in chemistry. The requirements for admission to the honors program are an above-median cumulative average and permission of the department. Prospective candidates should discuss their plans with their advisers by March 1 of their junior year. To be awarded honors, candidates must show outstanding performance in at least eight credits of undergraduate research such as offered in Chemistry 421, 433, 461, or 477. In addition outstanding work in the Honors Seminar, Chemistry 498, is expected.

Distribution Requirement

The distribution requirement in physical science is satisfied in chemistry by Chemistry 103, 207, or 215 and 104, 208, or 216.

General identification of the courses listed below is as follows:

Inorganic: 421, 605, 606, 607, 716.

Analytical: 300, 433, 625, 627, 628.

Organic: 253, 255, 357-358, 461, 665-666, 765, 766, 770, 774.

Physical and theoretical: 287-288, 289-290, 389, 390, 392, 477, 678, 681, 789, 794, 796, 798.

Bioorganic and biophysical: 668, 672, 677, 686, 782.

Experimental: 251, 252, 301, 302, 303, 404, 405.

Environmental: 200.

Note the following:

Students registered for laboratory courses who do not appear at the first meeting of the laboratory will forfeit their registration.

Students and members of the teaching staff are required to wear safety glasses or approved eye-protective devices in all chemistry laboratories. Those who fail to cooperate with the safety program may be asked to leave the laboratories.

Preliminary examinations for all courses may be given in the evening.

103-104 Introduction to Chemistry 103, fall; 104, spring. 3 credits each term. Enrollment limited. Recommended for students who have not had high school chemistry and for those needing a less mathematical course than Chemistry 207-208. 103 is prerequisite to 104.

Lec, M W 11:15 or 12:20; lab, T or Th 8-11,

F 10:10-1:10, M W or F 1:25-4:25. Fall,

E. L. Elson; spring, M. F. Semmelhack.

An introduction to chemistry with emphasis on the important principles and facts of inorganic and organic chemistry.

200 Man in his Chemical Environment Fall. 3 credits. Offered alternate years. Enrollment limited. Prerequisites: 103-104 or 207-208.

Lec, T Th 12:20; rec, T 1:25, Th 10:10, or Th 1:25.

F. W. McLafferty.

The chemical aspects of the human environment including the composition and properties of materials as these affect man's environment. Chemical limitations on the balance between survival and quality of living.

207-208 General Chemistry 207, fall; 208, spring. 4 credits each term. Enrollment limited. Recommended for those students who will take further courses in chemistry. Prerequisite: high school chemistry; 207 or 103-104 is prerequisite to 208.

Lec: fall, T Th 9:05, 10:10, or 12:20; spring,

T Th 9:05 or 10:10; lab: fall, T W Th S 8-11;

F 10:10-1:10; M T W Th or F 1:25-4:25;

spring, M T W Th F 12:20-4:25, or S 8-12. Fall,

A. C. Albrecht, R. C. Fay; spring, R. C. Fay.

The important chemical principles and facts are covered, with considerable attention given to the quantitative aspects and to the techniques important for further work in chemistry. Second-term laboratory includes a systematic study of qualitative analysis. Note: Entering students exceptionally well prepared in chemistry may receive advanced placement credit for Chemistry 207-208 by demonstrating competence in the advanced placement examination of the College Entrance Examination Board or in the departmental examination given at Cornell before classes start in the fall.

215-216 General Chemistry and Inorganic Qualitative Analysis 215, fall; 216, spring. Fall, 4 credits; spring, 5 credits. Enrollment limited. Recommended for students who intend to specialize in chemistry or in closely related fields. Prerequisites: high school chemistry and physics at a grade of 90 or higher. 215 is prerequisite to 216. Coregistration in a calculus course at the level of Math 111 or 191 and/or high school calculus is required.

Lec: fall, M W F 12:20; one lab period, M T W Th or

F 1:25-4:25. Lec or rec: spring, M W F 12:20; two

lab periods, M T 1:25-4:25, T Th 10:10-1:10,

W F 1:25-4:25, Th 1:25-4:25, and S 8-11. Fall,

G. G. Hammes, P. L. Houston; spring, L. Que.

An intensive, systematic study of the laws and concepts of chemistry, with considerable emphasis on mathematical aspects. Second term includes systematics of inorganic chemistry. Laboratory work will cover both qualitative and quantitative analysis.

251 Introduction to Experimental Organic Chemistry Fall. 2 credits. Recommended for nonchemistry majors. Prerequisite or parallel: 253 or 357 or permission of instructor.

Lec, M 8; lab, M T W or Th 1:25-4:25, or T or Th 8-11. B. Ganem.

An introduction to synthesis and the separation and handling of materials including applications of many types of chromatography, simple and fractional distillation, crystallization, extraction, and others.

252 Elementary Experimental Organic Chemistry Spring. 2 credits. Recommended for nonchemistry majors. Prerequisite: 251.
Lec, M 8; lab, M T W or Th 1:25-4:25. J. Meinwald. A continuation of Chemistry 251.

253 Elementary Organic Chemistry Fall or spring. 4 credits. Primarily for students in the premedical and biological curricula. Prerequisite: 104 with grade of C or better, 208 or 216.
Lec. M W F S 10:10. Make-up lec may be given in the evening. Fall, J. Meinwald; spring, J. R. Rasmussen.

A study of the occurrence and properties of organic molecules and the mechanisms of organic reactions, including a brief introduction to the organic chemistry of biological systems. The student should determine the entrance requirements of the particular medical school he or she wishes to enter. Students may obtain six credits by taking Chemistry 251–253 or eight credits by taking 253–301 or 253, 251, and 252.

255 Elementary Organic Chemistry Fall or spring. 2 credits. Prerequisite: 357. For students wanting to strengthen their background in organic chemistry without taking 358.
Lec. M W F S 10:10.

Course is identical to 253 but offered only to those who have already covered a substantial portion of the material in 357.

287–288 Introductory Physical Chemistry 287 fall; 288, spring. 3 credits each term. Prerequisites: 208 or 216 and Math 111–112, or permission of instructor. 287 is prerequisite to 288.

Lec. M W F 9:05; rec. M W or F 1:25. Fall, J. Lekner; spring, P. L. Houston.
A systematic treatment of the fundamental principles of physical chemistry.

289–290 Introductory Physical Chemistry Laboratory 289, fall; 290, spring. 2 credits each term. 289 is prerequisite to 290. Coregistration in 287–288 is required.

Lab-lec. W 7:30 p.m.; two labs, M T or W Th 1:25–4:25 or, if warranted by sufficient registration, F 1:25–4:25 and S 8–11. First hours of lab on M W F devoted to Chemistry 287 recitation.
E. R. Grant.

Quantitative and qualitative methods basic to the experimental study of physical chemistry.

300 Quantitative Chemistry Fall. 2 credits. Prerequisite: 208 or advanced placement in chemistry.

Lec. F 12:20; 1 lab, M T W Th or F 1:25–4:25 or T Th 8–11. Organizational meeting of this course on first class day of semester, 12:20.
G. H. Morrison.

A laboratory course designed to emphasize the more common quantitative procedures and techniques essential to laboratory work in the sciences. The relationship between theory and application will be stressed.

301 Experimental Chemistry I Spring. 4 credits. Prerequisite: 216 or 300, and 253 or 357. Parallel registration with 253 is not recommended.
Lec. M W 8; 2 lab periods, M W 1:25–4:25, T Th 8–11, T Th 1:25–4:25. J. C. Clardy.

An introduction to synthesis and the separation and handling of materials, including applications of many types of chromatography, simple and fractional distillation, crystallization, extraction, and others.

302 Experimental Chemistry II Fall. 4 credits. Prerequisite: 301. Enrollment limited: preference given to chemistry majors.

Lec. M W 9:05; 2 lab periods, M W 1:25–4:25, T Th 9–12, or T Th 1:25–4:25. J. M. Burlitch, B. K. Carpenter.
A survey of the various aspects of qualitative and quantitative analysis of both inorganic and organic compounds, including optical spectroscopy, NMR, mass spectroscopy, statistical analysis of data, and electrochemical methods.

303 Experimental Chemistry III Spring. 4 credits. Prerequisites: 302, 389, and coregistration in 390; knowledge of computer programming is essential. Each lab section limited to 18 students.
Lec. M W 9:05 (some weeks lec on F instead of W; labs M W 1:25–4:25, T Th 8–11 or 1:25–4:25. R. F. Porter.

An introduction to the techniques of vacuum line construction and operation; the principles and assembly of electronic measuring devices, optics, and kinetics.

357–358 Introductory Organic Chemistry 357, fall; 358, spring. 3 credits each term. Prerequisites: 208, or 216, or advanced placement in chemistry; 357 is prerequisite to 358; parallel registration in 251 in the fall term or 301 in the spring term is recommended.

Lec. M W F 9:05. Optional rec may be offered.
C. F. Wilcox.
A systematic study of the more important classes of carbon compounds—reactions of their functional groups, methods of synthesis, relations, and uses.

389–390 Physical Chemistry I and II 389, fall; 390, spring. 4 credits each term. Prerequisites: Math 214, 215, 216, or ideally, 221–222; Phys 208, Chem 208 or 216 or permission of instructor; 389 is prerequisite to 390.

Lec. M W F 10:10; rec and make-up lec, W 7:30 p.m. Examinations: fall, Th 7:30 p.m.; spring, T or Th 7:30 p.m. Fall, H. A. Scheraga; spring, E. L. Elson.
A study of the principles of physical chemistry from the standpoint of the laws of thermodynamics, kinetic theory, and quantum chemistry. At the level of *Thermal Properties of Matter* by W. L. Kauzmann and *Quantum Mechanics in Chemistry* by M. W. Hanna.

[392 Introductory Quantum Mechanics Spring. 2 credits. Strongly recommended for those planning to go into graduate work in chemistry or related areas. Prerequisite: 288 or 390 or consent of instructor. Not offered 1978–79.
Lec. Th 8–9:30.

This course is designed as a quantum mechanics supplement to the one year sequence of physical chemistry. A historical view of the development of quantum mechanics is followed by applications to the translational, vibrational, rotational, and electronic properties of molecules.]

404 Advanced Measurements Laboratory Fall. 4 credits. Prerequisite: 303.

Lab. M T Th 1:25–4:25, and occasional evening lec. Alternate hours may be arranged if necessary.
R. F. Porter.
Applications of modern experimental techniques in a variety of fields. Emphasis on kinetics, spectroscopy, and electronics.

405 Techniques of Modern Synthetic Chemistry Spring. 4 credits. Enrollment limited. Selection will be based on grades in Chemistry 301 and 302. Prerequisite: 302.

Lab time required: 12 hours each week including at least 2 four-hour sessions in 2 sections: M W 1:25, T Th 1:25. First meeting will be at 4:30 p.m. on first class day of semester. Lec, first week only, at times to be arranged. J. M. Burlitch.
The syntheses of complex organic and inorganic molecules will be carried out with emphasis on the following techniques: vacuum line, high pressure, high temperature solid state, inert atmosphere, nonaqueous solvents, radioactive labeling, photochemical and electrochemical methods, solid phase peptide synthesis, and macro and micro techniques.

421 Introduction to Inorganic Research Fall or spring. 2–4 credits. Prerequisites: 303 and 389–390, or 287–288, and 289–290 with an average of B– or better, or permission of instructor.

Selected faculty.

Informal advanced laboratory and library work, planned individually in consultation with a staff member, involving the preparation and characterization of inorganic substances. A written report is required.

433 Introduction to Analytical Research Fall or spring. 2–4 credits. Prerequisites: 303 and 390 with an average of B– or better, or permission of instructor.

Selected faculty.
Informal research in the field of analytical chemistry involving both laboratory and library work.

461 Introduction to Organic Research Fall or spring. 2–4 credits. Enrollment limited to those having a record of B– or better in prerequisite courses. Prerequisites: 302 and 358, or permission of instructor.

Selected faculty.
Informal research in the field of organic chemistry involving both laboratory and library work.

477 Introduction to Research in Physical Chemistry Fall or spring. 2–4 credits. Prerequisites: 390 at an average of B– or better and permission of instructor.

Selected faculty.
Informal laboratory and library work in physical chemistry, planned individually in consultation with a staff member.

498 Honors Seminar Spring. Noncredit. Admission only on the consent of the instructor. Prerequisite or parallel: outstanding performance in either (1) or (2): (1) Two coherent 4-credit units of research in a research course such as one of the following: 421, 433, 461, or 477. (2) One 4-credit unit in a research course such as 421, 433, 461, or 477 and summer research equivalent to at least 4 credits in the same subject.

A. G. Schultz.
The seminar will be an informal presentation and discussion of selected topics in which all members participate. Individual research will be on advanced problems in chemistry under the guidance of a staff member. A written report on the research results is required.

600 General Chemistry Seminar Fall and spring. Noncredit. Required of all graduate students except those majoring in organic or bioorganic chemistry. Open to qualified juniors and seniors.
Th 4:40.

A series of talks representative of all fields of current research interest in chemistry other than organic chemistry, given by research associates, faculty members, and distinguished visitors.

605 Advanced Inorganic Chemistry I (Symmetry and Structure) Fall. 4 credits. Prerequisite: 389–390 or equivalent, or permission of instructor.

Lec. M W F 11:15. L. Que.
This is the first of a three-term sequence. Symmetry and structure of discrete molecules, translational symmetry of arrays of molecules in crystals. Group theory at the level of Cotton's *Chemical Application of Group Theory*, Schönland's *Molecular Symmetry*, and Hall's *Group Theory and Symmetry in Chemistry*. Applications include molecular orbital theory, hybridization, and molecular vibrations. Outside readings in the chemistry of nontransition elements at the level of Cotton and Wilkinson's *Advanced Inorganic Chemistry* will be assigned.

606 Advanced Inorganic Chemistry II (Structure and Dynamics) Spring. 4 credits. Prerequisite: 605 or permission of instructor.

Lec T Th 8–9:55.
The second of a three-term sequence. The development of general background and systematics through which structure, stereochemistry, and reaction mechanism of organometallic compounds can be understood and anticipated. Outside readings at the level of Coates,

Green, and Wade's *Organometallic Compounds* and Basolo and Pearson's *Inorganic Reaction Mechanisms*.

[607 Advanced Inorganic Chemistry III (Structure and Properties)] Fall. 4 credits. Prerequisite: 605 or permission of instructor. Not offered 1978–79.

Lec T Th 10:10–11:40. M. J. Sienko.
The third of a three-term sequence introduction to ligand field theory and solid-state structure and properties, at the level of Figgis' *Introduction to Ligand Fields*, Krebs' *Fundamentals of Inorganic Crystal Chemistry* and Sach's *Solid State Theory*. Outside readings in transition metal chemistry will be assigned at the level of Cotton and Wilkinson's *Advanced Inorganic Chemistry*.

[622 Chemical Communication (also Bio S 622)] Spring. 3 credits. Offered in alternate years. Enrollment limited to thirty students. Intended primarily for research-oriented students. Prerequisites: 358, Bio S 102, and Biochemistry 231. Not offered 1978–79.

Lec, M W F 1:25. J. Meinwald, T. Eisner, W. Roelofs, and guest speakers.
The production, transmission, and reception of chemical signals in communicative interactions of animals, plants, and microorganisms. Specific topics treated with varying emphasis on chemical, biochemical, neurobiological, ecological, and evolutionary principles.]

625 Advanced Analytical Chemistry I Fall. 4 credits. Open to undergraduates with permission of instructor. Prerequisite: 288 or 390 or equivalents. Lec, M W F 8: examinations will be held

T 7:30 p.m. W. D. Cooke and F. W. McLafferty.
The application of molecular spectroscopy to chemical problems. Topics discussed include ultraviolet, infrared, NMR, Raman, and mass spectroscopy.

[627 Advanced Analytical Chemistry II] Spring. 3 credits. Offered in alternate years. Primarily for graduate students. Prerequisite: 288 or 390 or equivalents. Not offered 1978–79.

Lec, T Th 9:05; problem sessions and examinations, T 7:30. F. W. McLafferty.
Modern analytical methods, including electron, Mössbauer, and Fourier spectroscopy; mass spectrometry; methods applicable to macromolecules; information theory.]

628 Advanced Analytical Chemistry III Spring. 3 credits. Offered in alternate years. Primarily for graduate students. Prerequisite: 288 or 390 or equivalents.

Lec, T Th 9:05. G. H. Morrison.
Modern trace, micro, and surface methods of analysis, including atomic spectrometry, solids mass spectrometry, activation analysis, microscopes, microprobes, and electron spectroscopy.

650–651 Seminar in Organic Chemistry 650, fall; 651, spring. Noncredit. Required of all graduate students majoring in organic or bioorganic chemistry. Open to qualified juniors and seniors. M 8:15 p.m.

A series of talks representative of all fields of current research interest in organic chemistry, given by research associates, faculty members, and distinguished visitors.

665 Advanced Organic Chemistry Fall. 4 credits. Primarily for graduate students and upperclass undergraduates. Prerequisites: 253 or 358 and 390, or equivalents, or permission of instructor.

Lec, M W F 12:20; make-up lectures and examinations, Th 7:30 p.m. M. J. Goldstein.
An analysis of the simplest organic reactions. The principal aim is to provide the student with the skills

and background needed to predict the reactivity patterns and stereochemical preferences of new molecules in a variety of experimental environments.

666 Synthetic Organic Chemistry Spring. 4 credits. Primarily for graduate students and upperclass undergraduates. Prerequisites: 665 or permission of instructor.

Lec, M W 9:05 and a third hour to be arranged. B. Ganem.
Modern techniques of synthesis; applications of organic reaction mechanisms to the problems encountered in rational multistep synthesis, with particular emphasis on newer developments.

668 Chemical Aspects of Biological Processes Fall. 4 credits. Prerequisites: 358 and 389–390, or 287–288, or equivalents.

Lec, M W F 10:10. D. A. Usher.
Biochemical systems, bioenergetics, enzymes, metabolic pathways, chemical evolution. This course forms the chemical basis for the graduate program in molecular biology.

672 Enzyme Catalysis and Regulation Spring. 4 credits. Primarily for graduate students in chemistry and biochemistry. Prerequisites: 357–358 and 389–390, or equivalents, and a course in general biochemistry.

Lec, M W F 11:15 and occasional lec, W 7 p.m. G. G. Hammes.
Protein structure and dynamics, steady state and transient kinetics, binding isotherms, chemical modification of enzymes, application of NMR, EPR, and fluorescence, acid-base catalysis, allosterism; discussion of specific enzymes to illustrate general principles.

[677 Chemistry of Nucleic Acids] Spring. 4 credits. S-U grades only. Offered in alternate years. Primarily for graduate students. Prerequisites: 358 and 390 or equivalents. Not offered 1978–79.

Lec, M W F 8. E. L. Elson.
Properties, synthesis, and reaction of nucleic acids.]

678 Thermodynamics Spring. 4 credits. Primarily for graduate students. Prerequisite: 288 or 390 or equivalents.

Lec, T Th 8:30–9:55; disc to be arranged. J. H. Freed.
Development of the general laws of equilibria and nonequilibrium thermodynamics and investigation of their statistical basis. Applications to the study of physicochemical equilibrium and steady states in gases, liquids, solids, and liquid solutions.

681 Physical Chemistry III Fall. 4 credits. Prerequisites: 288 or 390; Math 214, 215, 216, 217, and Phys 208; or equivalents.

Lec, M W F 10:10, occasional lectures W 7:30 p.m. J. H. Freed.
A discussion of advanced topics in physical chemistry, including an introduction to the principles of quantum theory and statistical mechanics, atomic and molecular spectra, and elementary valence theory. At the level of *Atoms and Molecules* by Karplus and Porter.

686 Physical Chemistry of Proteins Spring. 4 credits. Offered in alternate years. Primarily for graduate students. Prerequisites: 288 or 390 or equivalents.

Lec, M W F 8, S 11:15, and occasionally W 7:30 p.m. H. A. Scheraga.
Chemical constitution, molecular weight, and structural basis of proteins; thermodynamic, hydrodynamic, optical, and electrical properties; protein and enzyme reactions; statistical mechanics of helix-coil transition in biopolymers; conformation of biopolymers; protein folding.

700 Baker Lectures Noncredit. Fall, on dates to be announced.

Lec, T Th 11:15. J. M. Lehn, University of Strasbourg.
Distinguished scientists who have made significant contributions to chemistry present lectures for periods varying from a few weeks to a full term.

701–702 Introductory Graduate Seminar in Analytical, Inorganic, and Physical Chemistry 701, fall; 702 spring. Noncredit. Required of all first-year graduate students majoring in analytical, inorganic, physical, theoretical, biophysical, and bioorganic chemistry.

Hours to be arranged. D. A. Usher.

[716 Selected Topics in Advanced Inorganic Chemistry] Fall. 3 credits. S-U grades only. Prerequisite: 390 or equivalent. Not offered 1978–79.

Lec, T Th 12:20.
Topics vary from year to year.]

765 Physical Organic Chemistry I Spring. 4 credits. Primarily for graduate students. Prerequisite: 665 or permission of instructor.

Lec, M W 8 and a third hour to be arranged; make-up lec, W 7:30 p.m. B. K. Carpenter.
Continues and extends the approach of 665 to more complicated organic reactions. Particular emphasis will be placed on the applications of reaction kinetics and isotope effects to an understanding of reaction mechanisms.

[766 Physical Organic Chemistry II] Spring. 3 credits. Primarily for graduate students. Prerequisite: 765 or permission of instructor. Not offered 1978–79. Quantitative aspects of organic chemistry.]

770 Selected Topics in Organic Chemistry Fall. 3 credits. Primarily for graduate students. Prerequisites: 665–666 or permission of instructor.

Lec, M W 11:15. M. F. Semmelhack.
Topics vary from year to year.

774 Chemistry of Natural Products Fall. 3 credits. Primarily for graduate students. Prerequisites: 665–666.

Lec, T Th 12:20. A. G. Schultz.
Particular attention will be devoted to methods of structure determination and synthesis as applied to selected terpenes, steroids, alkaloids, and antibiotics.

780 Principles of Chemical Kinetics Fall. 4 credits. Prerequisite: 681 or permission of instructor.

Lec, M W F 9:05 and occasionally T 7 p.m. G. G. Hammes and P. L. Houston.
Principles and theories of chemical kinetics; special topics including fast reactions in liquids, enzymatic reactions, shock tubes, and molecular beams.

782 Special Topics in Biophysical and Bioorganic Chemistry Spring. Noncredit. Primarily for graduate students.

Lec, T Th 11:15. Dates to be announced. Topics, which are presented by distinguished visitors, vary from year to year.

789 X-ray Crystallography Fall. 4 credits. Prerequisite: 288 or 390 or permission of instructor.

Meeting times to be arranged. Offered only when sufficient registration warrants. J. Clardy.
A beginning course in the application of x-ray crystallography to structural chemistry. Topics will include symmetry properties of crystals, diffraction of x-rays by crystals, interpretation of diffraction data and refinement of structures. The chemical information available from a diffraction experiment will be stressed and theoretical aspects will be illustrated by conducting an actual structure determination as a classroom exercise. At the level of Ladd and Palmer's *Structure Determination by X-ray Crystallography*.

793 Quantum Mechanics I Fall, 4 credits.

Prerequisites: 681 and coregistration in Math 421, and Phys 431, or equivalents, or permission of instructor.

Lec, T Th S 9:05. R. E. Hughes.
Schrödinger's equation, wave packets, uncertainty principle, WKB theory, matrix mechanics, orbital and spin angular momentum, exclusion principle, perturbation theory, variational principle, Born-Oppenheimer approximation. At the level of Bohm's *Quantum Theory*.

794 Quantum Mechanics II Spring, 4 credits.

Prerequisites: 793 or equivalent and coregistration in Phys 432 and Math 422, or permission of instructor.

Lec, M W F 10:10. R. Hoffmann.
Time-dependent phenomena in quantum mechanics and interaction with radiation. Spectroscopy. Elementary theory of ESR and NMR. Electronic structure of atoms and molecules.

796 Statistical Mechanics (also Physics 562)

Spring, 4 credits. Primarily for graduate students. Prerequisite: 793 or equivalent.

Lec, T Th S 8:30-9:50. B. Widom.
Ensembles and partition functions. Thermodynamic properties of ideal gases and crystals. Third law of thermodynamics, equilibrium constants, vapor pressures, imperfect gases, and virial coefficients. Distribution and correlation functions, structure and properties of liquids. Lattice statistics and phase transitions. Bose-Einstein and Fermi-Dirac ideal gases. At the level of Hill's *Statistical Thermodynamics*.

[798 Selected Topics in Physical Chemistry]

Spring, 3 credits. Lec, T Th S 9:05. Not offered 1978-79.]

The Classics

K. Clinton, chairman; L. S. Abel, F. M. Ahl, E. Asmis, J. E. Coleman (graduate faculty representative), J. R. Ginsburg, W. R. Johnson, G. M. Kirkwood, P. Kirkwood, P. I. Kuniholm, D. L. Malone, G. M. Messing, J. J. O'Donnell, P. Pucci, S. Stambler

The Department of Classics offers majors in Classics, Greek, Latin, and Classical civilization.

Classics

Those whose major study is in Classics must complete twenty-four credits in advanced courses in Greek or Latin (courses numbered 201 or above) and fifteen credits in related subjects, selected after a conference with the adviser.

Classical Civilization

Those whose major study is in Classical civilization must complete (a) qualification in Latin and Greek or proficiency in either; (b) twenty-four credits selected from the courses listed under Classical civilization, Classical archaeology, Latin, and Greek; and (c) fifteen credits in related subjects. Related subjects for this purpose may be any courses in the humanities selected in conference with the adviser.

Greek

Those whose major study is in Greek must complete twenty-four credits of advanced courses in Greek and fifteen credits in related subjects (including Latin). One or more courses offered by the Department of Comparative Literature may be counted towards the required twenty-four credits of Greek if students obtain the prior approval of their major adviser.

Latin

The major in Latin is parallel to the major in Greek.

Study Abroad

Cornell is a participant in the Intercollegiate Center for Classical Studies in Rome, which offers courses in Latin, Greek, ancient history, art, archaeology, and Italian. Cornell is also a member institution of the American School of Classical Studies at Athens, whose Summer Program is open to graduate students and qualified undergraduates. Detailed information on these programs is available in the Department of Classics office, 120A Goldwin Smith Hall.

The Honors Program

Candidates for the degree of Bachelor of Arts with honors in Classics, Greek, Latin, or Classical civilization must fulfill the requirements of the appropriate major study, as prescribed in the foregoing paragraphs and also must complete successfully the special honors courses 370, 471, and 472. Credit for honors courses may be included in the credits required for the major study. Students who wish to become candidates for honors, who have a cumulative average of B- or better, and have demonstrated superior performance in Classics courses (Greek, Latin and Classical civilization) should, after consulting a member of the department, submit an outline of their proposed honors work to the honors committee during the first month of their fifth semester.

Ancient Mediterranean Studies

See p. 129.

Distribution Requirement

The distribution requirement in the humanities is satisfied in Classics by (a) any two courses in Greek beginning with 201 or in Latin beginning with 205 that form a reasonable sequence; or (b) any two of the following: Classics 100, 119, 120, 121, 211, 212, 220, 221, 224, 225, 226, 232, 233, 236, 237, 238, 300, 304, 309, 320, 321, 322, 323, 326, 331, 332, 333, 336, 337, 339, 340, 345, 360, 363, 365, 365A, 426, 428, 430, 431, 610, 629, 630.

Greek

101 Greek for Beginners Fall or spring, 4 credits.

Fall: M T W F 9:05. D. Malone; M T W F 12:20. S. Stambler. Spring: M T W F 12:20. G. M. Kirkwood.

Introduction to Attic Greek. Designed to enable the student to read the ancient authors as soon as possible.

103 Attic Greek Spring, 3 credits. Prerequisite: Classics 101 or equivalent.

M W F 12:20. D. Malone.

111 Modern Greek Fall, 3 credits.

M W F 9:05. G. M. Messing.

112 Modern Greek Spring, 3 credits.

Prerequisite: Classics 111.

M W F 9:05. G. M. Messing.

201 Attic Authors: Xenophon and Lysias Fall, 3 credits. Prerequisite: Classics 103 or equivalent.

M W F 12:20. E. Asmis.
Attention is given both to the exact understanding of the Greek texts and to the relevant literary and historical questions.

202 New Testament Greek Spring, 3 credits.

Prerequisite: Classics 103 or equivalent.

M W F 9:05. J. J. O'Donnell.

Selected readings in the New Testament, chosen to sample the authors and genres included in the canon. Primary attention will be given to increasing the precision and fluency of the student's reading of the text, but there will be discussion of historical and religious points at issue as they occur.

203 Homer Spring, 3 credits. Prerequisite:

Classics 103 or equivalent.

M W F 9:05. P. Pucci.

Readings in the Homeric epic.

204 Plato Spring, 3 credits. Prerequisite:

Classics 103 or equivalent.

M W F 11:15. D. Malone.

Plato's *Apology* and other selected readings.

[209-210 Greek Composition 209, fall; 210, spring, 2 credits each term. Prerequisite: Classics 103 or equivalent. Not offered 1978-79.]

[301 Greek Historians 4 credits. Prerequisite: Classics 203, 204, or equivalent. Not offered 1978-79.]

[302 Greek Tragedy 4 credits. Prerequisite: Classics 203, 204, or equivalent. Not offered 1978-79.]

[305 Attic Comedy 4 credits. Prerequisite:

Classics 203, 204, or equivalent. Not offered

1978-79.]

306 Greek Melic, Elegiac, and Bucolic Poetry

Fall, 4 credits. Prerequisite: Classics 203, 204, or equivalent.

M W F 11:15. G. M. Kirkwood.

307 Plato Spring, 4 credits. Prerequisite:

Classics 203, 204, or equivalent.

T Th 10:10-11:25. E. Asmis.

A reading of two or three complete dialogues of Plato. Attention will be given to both grammar and philosophical content.

310 Greek Undergraduate Seminar: Plato's Symposium

Fall, 4 credits. Prerequisite: two terms of 200-level Greek or permission of instructor.

T Th 10:10-11:25. P. Pucci.

The literary and stylistical aspects of Plato's writing.

401-402 Independent Study For qualified

majors.

417 Advanced Readings in Greek Literature: Homer

Fall, 4 credits. For advanced undergraduates and graduate students. Prerequisite: two terms of 300-level Greek or permission of instructor.

M W F 1:25, T 11:30. K. Clinton, J. E. Coleman.

An introduction to advanced study of Homer. Two meetings each week will treat general topics and problems in Homeric composition and literary criticism, Homeric culture, society, and archaeology. The other two meetings will involve close study of sections of the text related to these topics. Jointly taught.

418 Advanced Readings in Greek Literature: Herodotus

Spring, 4 credits. Prerequisite: two

terms of 300-level Greek or permission of instructor.

M W F 1:25. S. Stambler.

419 Advanced Greek Composition Fall,

2 credits. Prerequisite: 209-219 or equivalent.

M 2:30-3:45. S. Stambler.

[421 Advanced Readings in Greek Orators

Spring, 4 credits. Prerequisite: two terms of 300-level Greek or permission of instructor. Not offered 1978-79.]

[442 Greek Philosophy 4 credits. Prerequisite: two terms of 300-level Greek or permission of instructor. Not offered 1978-79.]

671 Seminar Fall. 4 credits.
T 3-5. G. M. Kirkwood.
Sophocles: The Diptych Plays.

672 Seminar Spring. 4 credits.
T 3-5. P. Pucci.
Aristophanes.

701-702 Independent Study for Graduate Students

Latin

Placement of first-year students in Latin courses is determined by an examination given by the Department of Classics during orientation week, or, if necessary, in the second half of the fall term. Tentative placement is made on the basis of the previous training listed below as prerequisite for each course and the College Board achievement test scores.

105 Latin for Beginners Fall. 4 credits.
M T W F 8, P. Kirkwood; M T W F 10:10;
M T W F 1:25.

An introductory course in the essentials of the Latin language, designed for rapid progress towards reading the principal Latin writers.

106 Elementary Latin Spring. 3 credits.
Prerequisite: Classics 105 or placement by department examination.

M W F 8, P. Kirkwood; M W F 10:10; M W F 1:25.
Continues the work of Classics 105, followed by readings from various authors.

107 Intensive Latin Spring. 7 credits.
M T W Th F 8, additional session to be arranged.
F. Ahl.
This course combines Classics 105 and 106 in one term.

108 Latin in Review Fall. 3 credits. Prerequisite: two years of high school Latin or placement by departmental examination.
M W F 11:15. P. Kirkwood.

205 Intermediate Latin Fall. 3 credits.
Prerequisite: Classics 106, 108, or placement by departmental examination.
M W F 10:10, J. Ginsburg; M W F 12:20. R. Basto.
Selected readings in Latin literature.

[207 Catullus Spring. 3 credits. Prerequisite: Classics 106, 108, or placement by departmental examination. Not offered 1978-79.]

208 Roman Drama Spring. 3 credits.
Prerequisite: Classics 106, 108, or one term of 200-level Latin.
M W F 10:10. G. M. Kirkwood.
Readings in Roman comedy.

216 Vergil Spring. 3 credits. Prerequisite: one term of 200-level Latin.
M W F 11:15. K. Clinton.
Selections from Vergil's *Aeneid* will be read with emphasis on Vergil's use of the epic tradition, his own poetic milieu, his poetic techniques, and his relation to the politics of his time.

241-242 Latin Composition 241, fall; 242, spring. 2 credits each term. Prerequisite: Classics 106, 108, or equivalent.
Fall: W 2:30-3:45, P. Pucci; spring: W 2:30-3:45, J. Ginsburg.

312 Latin Undergraduate Seminar: Roman Rhetoric Spring. 4 credits. Prerequisite: two terms of 200-level Latin or permission of instructor.
T Th 12:20-1:35. D. Malone.

Areas of major emphasis will include: Roman views of their own development in the art of oratory; the relation of theories of public speaking to its practice; the influence of government on the forms of oratory. Students will be encouraged to read as much of the material as possible in Latin and will be asked to devote considerable effort to writing a paper.

314 The Augustan Age Fall. 4 credits.
Prerequisite: two terms of 200-level Latin.
T Th 12:20-1:35. A. Pomeroy.

Readings in Horace and Vergil to illustrate the poetics and politics of Augustan Rome.

315 Roman Satire Spring. 4 credits.
Prerequisite: two terms of 200-level Latin.
M W F 11:15. J. J. O'Donnell.
Ovid, *Ars Amatoria* and Juvenal, *Satires*.

[316 Roman Philosophical Writers Spring. 4 credits. Prerequisite: two terms of 200-level Latin. Not offered 1978-79.]

[317 Roman Historiography Spring. 4 credits. Prerequisite: one term of 300-level Latin. Not offered 1978-79.]

[318 Roman Elegy: Tibullus, Propertius, Ovid Fall. 4 credits. Prerequisite: two terms of 200-level Latin. Not offered 1978-79.]

366 Late Latin Fall. 4 credits. Prerequisite: permission of instructor.
M W F 11:15. J. J. O'Donnell.
Bede, *Ecclesiastical History of England*.

[368 Medieval Latin Literature 4 credits. Prerequisite: Classics 214 or permission of instructor. Not offered 1978-79.]

[411 Advanced Readings in Latin Literature Fall. 4 credits. For advanced undergraduates and graduate students. Prerequisite: two terms of 300-level Latin or permission of instructor. Not offered 1978-79.]

412 Advanced Readings in Latin Literature: The Latin Epic after Vergil Spring. 4 credits. For advanced undergraduates and graduate students. Prerequisite: two terms of 300-level Latin or permission of instructor.
M W F 2:30. F. M. Ahl.

Readings in translation and in the original from *Metamorphoses*, *Pharsalia*, *Punica*, and *Thebaid* to establish the continuity and changes in the Latin epic tradition.

[441 Advanced Latin Composition Spring. 2 credits. Prerequisite: 241-242 or graduate standing. Not offered 1978-79.]

451-452 Independent Study For qualified majors.

[460 The Latin Poems of Milton 4 credits. W. R. Johnson. Not offered 1978-79.]

679 Seminar Fall. 4 credits.
Th 3-5. E. Asmis.
Lucretius: a philosophical examination.

680 Seminar Spring. 4 credits.
Th 3-5. J. Ginsburg.
Sallust.

751-752 Independent Study for Graduate Students

Honors Courses

370 Honors Course Spring. 4 credits. To be taken in the junior year.
A program of readings and conferences centered on an author or topic chosen in accordance with the special interests of the student and instructor.

471 Honors Course Fall. 4 credits. To be taken in the senior year.
Continuation of 370, with change of author or topic.

472 Honors Course: Senior Essay Spring. 4 credits.
For students who have successfully completed Classics 471. Topics must be approved by the honors advisor at the end of the first term of the senior year.

Classical Linguistics

[420 History of the Greek Language 3 credits. G. M. Messing. Not offered 1978-79.]

[423 Vulgar Latin 4 credits. Not offered 1978-79. G. M. Messing.]

[424 Italic Dialects 4 credits. G. M. Messing. Not offered 1978-79.]

425 Greek Dialects Spring. 4 credits.
To be arranged. G. M. Messing.
Selected inscriptions will be read in the various ancient Greek dialects, including Mycenaean.

Classical Archaeology

The following courses may be used toward satisfaction of the intercollege concentration in archaeology; see Archaeology, p. 51 and below, under Classical civilization, for other courses dealing with Classical art and architecture.

220 Introduction to Classical Archaeology (also History of Art 220) Fall. 3 credits.

M W F 9:05. J. E. Coleman.
Life in the Classical world as revealed by the archaeologist's spade, from the pioneering discoveries to the results of modern scientific excavation: market places and sanctuaries; everyday objects and dedications to the gods; tombs and their treasures.

221 Minoan-Mycenaean Art and Archaeology (also History of Art 221) Spring. 3 credits.

M W F 9:05. J. E. Coleman.
The early age of Greece from the Neolithic period to the end of the Bronze Age, with special emphasis on Minoan and Mycenaean civilizations.

232-233 Archaeology in Action I and II 232, fall; 233, spring. 3 credits each term. Prerequisite: Archaeology 100, Classics 220, or permission of the instructor.

Lec, M 2:30; 2 lab sessions to be arranged.
P. I. Kuniholm.
Objects from the Classical, Hellenistic, and Roman periods are "dug" out of Cornell basements, identified, cleaned, restored, catalogued, and photographed, and are considered in their appropriate historic, artistic, and cultural contexts.

309 Dendrochronology of the Aegean Fall or spring. Variable credit. Prerequisite: permission of instructor. Enrollment limited to 10.

Lec, M 12:20; 2 lab sessions to be arranged.
P. I. Kuniholm.
Participation in a research project of dating modern and ancient tree ring samples from the Aegean and Mediterranean. Supervised reading and laboratory work. A possibility exists for summer fieldwork in Greece or Turkey.

320 Arts and Monuments of Athens (also Art H 320) Fall. 4 credits. Prerequisite: Classics 220 or permission of instructor.

T Th 2:30-4. P. I. Kuniholm.
Detailed study of the monuments and crafts of Athens from the Geometric to the Roman period: the Acropolis and the Agora, Attic pottery and sculpture, etc., considered within their cultural context. Lectures and student reports.

[321 Archaeology of Cyprus (also Art H 321)
Not offered 1978-79.]

322 Greeks and their Eastern Neighbors
Spring. 4 credits. Prerequisite: Classics 220, 221, or permission of instructor.
T Th 2:30-4. P. I. Kuniholm.

A study of the Eastern Mediterranean from the eighth through the fourth centuries B.C. Emphasis on the Phrygians, Lydians, Carians, Lycians, Ionians, and others.

[323 Painting in the Greek and Roman World (also Art H 323) Not offered 1978-79.]

[326 Art and Archaeology of Archaic Greece (also Art H 326) Not offered 1978-79.]

[350 Arts of the Roman Empire (also Art H 322)
Not offered 1978-79.]

629 Seminar in Aegean Archaeology Spring.
4 credits.
W 2:30-4:30. J. E. Coleman.

Current problems and questions in Minoan-Mycenaean archaeology. The topics will focus on eastern interconnections and the intermediary role of Cyprus, and will deal especially with the evidence for religion, language, and trade.

[630 Seminar in Classical Greek Archaeology
4 credits. Not offered 1978-79.]

Classical Civilization

No knowledge of Greek or Latin is needed for these courses.

100 Word Power: Greek and Latin Elements in the English Language Fall. 3 credits.
T Th 8:35-9:50. G. M. Messing.

This course gives the student with no knowledge of Classical languages an understanding of how the Greek and Latin elements, which make up over half our English vocabulary, operate in English usage, both literary and scientific. Attention will be paid to how words acquire their meaning, and to enlarging each student's working knowledge of vocabulary and grammar.

119 Freshman Seminar in Greek Literature Fall or spring. 3 credits.
M W F 9:05. Fall: R. Basto; spring: S. Stambler.

120 Freshman Seminar in Latin Literature Fall or spring. 3 credits.
Fall: M W F 12:20. D. Malone; M W F 1:25. J. Ginsburg. Spring: M W F 12:20.

121 Freshman Seminar in Archaeology Fall or spring. 3 credits.
T Th 10:10-11:25. R. Palmer.

211 The Greek Experience Fall. 3 credits.
M W F 10:10. F. M. Ahl.
An introduction to the literature and thought of ancient Greece with emphasis on their oral and dramatic presentation and intellectual and visual contexts. There will be analysis of tragedy and comedy, satire, and epic and lyric poetry; also selected prose works, augmented by films, slides, playreadings, and individual student interpretations.

212 The Roman Experience Spring. 3 credits.
M W F 10:10. J. Ginsburg.
An introduction to the civilization of the Romans as expressed in their literature, art, and social and political institutions. This course will examine not only the intellectual life of the Romans, but what it meant for men and women of all social classes to live in the Roman world. Selected readings (in translation) of works of literature, history, and philosophy, supplemented by slides and other visual materials.

220 Introduction to Classical Archaeology (also Art H 220) See above under Classical Archaeology.

221 Minoan-Mycenaean Art and Archaeology (also Art H 221) See above under Classical Archaeology.

[224 Greek Philosophy Fall. 3 credits. Not offered 1978-79.]

[225 Hellenistic and Roman Philosophy Spring. 3 credits. Not offered 1978-79.]

226 The Genius of Christianity Fall. 3 credits.
M W F 9:05. J. J. O'Donnell.
An evocation of the spirit of the Christian religion over the course of its history. Lectures will survey varieties of Christian experience from New Testament origins to contemporary controversies, while readings will be chosen from the classics of Christian literature. Authors read will include theologians, apologists, poets, and mystics from all periods.

232-233 Archaeology in Action I and II See above under Classical Archaeology.

236 Greek Mythology (also C Lit 236) Fall. 3 credits.
M W F 10:10. P. Pucci.
A survey of the Greek myths, with emphasis on myths that have entered the postclassical Western tradition. Of the aspects of mythology to be studied the following will be among the most important: what "myth" meant to the Greeks; the factors and influences involved in the creation of myths; and the significance of myths in daily life, religion, and thought. Comparison and contrast with Roman attitudes to myth.

[237 Greek and Roman Mystery Religions
3 credits. Not offered 1978-79.]

238 The Ancient Epic: Homer and Vergil
Spring. 3 credits.
M W F 12:20. K. Clinton.
A full discussion of the most outstanding epics of the ancient world, Homer's *Iliad* and *Odyssey* and Vergil's *Aeneid*, with some attention to other ancient epics. Interpretation of the three epics as works of art and the development of the epic genre in antiquity will be of primary concern.

300 Greek and Roman Drama (also C Lit 300)
Spring. 4 credits.
T Th 10:10-11:25. G. M. Kirkwood.

A study of ancient tragedy and comedy as exemplified by representative plays, read in translation, of Aeschylus, Sophocles, Euripides, Aristophanes, Menander, Plautus, Terence, and Seneca. Main emphasis is on Greek tragedy. Consideration also of the development of the Greek theater (illustrated) and its relationship to the form and presentation of the dramas; the origins of tragedy; the influence of Greek tragedy and Seneca on later European drama.

[304 Roman Law 4 credits. Not offered 1978-79.]

309 Dendrochronology of the Aegean See above under Classical Archaeology.

320 Arts and Monuments of Athens (also Art H 320) See above under Classical Archaeology.

[321 Archaeology of Cyprus (also Art H 321)
See above under Classical Archaeology. Not offered 1978-79.]

322 Greeks and their Eastern Neighbors See above under Classical Archaeology.

[326 Art and Archaeology of Archaic Greece (also Art H 326) Not offered 1978-79.]

[331 Greek Foundations of Western Literature (also C Lit 331) 4 credits. Not offered 1978-79.]

[332 Pagan and Christian at Rome (also C Lit 332) 4 credits. Not offered 1978-79.]

[333 Latin Foundations of Western Literature (also C Lit 333) 4 credits. Not offered 1978-79.]

336 Foundations of Western Thought: Plato and His Influence Spring. 4 credits.
T Th 12:20-1:35. E. Asmis.

A reading of select dialogues of Plato (including *Phaedo*, *Phaedrus*, *Timaeus*), and a study of his influence in ancient times and into the Renaissance.

337 Ancient Philosophy of Science Fall. 4 credits.

T Th 10:10-11:25. E. Asmis.
An introduction to Aristotle's view on science (on physics and biology in particular), and to the views of later scientific thinkers, including Galen.

339 Ancient Wit: An Introduction to the Theory and Form of Comic and Satiric Writing in Greece and Rome (also C Lit 339) Spring. 4 credits.
M W F 11:15. F. M. Ahl.

The aim is not only to provide an introduction to comedy, satire, and other humorous writing in Greek and Roman literature, but to discuss the ancient works in the light of modern theories of comedy and laughter. Discussion of the nature of laughter itself in the light of both ancient and modern scholarship on the subject, from Plato's *Philebus* to Freud's *Wit and its Relation to the Unconscious* and Koestler's *The Act of Creation*. Examination of select works and passages of Homer, Euripides, Aristophanes, Hierocles, Lucian, Nonnus, Plautus, Horace, Martial, Juvenal, and Petronius.

345 Greek and Roman Historians Fall. 4 credits.

M W F 12:20. S. Stambler.
Study of historical writing in antiquity through selected readings (in translation) from the Greek and Roman historians. Among the topics to be examined are: the historian's task as understood by the ancients; the method, narrative technique and accuracy of the Greek and Roman historians; their attitudes to the events which they relate.

363 Women in Classical Greece and Rome (also Womns 363) Spring. 4 credits.
T Th 12:20. L. Abel.

In this course students will examine the evidence about the social and political position of women in ancient Greece and Rome. The purpose will be to trace the origins of some Western attitudes about women and to address general historical questions about the nature of evidence, basic chronology, and the development of political systems.

[365 Cicero and His Age (also Hist 365)
4 credits. Not offered 1978-79.
W. R. Johnson, A. Bernstein.]

[426 Augustine Spring. 4 credits. Prerequisite: Classics 428 or permission of instructor. Not offered 1978-79.
J. J. O'Donnell.]

428 The Church of the Fathers Spring. 4 credits.
W 2:30-4:30. J. J. O'Donnell.

A rigorous historical survey of the development of doctrines and ecclesiastical institutions in the early church from the second through eighth centuries. Readings from original sources in translation.

[430 Genre and Period in Greek and Roman Literature (also C Lit 430) 4 credits. Prerequisite: one upper-division course in Classics, comparative literature, English, or the modern foreign languages; senior standing or permission of instructor. Not offered 1978-79.]

[610 Language of Myth (also Anthr 610) 4 credits. Not offered 1978-79.
P. Pucci, J. Siegel.]

629 Seminar in Aegean Archaeology See above under Classical Archaeology.

[630 Seminar in Classical Greek Archaeology See above under Classical Archaeology. Not offered 1978-79.]

711-712 Independent Study for Graduate Students

See also:

Architecture of the Ancient Near East (Architecture 340)

Architecture of the Classical World (Architecture 341)

Seminar in Architecture of the Ancient Near East (Architecture 640)

Seminar in Architecture of the Classical World (Architecture 641)

The Ancient City: Plato and Machiavelli (History 261)

[The Emergence of Greek Democracy (History 265) Not offered 1978-79.]

The Roman Republic (History 267)

Rome of the Caesars (History 268)

[Archaic Greece, 776-500 B.C. (History 450) Not offered 1978-79.]

Greece from Cleisthenes to Cleon, 514-429 B.C. (History 452)

Thucydides and the Peloponnesian War, 432-404 B.C. (History 453)

[Greece in the Age of Lysander and Agesilaus, 410-360 B.C. (History 454) Not offered 1978-79.]

[Philip of Macedon and Alexander the Great (History 455) Not offered 1978-79.]

Roman Imperialism (History 460)

The Roman Revolution (History 461)

[The High Roman Empire (History 462) Not offered 1978-79.]

[Decline and Fall of the Roman Empire (History 463) Not offered 1978-79.]

[Science in Classical Antiquity (History 481-482) Not offered 1978-79.]

[Social and Economic History of Ancient Rome (History 561) Not offered 1978-79.]

[Roman Africa (History 562) Not offered 1978-79.]

[Graduate Seminar in Ancient Classical History (History 661) Not offered 1978-79.]

[Painting in the Greek and Roman World (History of Art 323) Not offered 1978-79.]

[Greek Vase Painting (History of Art 325) Not offered 1978-79.]

[Numismatics (History of Art 424) Not offered 1978-79.]

History of Ancient Israel I (Near Eastern Studies 243)

History of Ancient Israel II (Near Eastern Studies 244)

[Ancient Seafaring (Near Eastern Studies 249) Not offered 1978-79.]

Introduction to Biblical Archaeology (Near Eastern Studies 285)

[Interconnections in the Eastern Mediterranean World in Antiquity (Near Eastern Studies 385) Not offered 1978-79.]

Archaeology of the Ancient Near East (Near Eastern Studies 387)

[Seminar in Syro-Palestinian Archaeology (Near Eastern Studies 481) Not offered 1978-79.]

[Ancient Thought (Philosophy 210) Not offered 1978-79.]

[Ancient Philosophy (Philosophy 211) Not offered 1978-79.]

[Plato (Philosophy 309) Not offered 1978-79.]

Aristotle (Philosophy 310)

[Topics in Ancient Philosophy (Philosophy 314) Not offered 1978-79.]

Plato and Aristotle (Philosophy 413)

Ancient Philosophy (Philosophy 611)

Comparative Literature

W. J. Kennedy, chairman; T. Bahti, C. M. Carmichael, W. W. Holdheim, M. Spariosu, with J. Culler (English), D. I. Grossvogel (Romance Studies), P. Hohendahl (German), E. Rosenberg (English)

Also cooperating: M. H. Abrams, C. Morón-Arroyo, J. P. Bishop, E. A. Blackall, M. A. Carlson, E. G. Fogel, G. Gibian, S. L. Gilman, A. V. Grossvogel, T. L. Jeffers, W. R. Johnson, C. Kaske, R. E. Kaske, G. M. Kirkwood, C. Levy, H. S. McMillin, B. O. States

Majors

Although the Department of Comparative Literature offers no formal undergraduate major program, well-qualified students may design the equivalent of such a major with the advice of a faculty member and present his or her proposal to the Independent Major Program. In addition, most of the courses in Comparative Literature may be counted toward the major requirements of other departments at their option. For information consult the Classics, English, Germanic Studies, Romance Studies, and Russian sections in this *Announcement*.

Distribution Requirement

The distribution requirement in the humanities may be satisfied by any two of the 200- or 300-level courses in Comparative Literature. 400-level courses may be applied with the permission of the instructor. Any of the 100-level courses may be used toward satisfying the Freshman Seminar requirement.

101 Character and Context Fall or spring. 3 credits. Freshman Seminar.

M W F 10:10, T Th 12:20-1:35. Staff.
Often a character in crisis represents a broader "human condition." We will investigate a variety of characters and character-types facing different situations to discover what the writer is trying to say about the world. For example, heroes who shun confrontation (escapism, idealism) in mystery-gothic tales and psychological fantasies will be compared to heroes facing more "concrete" relationships to the world in psychological, sociological and mythological fiction. Readings will include works by Kafka, Poe, and Dostoevsky.

102 Tales of Mystery, Quest, and Self-discovery Fall or spring. 3 credits. Freshman Seminar.

M W F 9:05 or 11:15. Staff.
On the premise that storytelling always begins with an appeal to the reader's curiosity, this course deals with three kinds of mystery and discovery: psychological fiction (How does a writer involve the reader in a character's discovery of his own nature?); detective stories (How does the writer tease or satisfy our curiosity about hidden events?); and allegorical narrative (How can a writer's creation of fantastic or terrifying worlds lead the reader to new perceptions about his own world?). Readings include *Oedipus Rex*, Dostoevsky, Edgar Allan Poe.

103 Inner Worlds, Outer Worlds, Other Worlds Fall or spring. 3 credits. Freshman Seminar.

M W F 10:10, 12:20, or 1:25. Staff.
Discussion of a series of dramatic and narrative works starting with the most "realistic" and moving towards various grotesque, fantastic, and romantic forms. Such a progression raises the question of literary reality: How does the writer perceive the world and how does the writer's imagination function in transforming and deforming it? Readings include Ibsen, Kafka, Borges.

236 Greek Mythology (also Class 236) Fall. 3 credits.

M W F 10:10 P. Pucci.
A survey of the Greek myths, with emphasis on myths that have entered the postclassical Western tradition. Of the aspects of mythology to be studied the following will be among the most important: what "myth" meant to the Greeks; the factors and influences involved in the creation of myths; and the significance of myths in daily life, religion, and thought. Comparison and contrast with Roman attitudes to myth.

295 Introduction to Semiotics Fall. 3 credits.
T Th 10:10-11:25. J. Culler.

A culture can be studied as a group of sign systems. After an introduction to some basic concepts of linguistics and sign theory we will study a variety of social practices from a semiotic point of view. Five or six topics will be selected from among the following: literature, baseball, dirt, nonverbal communication, madness, menus and dietary prohibitions, circuses, prisons, tourism.

300 Greek and Roman Drama (also Class 300) Spring. 4 credits.

T Th 10:10-11:25. G. Kirkwood.
A study of ancient tragedy and comedy as exemplified by representative plays, read in translation, of Aeschylus, Sophocles, Euripides, Aristophanes, Menander, Plautus, Terence, and Seneca. Main emphasis is on Greek tragedy. Consideration also of the development of the Greek theater (illustrated) and its relationship to the form and presentation of the dramas; the origins of tragedy; the influence of Greek tragedy and Seneca on later European drama.

311 Introduction to Psychopathological Texts Fall. 4 credits.

T Th 12:20–1:35. S. L. Gilman.
A survey of the literature on the literary products of the mentally ill. Stress will be placed on texts written by schizophrenic patients. Reading knowledge of German or French helpful.

312 Comedy Spring. 4 credits.

M W F 12:20. W. J. Kennedy.
Discussion of comic styles (classical, colloquial, improvisational, absurd) and modes of comedy (satire, romance, farce, grotesque) in drama and narrative fiction from Aristophanes to Nabokov, with special attention to Chaucer, Rabelais, Molière, Shaw, and Ionesco.

315 Rhetoric and Technology Spring. 4 credits.

M W F 10:10. W. J. Kennedy.
A study of ways in which communication between authors and audiences undergoes changes through the influence of various media in texts from oral, literate, and advanced technological cultures. Readings include works by Plato, Dante, Swift, Nietzsche, Joyce, Borges.

320 Meaning Across Cultures (also Anthr 320) Fall. 4 credits.

T Th 10:10–11:30. J. A. Boon.
The course compares anthropological views of cultures to issues in linguistic and literary theory and semiotics. Are societies machines, therapies, religions, dramas, stories, games, aesthetic forms, structural codes . . . ? From the cosmologies and ceremonies of tribal systems, we move to expressive genres of archaic hierarchies and to differentiated arts and sports of nation states.

323 Literature of the Holocaust Spring.

4 credits.
T Th 12:20–1:35. S. L. Gilman.
An introduction to the major writers from and on the Holocaust in Western Europe, read in English translation. Readings will be from Wiesel, Borowski, Sachs, Weiss, Hochhuth, Kosinski, Singer as well as from the poetry and autobiographies written in the camps.

328 The Literature of the Old Testament Fall. 4 credits. Not open to freshmen.

M W F 11:15. C. M. Carmichael.
A study of the customs and conventions and the religious, moral, legal and wisdom ideas found in the Old Testament.

339 Ancient Wit: An Introduction to the Theory and Form of Comic and Satiric Writing in Greece and Rome (also Class 339) Spring. 4 credits.

M W F 11:15. F. Ahl.
The aim is not only to provide an introduction to comedy, satire, and other humorous writing in Greek and Roman literature, but to discuss the ancient works in the light of modern theories of comedy and laughter. Discussion of the nature of laughter itself in the light of both ancient and modern scholarship on the subject, from Plato's *Philebus* to Freud's *Wit and Its Relation to the Unconscious* and Koestler's *The Act of Creation*. Examination of select works and passages of Homer, Euripides, Aristophanes, Hierocles, Lucian, Nonnus, Plautus, Horace, Martial, Juvenal, and Petronius.

343 Medieval Literature Spring. 4 credits.

M W F 12:20. T. D. Hill.
Analysis and interpretation of great medieval literary works in translation. Though readings will vary somewhat from year to year, a typical program would be *Beowulf*; *Chanson de Roland*; *Njáls saga*; a romance of Chrétien; *Wolfram's Parzival*; Gottfried's *Tristan*, or *Sir Gawain and the Green Knight*; *Pearl*; *Piers Plowman*.

349 Women in Medieval Literature (also Womns 364) Fall. 4 credits.

M W F 11:15–12:05. B. Buettner.
A study of women and their roles in the social order as portrayed in the literature of the Middle Ages (For a more complete description, see *Women's Studies 364*.) Works to be studied in English translation will include a play of Hroswitha, the *Nibelungenlied*, selected Mariological and mystical poems, courtly love lyric, *Parzival*, *Tristan and Isolde*, selections from the *Romance of the Rose*, and the "Marriage Group" in Chaucer's *Canterbury Tales*.

352 Classic and Renaissance Drama (also Thetr 325) Fall. 4 credits.

T Th 2:30–3:45. S. McMillin.
Readings in world drama from the Greeks to Shakespeare, including such dramatists as Aeschylus, Sophocles, Aristophanes, Plautus, Seneca, Calderón, Kyd, Marlowe, Shakespeare, Jonson, and Webster, with emphasis on the Greek and Elizabethan period.

353 European Drama, 1660–1900 (also Thetr 326) Spring. 4 credits.

T Th 10:10–11:25. I. Hauptman.
Readings from major dramatists from Molière to Ibsen, including such authors as Racine, Congreve, Sheridan, Schiller, Goethe, Hugo, Buchner, Gogol, Turgenev, Zola, Hauptmann, and Chekhov.

354 Modern Drama (also Thetr 327) Spring. 4 credits.

M W F 1:25. B. States.
Readings from major dramatists of the 20th century, including Ibsen, Chekhov, Strindberg, Shaw, Pirandello, Ionesco, Brecht, Beckett, Pinter, and others.

356 The Literature of Europe in the Renaissance Fall. 4 credits.

M W F 1:25. C. Levy.
Renaissance readings mainly in the tradition of Christian humanism; the work of such authors as Petrarch, Castiglione, Machiavelli, Erasmus, More, Montaigne, Marlowe, Shakespeare, and Milton, with introductory readings in Augustine's *Confessions*.

357 The Literature of Europe Since 1800 Spring. 4 credits.

M W F 9:05. T. L. Jeffers.
A study of European writers' search for values. The class not only contemplates the books as historical documents or aesthetic objects, but also attends to their present uses. There is much emphasis on students' abilities to speak to one another in discussions and essays. Authors include Balzac, Tolstoy, James, Nietzsche, Mann, Eliot.

359 Being, God, and Mind: The Key Concepts of European Thought from Plato to Vico (also Rom S 359) Fall. 4 credits.

M W F 12:20. C. Morón-Arroyo.
A study of the origins of the scientific language: body/soul, matter/form, act/potentiality, being. A study of the ideological background of western literatures: the conception of human personality and the presentation of character, the conception of reality and the sense of literary structures. A study of the fusion of Greek thought and the Bible, and its reflection on the development of the ideas of freedom and equality in Western thought.

363 The European Novel Fall. 4 credits.

M W F 11:15.
364 The European Novel Spring. 4 credits.
T Th 12:20–1:35. M. Spariosu.
This course will examine some of the main modern novelistic conventions from Flaubert to Nabokov. Discussion will focus on texts by Flaubert, Dostoevsky, Mann, Bulgakov, Lowry, and Nabokov.

368 The Birth of the Novel in Spain: Toward Don Quijote (also Span 368) Spring. 4 credits.

T Th 10:10–11:25. M. Randel.
A study of pastoral, picaresque, and Moorish tales, as well as the epistolary and dialogued fiction which paved the way for Cervantes' synthesis. Works read will include *La Diana* of Montemayor, *Lazarillo de Tormes*, *El Abencerraje y la hermosa Jarifa*, and Guevara's *Epistolas familiares*. Reading knowledge of Spanish recommended.

388 Ideas and Art in Great Political Novels Fall. 4 credits.

T Th 10:10 plus 1 hour to be arranged. G. Gibian.
Discussion of themes and form of novels in which political and philosophical problems play a prominent part. Malraux, *Man's Fate*; Dostoevsky, *The Possessed*; Turgenev, *Fathers and Sons*; Henry James, *Princess Casamassima*; Naipaul, *The Guerrillas*; and others.

[389 Modern Literature in Poland, Czechoslovakia, and Yugoslavia Spring. Not offered 1978–79.

G. Gibian.]

390 Camus: Novels, Plays, Essays (also Frnch 390) Spring. 3 credits in English; 1 additional credit hour for extra French component.

T Th 10:10–11:25. D. I. Grossvogel.

391 Readings in Modern Poetry Fall. 4 credits.

T Th 12:20–1:35. T. Bahti.
Brief consideration of representative Romantic poems, followed by more sustained examination of major modern poets. Questions will include the relations of self and language; the poet, history, and myth; "Romanticism" and "modernity." Authors include Baudelaire, Mallarmé, Valéry, Stephan George, Rilke, Yeats, and Stevens. Bilingual texts will be used.

395 Introduction to Twentieth-Century Criticism Spring. 4 credits.

T Th 10:10. T. Bahti.
Emphasis on the German tradition, with some attention to Anglo-American and French developments. Historical, philosophic, and ideological approaches to literature will be considered through studies of the "German philologists"; phenomenology; Heidegger, and the hermeneutic tradition; Lukács; *Rezeptionsästhetik*. Readings available in English.

[400 Seminar in the Theory and Practice of Translation (also Engl 607) Spring. 4 credits.

Limited to 15 students. Prerequisite: reading knowledge of a foreign language, ancient or modern. Not offered 1978–79.
E. G. Fogel.]

410 Structuralism (also Anthr 417) Spring. 4 credits.

T Th 10:10–11:30. J. A. Boon.
A study of the work of Claude Lévi-Strauss and a reading of diverse structuralist texts that raise general issues in philosophy, criticism, and the comparative method. An effort is made to assess the place of structuralism in the history of ideas.

[413 The Detectory Schema Fall. 4 credits. Not offered 1978–79.

W. W. Holdheim.]

414 The Novella in World Literature Spring. 4 credits.

T Th 2:30. W. W. Holdheim.
The art of the novella from Boccaccio to modern times. Readings will include works of Cervantes, Hoffmann, Kleist, Melville, James, Gogol, Pushkin, Mérimée, Maupassant. The theory of the novella and the genre's relation to other short narrative forms will be discussed.

419-420 Independent Study Fall or spring.
Credit to be arranged.
Staff.
First term not prerequisite to second.

421 Old Testament Seminar Fall. 4 credits.
Limited to 20 students. Prerequisite: 328 or consent of instructor.
Th 2:30-4:20. C. M. Carmichael.
Identification and discussion of problems in the Old Testament.

429 Readings in the New Testament Fall.
4 credits. Prerequisite: upperclass standing.
T Th 1:25. J. P. Bishop.
Close readings of representative texts from the New Testament in modern scholarly editions, with the help of appropriate commentary, introductory and specialized. The focus in 1978 will be on the narrative gospels of Mark and John. All readings will be in English, but some reference to the Greek original will be made. Graduate students and undergraduates from other colleges are encouraged to enroll. The approach will be chiefly academic and literary but with the hope of staying open to scholarly and religious issues alike.

446 Allegory and Symbolism Spring. 4 credits.
M W F 1:25. C. Kaske.
Definitions and models drawn from Dante's *Divine Comedy* will be related to a reading of works ranging from classical to modern: the myths of Plato, the *Romance of the Rose*, mystical lyrics of St. John of the Cross, Goethe's *Faust Part II*, and some stories by Kafka.

[458 Petrarch, Ronsard, and Donne Spring.
4 credits: Not offered 1978-79.
W. J. Kennedy.]

[459 Italy and the Transalpine Renaissance: Ariosto, Spenser, and Rabelais Fall. 4 credits.
Not offered 1978-79.
W. J. Kennedy.]

465 Feminist Literary Criticism (also Womns 465) Spring. 4 credits. Prerequisite: Permission of instructor.
Th 1:25-3:25. R. Levin.
An examination of recent feminist literary criticism and theory. The course will explore such categories as (1) "images of women" as they are produced in works by male writers (2) criticism of female authors (3) development of a feminist poetics: modes and methodologies. Discussion will focus on both primary and secondary texts with an eye toward students' own research interests. Readings will include works by Charlotte Bronte, Virginia Woolf, Kate Millet, Mary Ellmann, Elaine Showalter, and Tillie Olsen, among others.

470 Early Romantic Poetry and Discourse Fall.
4 credits.
M 2:30-4:30. T. Bahti.
Readings in the poetry and discursive prose of the late eighteenth century. A central issue will be the interrelations of author, nature, and language; the usefulness of such period concepts as the Enlightenment, "pre-Romanticism," and Romanticism will also be investigated. Texts will be chosen from among Chénier, Wordsworth, Coleridge, Hölderlin, Goethe, Rousseau, Vico, Herder, and others. Bilingual editions available.

471 Romanticism: Dialectic and Rhetoric Spring. 4 credits.
Th 12:20-2:30. T. Bahti.
Readings in the poetry and discursive prose of the early nineteenth century. The seminar will focus on the question of dialectical and/or rhetorical modes of narrative, argument, and understanding. Texts will be chosen from among Hölderlin, Shelley, Keats, Heine, Hegel, Schlegel, Nerval, Leopardi, Baudelaire, and others.

472 Ibsen and Chekhov (also Theatr 442) Fall.
4 credits.
T Th 10:10-11:40. M. Carlson.
Study of the major dramas of Ibsen and Chekhov in historical perspective and as illustrations of the development of each author's dramatic technique.

477 The Bildungsroman in Modern Literature Fall. 4 credits.
W 2:30-4:30. W. W. Holdheim.
Seminar for graduates and advanced undergraduates on the novel of education and development, from Goethe, Balzac, and Stendhal via Flaubert and Henry Adams to Gide and Thomas Mann (*Magic Mountain, Felix Krull*). Discussion will relate the problems of education to the form of the novel. Related subjects (such as the Künstlerroman and the novel of cultural diagnosis) will be taken up.

487 Towards Thomas Mann Spring. 4 credits.
W 2:30-4:25. E. Rosenberg.
The nineteenth-century realistic epic culminating in the works of Thomas Mann's maturity. Texts: *Elective Affinities, Anna Karenina, Germinal, Fontane's Effi Briest, Mann's Friedemann stories, Buddenbrooks, and The Magic Mountain*. Ancillary readings: Mann's essays on Schopenhauer, Wagner, Goethe, and Tolstoy.

491 Twentieth-Century Poetry in America and Russia Fall. 4 credits.
T Th 1:25-2:40. E. G. Fogel.
The development of modernism in American and Russian poetry in the first four decades of the twentieth century. The achievement of such American poets as Pound, Eliot, Williams, and especially Wallace Stevens; and of such Russian poets as Blok, Akhmatova, Pasternak, and especially Osip Mandelstam. Foreign poets will be read in translation or in bilingual texts.

496 Toward a Theory of the Humanities: Jürgen Habermas Fall. 4 credits.
Th 12:20-2:30. P. Hohendahl.
The seminar will attempt to situate Jürgen Habermas in the context of contemporary philosophy and social theory: in relation to Western Marxism (Frankfurt School); hermeneutic and language theory (Gadamer, Apel); psychoanalysis; and contemporary social theory (Systemtheorie). The discussion will focus on the epistemological problems presented in Habermas' *Knowledge and Human Interests*. Readings will also draw on *Theory and Practice, Toward a Rational Society, and Legitimation Crisis*. Reading knowledge of German helpful but not required. Previous acquaintance with critical theory will be an advantage.

619-620 Independent Study Fall or spring.
Credit to be arranged.
Staff.
First term not prerequisite to second.

628 Political Anthropology: Les Sciences de l'Homme (also Rom S 628 and Anthr 628) Spring.
4 credits.
W 2:30-4:25. R. Klein, J. Siegel.
The Heideggerian critique of science and of humanism with the correlative analysis of technology and its institutions will serve as the basis for considering the conceptual status of the social sciences—what the French call *les sciences de l'homme*. The course will also consider the influence of the Heideggerian problematic on more recent philosophical and theoretical writing.

694 Mimesis and Antimimesis in Modern Literary Theory Fall. 4 credits.
T 2:30-4:30. M. Spariosu.
This course will examine the concept of mimesis as it appears in modern criticism whether under the structuralist or formalist, Marxist or Freudian guise.

Readings will include selections from Shklovsky, Freud, Benjamin, Auerbach, Goldmann, Barthes, Girard, Derrida, et al.

699 Hermeneutics Spring.
M 2:30-4:25. W. W. Holdheim.
Study of the theory of understanding of H. G. Gadamer, centering on his chief work, *Truth and Method* (in translation).

See also:

Themes from Russian Culture (Russian 207-208)

Tolstoy and the Disciplines (Russian 350)

Chekhov and the Short Story (Russian 373)

Chinese Poetry (Asian Studies 372)

Twentieth-Century Chinese Literature (Asian Studies 373)

Chinese Narrative Literature (Asian Studies 374)

Japanese Poetry and Drama (Asian Studies 375)

Modern Japanese Fiction (Asian Studies 376)

Japanese Narrative Literature (Asian Studies 377)

Japanese Nô Theatre (Asian Studies 400)

The Historical Development of Rabbinic Legal Literature (Near Eastern Studies 333)

Computer Science

J. Hartmanis, chairman; G. Andrews, R. Cartwright, R. L. Constable, R. W. Conway, A. Demers, J. E. Dennis, Jr., J. Donahue, D. Gries, J. E. Hopcroft, F. Luk, G. Salton, F. Schneider, T. Teitelbaum, C. Van Loan, J. Williams

Although there is no formal undergraduate major in computer science, the department offers a comprehensive set of undergraduate and graduate courses from which students can select appropriate sequences to fit their major interests. It is possible to take a strong computer science minor through the Mathematics Department (option II) or to include computer science as part of an independent major with substantial work in other fields—as in the case of a sociology student who wants to learn to use computers. Such majors must be approved by the Independent Major Board.

There are two introductory courses with distinct aims. 100 offers a full semester of programming instruction using the languages PL/I and FORTRAN, the goal being to teach the student how to use the computer. 101 offers an extensive survey of the capabilities and applications of computers as well as some instruction in PL/I programming (about half as much as 100).

A student completing 101 may elect to take 100 although 101 is not considered a prerequisite for 100. 100 is a prerequisite for subsequent courses in computer science (for example, 211 or 321).

Students who want a strong minor in computer science should take the following courses: 211, 280, 314, 410, and two from 321, 322, 414, 432, 481, 482, 611, 612.

Courses are listed in College of Engineering section under Computer Science.

Economics

E. Thorbecke, chairman; M. G. Clark, T. E. Davis, L. Ebrill, R. H. Frank, W. Galenson, M. Gertler, R. H. Golay, W. Greene, E. Grinols, M. R. Haines, G. H. Hildebrand, W. Isard, A. E. Kahn, M. Majumdar, S. Marston, R. Masson, P. D. McClelland, U. M. Possen, R. E. Schuler, S. M. Slutsky, G. J. Staller, S. C. Tsiang, J. Vanek, H. Y. Wan, Jr.

The Major

Students who wish to major in economics must have completed Economics 101-102 or its equivalent with an average of C or better. Students who have completed only one semester of the introductory course may be accepted as provisional majors provided their grade was at least C. Prospective majors should report to the Department of Economics office.

The requirements for a major are: (1) Economics 311 and 312; (2) twenty credits of other economics courses listed by the Department of Economics in this *Announcement*, except that, with the permission of the major adviser, two economics courses outside the College of Arts and Sciences may be used to fulfill this requirement; and (3) three courses above the introductory level in subjects related to economics selected, with the approval of the major adviser, from the offerings of the Departments of Anthropology, Asian Studies, Government, History, Mathematics, Philosophy, Psychology, and Sociology.

In addition to the courses required for the major, many students will find it valuable to take statistics (the diverse possibilities include Agricultural Economics 310, OR & IE 270 or OR & IE 260 and 370, and Mathematics 370 and 371, 472, 475). Mathematics courses are not needed for an undergraduate major. However, students planning graduate work in economics are strongly advised to take mathematics at least through calculus and linear algebra.

The Honors Program

Candidates for the degree of Bachelor of Arts with honors are required to have: (1) a grade-point average in economics course of A- or better except in exceptional circumstances; (2) enrollment in the senior year in Economics 391 and 392.

Distribution Requirement

The distribution requirement in social sciences is satisfied in economics by Economics 101-102.

Course Changes

All Department of Economics courses listed below are subject to change and should be checked against departmental supplements which are available in the Economics Department before the start of each semester. These supplements will also include the day and time of each course.

101 Introductory Economics

Fall or spring. 3 credits. Lectures and discussion.

Staff.

Analysis of aggregate economic activity in relation to the level, stability, and growth of national income. Topics discussed may include the determination and effects of unemployment, inflation, balance of payments deficits, and economic development, and how these may be influenced by monetary, fiscal, and other policies.

102 Introductory Economics

Fall or spring. 3 credits. Lectures and discussion.

Staff.

Explanation and evaluation of how the price system operates in determining what goods are produced, how goods are produced, and who receives income, and how the price system is modified and influenced by private organizations and government policy.

General Courses

[301 Economics of Market Failure

4 credits.

Prerequisite: 102. Not offered 1978-79.]

302 The Impact and Control of Technological Change (also Gov 302 and CRP 440, College of Architecture, Art, and Planning)

Spring. 4 credits.

D. Nelkin.

Examines social, environmental, and economic implications of technological change in the United States in the context of possible policies and strategies of control. Several specific cases will be considered in detail, followed by a broader investigation of the problems of a modern technological society. Alternative political-economic solutions will be explored.

[304 Economics and the Law

Spring. 4 credits.

Prerequisite: 311 or permission of instructor. Not offered 1978-79.

This course deals with both the economic analysis of legal institutions and the economic impact of various legal institutions. Topics to be covered include the economic effects of the assignment of property rights, an economic theory of contracts, the economics of the allocation of liability, no-fault insurance, regulation and its alternatives, the economics of justice, fairness, and equity, the economic approach to crime control, and the legal process compared to the market system. Readings will include Posner's *Economic Analysis of the Law* and articles from recent issues of the *Journal of Law and Economics*, the *Journal of Legal Studies*, and various law reviews. The course will be conducted primarily as a discussion and students can expect to be called upon to discuss current assignments. This course is not a professional law course, but rather a course in economics; the methods of analysis will be economic rather than legal.]

[306 Economics of Defense Spending

Spring. 4 credits. Prerequisite: Econ 102. Not offered 1978-79.

An analysis of the economic aspects of defense spending with the emphasis on the procurement of weapons systems. Topics covered will include an overview of the defense budget, special characteristics of the defense market, the structure of the defense industry, and the economic behavior of defense firms. There will be guest lectures by visitors to the Cornell Peace Studies Program.

308 Economic Analysis of Government (also

CEE B302, College of Engineering)

Spring. 4 credits. Prerequisite: one year of college level mathematics plus CEE B301 or Econ 311.

Staff.
Analyzes government intervention in a market economy. Public goods, public finance, cost-benefit analysis, environment regulation, and macroeconomic topics are covered.

309 Capitalism and Socialism (also I & LR 347)

Fall. 4 credits. Permission of instructor required.

G. H. Hildebrand.

A seminar in some of the basic literature of the subject.

311 Intermediate Microeconomic Theory

Fall or spring. 4 credits. Prerequisites: 101-102 or permission of instructor. Section 311.5 has a more mathematical approach and is designed to accommodate students in the Engineering College.

Staff.

Analysis of the pricing processes in a private enterprise economy under varying competitive conditions, their role in the allocation of resources, and the functional distribution of national income.

312 Intermediate Macroeconomic Theory

Fall or spring. 4 credits. Prerequisites: 101-102 or permission of instructor.

Staff.

An introduction to the theory of national income determination and economic growth in alternative models of the national economy; the interaction and relation of aspects of these models of empirical aggregate economic analysis.

[315 History of Economic Thought

Fall. 4 credits. Prerequisites: 101-102 or permission of instructor. Not offered 1978-79.

Survey of development of economic thought from the early modern period to early twentieth century. Emphasis placed on English classical economic thought, with attention to divergent and dissident schools, terminating with the work of Alfred Marshall. Students have the option of writing an approved term paper or taking the final.]

317 Intermediate Mathematical Economics I

Fall. 4 credits.

M. Majumdar.

Introduction of calculus and matrix algebra; problems of maximization of a function of several variables. Economic examples are used to illustrate and teach the mathematical concepts.

318 Intermediate Mathematical Economics II

Spring. 4 credits.

H. Wan.

Advanced techniques of optimization and application to economic theory.

319 Quantitative Methods

Fall. 4 credits.

W. Greene.

320 Quantitative Methods

Fall. 4 credits.

Prerequisite: Good control of microeconomic and macroeconomic theory and some elementary calculus.

W. Greene.

Introduction to use of quantitative analysis in economics. Topics include index numbers, input-output analysis, elementary decision theory, and an introduction to hypothesis testing and the formulation and estimation of econometric models.

Economic History

[321 Economic History of Ancient Medieval

Europe

4 credits. Prerequisite: permission of instructor. Not offered 1978-79.]

322 Economic History of Modern Europe: 1750

to the Present

Fall. 4 credits. Open to upperclass students with some background in economics or history, or with permission of instructor.

M. R. Haines.
Covers and analyzes the background, origins, and character of the industrialization and modernization of Europe since 1750. Topics include the agricultural revolution and the role of technology in historical economic change; the importance of trade, institutional, and structural change; the social and demographic aspects of modernization; and the geographic diffusion of modern growth.

323 American Economic History

Spring. 4 credits. Prerequisites: 101-102, or permission of instructor.

P. D. McClelland.

A survey of problems in American economic history from first settlement to early industrialization.

[324 American Economic History

Fall. 4 credits.

Prerequisites: 101-102, or permission of instructor. Not offered 1978-79.]

[325 Economic History of Latin America] Fall. 4 credits. Open to upperclass students with some background in economics or history, or with permission of instructor. Not offered 1978-79.]

Money, Banking, and Public Finance

331 Money and Credit Fall. 4 credits.

Prerequisites: 101-102.

U. M. Possen.

A systematic treatment of the determinants of the money supply and the volume of credit. Economic analysis of credit markets and financial institutions in the United States.

333 Theory and Practice of Asset Markets Fall.

4 credits. Prerequisites: 311-312.

E. Burton.

This course is designed to acquaint students with the theory of decision making in the presence of uncertainty and the practical aspects of particular asset markets.

335 Public Finance: Resource Allocation

Spring. 4 credits. Prerequisites: 101-102.

M. Gertler.

Analysis of the role of government in allocating resources through taxes and expenditures. Criteria for evaluation will be developed and applied to specific policies. Attention will focus on the federal government.

[336 Collective Choice: Theory and Applications]

Fall. 4 credits. Prerequisite: 311, or permission of instructor. Not offered 1978-79.]

338 Macroeconomic Policy Spring. 4 credits.

Prerequisite: 312.

U. M. Possen.

A study of the use of fiscal and monetary policies for achieving full employment, price level stability, and appropriate economic growth.

Labor Economics

341 Labor Economics Fall. 4 credits.

Prerequisite: 101-102.

W. Galenson.

An analysis of the organization and operation of labor markets. The main topics treated are trade unionism; labor supply and demand; wage determination; unemployment, inflation, and income policies; and problems of discrimination in employment.

342 Problems in Labor Economics (also I & LR 343)

Spring. 4 credits. Prerequisites: 101-102; ILR 240 recommended.

Staff.

An advanced course concerning the institutional organization of labor markets, economic analysis of their operation, and major policy questions involved. Principal topics include wage and employment theory, determinants of wage level and structure, technological change, unemployment, poverty and income distribution, inflation and incomes policy.

Organization, Performance, and Control of Industry

351 Industrial Organization Fall. 4 credits.

Prerequisites: 101-102 (312 useful but not required).

R. Masson.

An examination of the basic factors that lead to less competitive markets in the United States economy, and of the factors that may countervail these factors. The course emphasizes both theoretical and empirical generalizations rather than studies of specific industries. Students are required to study some specific industry in a term paper. The first third of the course is abstract theoretical modeling of competition, oligopoly, and monopoly markets. The latter sections treat the question of what the

relationship is between market structure (e.g., number of firms and market shares) and its conduct and performance.

352 Public Regulation of Business Spring.

4 credits. Prerequisite: 351 or permission of the instructor.

R. Masson.

Questions of public policy concerning patents and antitrust. As in 351, the basic aims of the course are oriented towards generalization. Questions involving firms' incentives under current law are pursued. The analyses of these questions along with theories of social costs will be used to examine how patent laws, antitrust laws, or endorsement policies "should" be designed. Some small amount of analysis is devoted to past cases that have shaped the current interpretation of the laws. The term paper may cover either a specific law; a specific industrial problem and (actual or potential) legal solutions; or an economic analysis of the law applied to a specific industry or law case.

[354 Economics of Regulation] Spring. 4 credits.

Not offered 1978-79.]

355 Economics of the American System of Private Enterprise

Fall. 4 credits. Prerequisites: 101-102, 311-312, or equivalent.

G. H. Hildebrand.

A critical examination of the private sector of the United States economy: its history, some leading current issues involving it, and its relation to theoretical and philosophical interpretations of the market economy.

356 Economics of the American System of Private Enterprise

Spring. 4 credits. Prerequisites: 101-102, 311-312, or equivalent.

G. H. Hildebrand.

For course description, see Economics 355.

International and Comparative Economics

361 International Trade Theory and Policy Fall.

4 credits. Prerequisites: 101-102, or permission of instructor.

L. Ebrill.

Survey of the principles that have served as guides in the formulation of international trade and commercial policies. The evolution of the theory of international trade, principles and practices of commercial policy, problems of regional integration and customs unions, and institutions and practices of state trading.

362 International Monetary Theory and Policy

Spring. 4 credits. Prerequisites: 101-102, or permission of instructor.

E. Grinols.

Survey of the principles that have served as guides in the formulation of international financial policies. The evolution of the theory of balance of payments adjustment, international monetary standards; international capital movements, economic aid, international monetary institutions, and proposals for international monetary reforms.

[364 The United States in the World Economy]

Spring. 4 credits. Prerequisites: 101-102, or permission of instructor. Not offered 1978-79.]

[365 Economic Policy and Development in Southeast Asia]

Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1978-79.]

[366 Introduction to the Japanese Economy]

Spring. 4 credits. Not offered 1978-79.]

[367 Comparative Economic Systems: Soviet Union and Europe]

Fall. 4 credits. Not offered 1978-79.

G. J. Staller.

Discussion of approaches to comparison of economic systems. Consideration of abstract models (market economy, central planning, decentralized socialist market) as well as national economies (France and Sweden, Yugoslavia and Soviet Union). Possibility of convergence of economic systems is explored.]

[368 Contemporary Brazil (also Soc 368)]

Spring. 4 credits. Prerequisites: two courses in social sciences. Not offered 1978-79.]

Economic Growth and Development

371 Process of Economic Development Fall.

4 credits.

Staff.

The process of economic development in developing countries. Theories and explanations of the growth and development process. The role of the state in development planning. Strategies of economic and social development to achieve higher income growth, increased employment, and a more equitable income distribution.

372 Applied Economic Development Spring.

4 credits.

F. Goley.

Empirical study of the development process. Case studies of a few developing countries. The relationship between traditional and modern sectors in the growth process. Performance of developing countries with respect to income, employment, and income distribution.

378 Economics, Population, and Development

Spring. 4 credits.

M. R. Haines.

An introduction to the economic aspects of population and the interaction between population change and economic change. Particular attention will be paid to economic views of fertility, mortality, and migration, and to the impact of population growth on economic growth, development, modernization, resources, and the environment.

381 Economics of Workers' Management in Yugoslavia

Fall. 4 credits. Prerequisites: 311-312, or permission of instructor.

J. Vanek.

After a historical survey of the doctrine and practice of self-management and workers' cooperation, the organizational structure and institutional form of the participatory economy will be studied. Special attention will be given to the outcome of the decision-making process at the level of the enterprise, the consistency of these outcomes with national plans, and the policies used to implement them. Examples will be drawn from the Yugoslav experience and, depending on student interest, the discussion will cover other foreign experiences such as those of Algeria, the Basque region, Chile, Israel, Peru. A considerable emphasis will be given to the new developments, and new possibilities of implementing democratic, worker-owned and worker-managed enterprises in the United States. Drawing on theoretical analysis developed in the course, appropriate institutions and legal forms of self-management in the United States will be examined.

382 The Practice and Implementation of Self-Management

Spring. 4 credits. Prerequisite: 311-312 or permission of the instructor.

J. Vanek.

The principal purposes of this course are to describe the various forms of labor participation as they arise in different parts of the world today and to explain how producer cooperatives and labor-managed firms and systems can be created. Extensive use is made of the theory of labor-managed systems.

Attention is given to the history of various doctrines and self-managed experiences. The course is organized in a participatory manner to give students

a concrete experience in a participatory educational process. Autonomous research groups are organized, centering on major problems of self-management. Outside speakers are sometimes invited to present more specialized subjects.

The course is open to economics graduate students, upperclass undergraduates, and to students from other schools and departments with permission of the instructor.

See also:

Comparative Economic System: Soviet Russia (Industrial and Labor Relations 344)

Honors Program

391 Honors Seminar Fall. 4 credits. Required of all senior honors candidates.

R. H. Frank.
Selected readings in the economics of public issues.

392 Honors Seminar Spring. 4 credits. Required of all senior honors candidates.

S. Marston.
Continuation of 391.

399 Readings in Economics Fall or spring. Variable credit.

Any member of the department.

Graduate Courses and Seminars

[504 Economics and the Law Fall. 4 credits. Not offered 1978-79.

Staff.
See 304 for course description.]

509 Microeconomic Theory I Fall. 4 credits.

R. Masson.
Topics in consumer and producer theory.

510 Microeconomic Theory II Spring. 4 credits.

R. E. Schuler.
Additional topics in consumer and producer theory, equilibrium models and their application, externalities and public goods, intertemporal choice, simple dynamic models and resource depletion, choice under uncertainty.

513 Macroeconomic Theory: Static Income Determination Fall. 4 credits.

M. Gertler.

514 Macroeconomic Theory: Dynamic Models, Growth, and Inflation Spring. 4 credits.

R. H. Frank.

517 Intermediate Mathematical Economics I

Fall. 4 credits.
H. Wan.
See 317 for course description.

518 Intermediate Mathematical Economics II

Spring. 4 credits.
H. Wan.
See 318 for course description.

519 Quantitative Methods Fall. 4 credits.

Staff.
520 Quantitative Methods Spring. 4 credits. Prerequisites: good control of micro- and macroeconomic theory and some knowledge of calculus, linear algebra and probability; or permission of instructor.
R. Frank.

The application of quantitative analysis to testing of economic theories. This framework will provide a basis for study and evaluation of cross-section and time-series data; methodology and theory of economic measurement, statistical techniques, empirical studies, and economic forecasting.

[521 Economic History of Ancient Medieval Europe Fall. 4 credits. Not offered 1978-79.]

522 Economic History of Modern Europe: 1750 to the Present Fall. 4 credits.

M. R. Haines.
See 322 for course description.

523 American Economic History Spring. 4 credits.

P. McClelland.
See 323 for course description.

[524 American Economic History Spring. 4 credits. Not offered 1978-79.

P. D. McClelland.

[525 Economic History of Latin America Fall. 4 credits. Not offered 1978-79.

T. E. Davis.]

[536 Collective Choice: Theory and Applications Spring. 4 credits. Not offered 1978-79.]

551 Industrial Organization Fall. 4 credits.

R. Masson.
See 351 for course description.

552 Public Regulation of Business Spring. 4 credits.

R. Masson.
See 352 for course description.

555 Economics of the American System of Private Enterprise Fall. 4 credits. Prerequisites: 101-102, 311-312, or equivalent.

G. H. Hildebrand.
See 355 for course description.

556 Economics of the American System of Private Enterprise Spring. 4 credits.

Prerequisites: 101-102, 311-312, or equivalent.
G. H. Hildebrand.
See 356 for course description.

561 International Trade Theory and Policy Fall. 4 credits. Prerequisites: Economics 101-102, or permission of instructor.

L. Ebrill.
See 361 for course description.

562 International Monetary Theory and Policy

Spring. 4 credits. Prerequisites: 101-102, or permission of instructor.
E. Grinols.
See 362 for course description.

[565 Economic Problems of Latin America Spring. 4 credits. Not offered 1978-79.

T. E. Davis.]

[566 Introduction to the Japanese Economy Spring. 4 credits. Not offered 1978-79.]

[567 Comparative Economic Systems: Soviet Union and Europe Fall. 4 credits. Not offered 1978-79.

G. J. Staller.]

[568 Contemporary Brazil Spring. 4 credits. See 368 for course description. Not offered 1978-79.]

571 Process of Economic Development Fall. 4 credits.

Staff.
See 371 for course description.

572 Applied Economic Development Spring. 4 credits.

F. Golay.
See 372 for course description.

578 Economics, Population, and Development Spring. 4 credits.

M. R. Haines.
See 378 for course description.

581 Economics of Workers' Management in Yugoslavia Fall. 4 credits. Prerequisites: 311-312, or permission of instructor.

J. Vanek.
See 381 for course description.

582 The Practice and Implementation of Self-management Spring. 4 credits.

See 382 for description.

599 Readings in Economics Fall or spring. Variable credit.

Any Economics Department member.

611 Advanced Microeconomic Theory Spring. 4 credits.

S. Slutsky.

612 Advanced Macroeconomic Theory Fall. 4 credits.

U. Possen.

617 Mathematical Economics Fall. 4 credits.

M. Majumdar.

618 Mathematical Economics Spring. 4 credits.

M. Majumdar.

619 Econometrics Fall. 4 credits. Prerequisites: calculus and linear algebra; Econ 520 or equivalent useful, but not required.

Staff.
Detailed examination of regression models at the level of H. Theil, *Principles of Econometrics*. Emphasis is on theoretical aspects of the model rather than practical applications. Topics include distribution theory and the use of sufficient statistics, the classical regression model, generalized least squares, modified generalized least squares, and the multivariate regression model.

620 Econometrics Spring. 4 credits.

Prerequisites: same as 619; also 619 or permission of instructor.
Staff.

Advanced topics in econometrics, such as asymptotic distribution theory, errors in variable and latent variable models (e.g. factor analysis), simultaneous equation models with particular attention to problems of identification, time series analysis, qualitative response models, and aggregation.

[623 American Economic History Fall. 4 credits. Not offered 1978-79.]

[624 American Economic History Spring. 4 credits. Not offered 1978-79.]

[626 Methods in Economic History Spring. 4 credits. Not offered 1978-79.]

631 Monetary Theory and Policy Fall. 4 credits.

S. Tsiang.

632 Monetary Theory and Policy Spring. 4 credits.

S. Tsiang.

635 Public Finance: Resource Allocation and Fiscal Policy Fall. 4 credits.

L. Ebrill.

638 Public Finance: Resource Allocation and Fiscal Policy Spring. 4 credits.

L. Ebrill.

638 Public Finance: Local Government and Urban Structure Fall. 4 credits.

R. E. Schuler.

Integrates urban and regional theory with the economics of local government. Topics include urban spatial and hierarchical models, optimal governmental organization, spatial allocation of facilities, service spill-overs, revenue transfers, and regional growth.

641 Seminar in Labor Economics Fall.

4 credits.

R. Ehrenberg.

642 Seminar in Labor Economics Spring.

4 credits.

W. Galenson.

[644 The Labor Market and Public Policy: A Comparative View Spring. 4 credits. Not offered 1978-79.]**647 Economics of Evaluation (also I&LR 647)**

R. Ehrenberg.

See ILR 647 for description.

[648 Issues in Latin America Spring. 4 credits.

Not offered 1978-79.]

651 Industrial Organization and Regulation

Fall. 4 credits.

W. Greene.

652 Industrial Organization and Regulation

Fall. 4 credits.

R. Masson.

661 International Economics: Pure Theory and Policy Fall. 4 credits.

E. Grinols.

664 International Economics: Balance of Payments and International Finance Spring. 4 credits.

S. C. Tsiang.

670 Economic Demography and Development

Fall. 4 credits.

M. R. Haines.

Covers the literature on economic aspects of population dynamics with emphasis on interaction between population change and economic development. Includes a survey of material on the role of economic factors in fertility, mortality, and migration during the development and modernization process. Covers policy implications of rapid versus slow or zero population growth.

671 Economics of Development Fall. 4 credits.

E. Thorbecke.

672 Economics of Development Spring.

4 credits.

F. Golay.

[674 Economic Systems Spring. 4 credits.

G. J. Staller. Not offered 1978-79.]

[678 Economic Growth in Southeast Asia

Spring. 4 credits. Not offered 1978-79.]

[679 Theory of Quantitative Economic Policy Applied to Development Fall. 4 credits. Not offered 1978-79.]**681 Economics of Participation and Labor-Managed Systems: Theory** Fall. 4 credits.

J. Vanek.

The theory of labor-managed economies will be systematically developed and literature on that and related subjects surveyed. Theories of the participatory firm, industry and general equilibrium are covered together with a microeconomic theory and analysis of special dimensions of the system. Efficient decision-making processes within the firm

are also studied. Illustrative references to Yugoslavia and other real instances of labor participation are made throughout.

[682 The Practice and Implementation of Self-Management Spring. 4 credits.

J. Vanek. Not offered 1978-79.]

684 Seminars in Advanced Economics Fall or spring. Variable credit.

S. Tsiang.

English

A. R. Parker, chairman; M. H. Abrams, B. B. Adams, A. R. Ammons, J. P. Bishop, J. F. Blackall, S. Budick, A. Caputi, M. J. Colacurcio, J. Culler, D. D. Eddy, R. H. Elias, S. B. Elledge, R. T. Farrell, E. G. Fogel, L. Green, L. Herrin, N. H. Hertz, T. D. Hill, T. L. Jeffers, C. V. Kaske, R. E. Kaske, R. Kirschten, C. S. Levy, A. Lurie, P. L. Marcus, D. E. McCall, K. A. McClane, J. R. McConkey, H. S. McMillin, D. M. Mermin, J. B. Merod, R. Morgan, D. Novarr, S. M. Parrish, B. Rosecrance, E. Rosenberg, P. L. Sawyer, D. R. Schwarz, H. E. Shaw, S. Siegel, W. J. Stlotoff, W. Sollors, J. Stallworthy, B. O. States, S. C. Strout, W. Wetherbee

Majors

Any student considering a major in English should see the director of undergraduate studies in English to arrange an assignment to a major adviser. Copies of a brochure containing suggestions for English majors and prospective English majors are available in the department's office, 252 Goldwin Smith Hall.

Prospective English majors should take one or more courses from the group English 270, 271, 272, 280, 281 as early as possible. All these courses are open to sophomores; English 270, 271, 272 are also open to second-term freshmen and may be used to satisfy the Freshman Seminar requirement. First-term freshmen with advanced placement in English may enroll in English 270, 271, or 272 as space permits, and prospective English majors are encouraged to do so. As soon as students have completed one of these courses they may declare themselves as English majors, provided they have achieved a letter grade of C or better in this and any other English course they may have taken.

English majors are required to complete six credits of foreign language study (preferably in the literature of a foreign language) in courses for which qualification is a prerequisite. Majors are urged to complete this requirement by the end of their sophomore year, and those who enter Cornell without sufficient preparation should therefore begin their language study at once.

In addition to satisfying the requirements outlined above, English majors must take a minimum of thirty-six credits in courses approved for the major and complete them with passing letter grades. Courses approved for the major are English 201, 202, and all English courses numbered 300 or above except English 496, 570, 571, 575, 576, 578 and 579. Students may also offer in satisfaction of the major as many as three courses numbered 300 or above in a foreign literature, in comparative literature, or in special courses such as those sponsored by the Society for the Humanities, provided these alternatives are approved by the adviser as relevant to the major.

Among the courses approved for the major, English 201 and 202 are especially recommended for English majors and should be taken by the end of the sophomore year. Students who do not take English 201-202 should choose their major courses with a view toward covering the historical range of English and American literature. Literature courses at the 300 level are intended to provide such coverage.

Of the thirty-six credits required for the major, at least eight must be in English or American literature written before 1800.

The Honors Program

Prospective candidates for the degree of Bachelor of Arts with honors in English should consult with the chairperson of the Honors Committee during the spring term of their sophomore year or early in their junior year.

Honors candidates will take one or two Honors Seminars (491 or 492) during their junior year, as well as a 400-level course in the field in which they plan to work during their senior year. The work of the senior year is a year-long tutorial (493 and 494) on a special topic of the candidate's choosing, culminating in the writing of an honors thesis of approximately 50 pages.

More information about the program may be found in the department's brochure for honors candidates.

Distribution Requirement

The distribution requirement in the humanities may be satisfied with any two courses in English at the 200 level or above other than those required for teacher certification (English 496 and courses in the 500s). If students have satisfied the expressive arts requirement in English, then the student should not take courses numbered in the 80s to satisfy the humanities requirement.

The distribution requirement in the expressive arts may be satisfied with any two courses in English at the 200 level or above numbered in the 80s.

Nonmajors

For students not majoring in English, the department makes available a variety of courses at all levels. Some courses at the 200 level are open to qualified freshmen, and all of them are open to sophomores. Courses at the 300 level are open to juniors and seniors, and to underclass students with permission of the instructor. The suitability of courses at the 400 and 600 levels for nonmajors will vary from topic to topic, and permission of the instructor is required.

Teacher Preparation

Prospective teachers of English in secondary schools who seek provisional certification in New York State must fulfill all the requirements of the major. In addition, they elect a special program of professional courses. A detailed statement about programs for teachers is available in the office of the Department of English.

Courses for Freshmen

As part of the Freshman Seminar Program, the Department of English offers many one-semester courses. The courses are concerned with various forms of writing (narrative, biographical, expository), with the study of specific areas in English and American literature, and with the relation of literature to culture. Students may elect any two of these courses during their first year to satisfy the Freshman Seminar requirement (see p. 46). See also English 270, 271, and 272, below.

Courses for Sophomores

Although courses numbered in the 200s are primarily for sophomores, some of them are open to qualified freshmen and to upperclass students.

201-202 The English Literary Tradition 201, fall; 202, spring. 4 credits each term. Open to all undergraduates. 201 not a prerequisite to 202. May be counted toward the English major.

Fall: M W F 11:15. B. B. Adams, S. Elledge.

Spring: M W F 11:15. S. Budick, M. H. Abrams.

Interpretation of major works from Beowulf through Yeats. Fall term will include Old English poetry, Chaucer, medieval romances, Spenser, Shakespeare, Donne, and Milton. Spring term will include Dryden, Swift, Pope, Samuel Johnson, Blake, Jane Austen, the major romantic and Victorian poets, Shaw, and Yeats. The course will be conducted by a combination of lectures and intensive seminars in special topics.

205–206 Readings in English and American Literature 205, fall; 206, spring. 3 credits each term. Open to all undergraduates. 205 not a prerequisite to 206. Primarily for students who do not expect to major in English.

Fall: M W F 10:10. B. B. Adams.

Spring: M W F 10:10. S. M. Parrish.

Fall: masterpieces of English prose and verse from Shakespeare to the middle of the nineteenth century, including selections from the works of Shakespeare, John Donne, Jonathan Swift, Jane Austen, Lord Byron, Nathaniel Hawthorne, Edgar Allan Poe, and others. Informal lectures and discussion. Midterm and final examinations; papers optional. Spring: Literature since the mid-nineteenth century, including such authors as Whitman, Dickens, T. S. Eliot, and D. H. Lawrence.

227 Shakespeare Fall or spring. 3 credits. Primarily for students who do not expect to major in English. Sections limited to 25.

M W F 10:10 or 1:25 or T Th 10:10–11:25 or 2:30–3:45. S. B. Elledge, C. S. Levy, and others.

A critical study of representative plays from the principal periods of Shakespeare's career.

253 The Modern Novel Fall. 3 credits. Primarily for students who do not expect to major in English. T Th 8:30–9:45. J. B. Merod.

Our focus includes two kinds of narrative strategies: novelistic and philosophical. Both are "fictional," although in different ways which we will need to distinguish. Both are "critical," in ways similar as well as dissimilar. Readings include: Conrad, Kafka, Dostoevsky, Nietzsche, Sartre, Bellow, and others—perhaps Faulkner, Joyce, or Marquez. We will supplement the lectures with occasional seminar discussions.

270 The Reading of Fiction Fall or spring. 3 credits. Recommended for prospective majors in English. Primarily for sophomores. Upperclass students admitted as space permits. Fall: open to freshmen who have received advanced placement in English. Spring: open to other qualified freshmen. May be used to satisfy either the Freshman Seminar requirement or the distribution requirement in the humanities, but not both. Sections limited to 22.

M W F 11:15, 1:25, 2:30; or T Th 10:10 or 2:30.

J. F. Blackall, D. Novarr, E. Rosenberg, and others. Forms of modern fiction, with emphasis on the short story and novella. Critical studies of works by English, American, and Continental writers from 1880 to the present—Chekhov, James, Conrad, Faulkner, Mann, Kafka, and others.

271 The Reading of Poetry Fall or spring. 3 credits. Recommended for prospective majors in English. Primarily for sophomores. Upperclass students admitted as space permits. Fall: open to freshmen who have received advanced placement in English. Spring: open to other qualified freshmen. May be used to satisfy either the Freshman Seminar requirement or the distribution requirement in the humanities, but not both. Sections limited to 22.

Fall: M W F 10:10 or 11:15, T Th 10:10–11:25;

P. L. Marcus, S. Budick. Spring: M W F 9:05, 10:10, S. Siegel, J. Stallworthy, B. Rosencrance.

Designed to sharpen the student's ability to understand and respond to poetry. Readings in the major periods, modes, and genres of poetry written in English.

272 Introduction to Drama Fall or spring. 3 credits. Recommended for prospective majors in English. Primarily for sophomores. Upperclass students admitted as space permits. Fall: open to freshmen who have received advanced placement in English. Spring: open to other qualified freshmen. May be used to satisfy either the Freshman Seminar requirement or the distribution requirement in the humanities, but not both. Section limited to 22.

Fall: T Th 10:10–11:25 or 2:30–3:45. E. G. Fogel, A. Caputi. Spring: M W F 11:15 or 12:20.

B. O. States, B. B. Adams.

A study of how drama molds feeling and comprehension by integrating such means available to the dramatist as action, language, and artistic design. Critical examination of plays of all periods, including the twentieth century, with major emphasis on plays written in English, but with collateral examples of outstanding plays from the European tradition. The syllabus will be adjusted from year to year to include plays produced on campus under the sponsorship of the Department of Theatre Arts.

280–281 Creative Writing 280, fall; 281, spring. 3 credits each term. Recommended for prospective majors in English. Recommendation of 280 instructor is prerequisite for admission to 281. Sections limited to 16.

M W F 9:05 or 3:35; T Th 9:05 or 12:20.

E. Rosenberg, K. A. McClane, L. Herrin, and others.

An introductory course in the theory and practice of writing narrative, poetry, and allied forms.

288–289 Expository Writing 288, fall; 289, spring. 3 credits each term. Sections limited to 15.

M W 9:05 or 10:10; T Th 2:30, and conferences to be arranged. N. H. Hertz, P. Sawyer, and others.

Primarily for non-English majors who practice in various kinds of expository writing—definition, analysis, comparison, contrast, argument—applied to students' particular disciplines and interests. Frequent short essays, complemented by discussion of writings by good authors.

Courses for Sophomores, Juniors, and Seniors

Courses at the 300 level are open to juniors and seniors, and to others with the permission of the instructor. There are no prerequisites, except as noted for English 382–383 and 384–385.

Major Periods of English Literature

320 Renaissance Literature Spring. 4 credits.

M W F 10:10. B. B. Adams.

A survey of major literary movements of the sixteenth and seventeenth centuries, with particular attention to the works of Spenser, Marlowe, Shakespeare, Donne, Jonson, Webster, Herbert, and Milton.

330 Restoration and Eighteenth-century Literature Spring. 4 credits.

M W F 1:25. J. Culler.

A broad survey covering works by the major poets, dramatists, and novelists of the period, with particular emphasis on Dryden, Pope, Swift, Fielding, Sterne, and Johnson. Two short papers and a final exam.

340 The Romantic Period Fall. 4 credits.

M W F 11:15. A. R. Parker.

A critical study of the writings of Blake, Coleridge, Wordsworth, Byron, Shelley, and Keats.

345 The Victorian Period Spring. 4 credits.

M W F 12:20. P. Sawyer.

A survey of some major achievements in prose and poetry. Readings will include poems of Tennyson, Browning, and Arnold; one novel each by Dickens and Eliot; and selections from the autobiographers and social critics—Mill, Ruskin, Carlyle, and others.

350 The Early Twentieth Century (to 1914) Fall. 4 credits.

M W F 10:10. S. Siegel.

Interpretations of English and Anglo-Irish poetry, fiction, and drama. Writers will include Wilde, Hardy, Conrad, Lawrence, Joyce, Eliot, Yeats, Woolf, and others. Although the emphasis will be upon individual works, we will consider the authors and their achievements within the wider context of literary, intellectual, and social history. Topics for discussion will include the esthetic movement, the Abbey Theatre, Imagism, Modernism, Bloomsbury, Surrealism. Lectures, discussion, special seminars.

351 Modern Literature Since World War I Spring. 4 credits.

M W F 11:15. P. L. Marcus.

Interpretations of modern English and Anglo-Irish poetry, fiction, and drama. Lectures and discussions. Some attention will be given to intellectual history and to parallel movements in the other arts. Authors will include Joyce (*Ulysses*), Yeats, Shaw, Eliot, Lawrence, Woolf, O'Casey, Auden, and Beckett.

Major English Authors

319 Chaucer Spring. 4 credits.

T Th 10:10. R. T. Farrell.

Though the main emphasis will be on *Troilus* and *The Canterbury Tales*, some attention will also be given to the early poems and the question of Chaucer's development as a poet.

327 Shakespeare Spring. 4 credits.

M W F 11:15. H. S. McMillin.

An introduction to the works of Shakespeare, based on a selection of plays representative of the stages of his artistic development and the range of his achievement.

329 Milton Fall. 4 credits.

M W F 10:10. C. S. Levy.

Milton's English poems, including *Paradise Lost* and *Samson Agonistes*, and selections from his prose.

Major Periods of American Literature

361 Early American Literature Fall. 4 credits.

T Th 10:10–11:25. S. C. Strout.

The literature of religious and political ideas produced by Puritan and Enlightenment writers from Bradford to Jefferson as a context for the early literary achievements in poetry (Bradstreet, Taylor), memoir (Franklin), novel (Brown), and tale (Irving, Hawthorne).

362 The American Renaissance Spring. 4 credits.

M W F 11:15. M. J. Colacurcio.

America's literary maturity at mid-century: the individual masterpieces and the interrelated careers of Emerson, Thoreau, Hawthorne, Melville, Whitman, and Dickinson.

363 The Age of Realism and Naturalism Fall. 4 credits.

T Th 2:30–3:45. R. H. Elias.

The literary expression of new attitudes toward American society and the individual between the Civil War and the early years of the twentieth century, primarily as exemplified in representative writings by Mark Twain, W. D. Howells, Henry James, Mary Wilkins Freeman, Charles W. Chesnut, Henry Adams, Stephen Crane, and Theodore Dreiser.

Genres and Special Topics

364 American Literature in the Twentieth Century Spring. 4 credits.

M W F 11:15. J. P. Bishop.

A sequence of impressive literary texts composed by Americans from the beginning of the twentieth century to the present in a variety of genres. The authors represented should include the principal poets from Frost to Ammons; Hemingway, Fitzgerald,

Faulkner, Salinger, and Bellow for prose fiction; and Wilson, Agee, Goodman, and Mailer for criticism and journalism. An attempt will be made to redefine the idea of modernity with the help of the evidence provided.

366 The Earlier American Novel: Brockden Brown to Henry James Fall. 4 credits.

T Th 2:30-3:45. D. E. McCall.
A survey of major American novels of the nineteenth century. Writers studied will include Poe, Cooper, Hawthorne, Melville, Mark Twain, Howells, Chopin, and James.

367 The Modern American Novel Spring. 4 credits.

T Th 2:30-3:45. D. E. McCall.
A survey of major American novels of the twentieth century. Writers studied will include Dreiser, Crane, Fitzgerald, Hemingway, West, Wright, Faulkner, Agee.

370 The Nineteenth-century English Novel Spring. 4 credits.

M W F 12:20. T. L. Jeffers.
Survey of works by major English novelists in the nineteenth century. Reading list: Austen, *Emma*; Thackeray, *Vanity Fair*; Brontë, *Wuthering Heights*; Dickens, *Little Dorrit*; Eliot, *Adam Bede*; Hardy, *Tess of the d'Urbervilles*; Conrad, *Nostromo*. Students will write two essays.

372 Representative English Dramas Fall. 4 credits.

T Th 12:20-1:35. A. Caputi.
A study of important events in the English theatre from its beginnings to the early twentieth century. Plays by Marlowe, Shakespeare, Jonson, Webster, Dryden, Wycherley, Congreve, Sheridan, Shelley, Robertson, Shaw, and others.

Creative Writing

382-383 Narrative Writing 382, fall; 383, spring. 4 credits each term. Sections limited to 15.

Prerequisite: 280-281, or permission of instructor.
T Th 12:20 or 2:30, and conferences to be arranged. D. E. McCall, L. Herrin.
The writing of fiction; study of models; analysis of students' work.

384-385 Verse Writing 384, fall; 385, spring. 4 credits each term. Sections limited to 15.

Prerequisite: 280-281, or permission of instructor.
T 2:30-4:25. A. R. Ammons and others.
The writing of poetry; study of models; analysis of students' poems; personal conferences.

388-389 The Art of the Essay 388, fall; 389, spring. 4 credits each term. Prerequisite: permission of instructor. Sections limited to 18.

T Th 11:15 and conferences to be arranged.
L. Green.
For both English and non-English majors who have done well in such courses as the Freshman Seminar or 288-289 and who desire intensive practice in writing criticism, general exposition, and personal essays. Particular (but not exclusive) emphasis on expository techniques of analysis and persuasion. Some twelve papers of between two and eight pages.

Advanced Undergraduate Course

Most courses of the 400 level are limited in enrollment and require the permission of the instructor.

407 Studies in Biography Fall. 4 credits. Limited to 15.

T Th 10:10-11:25. D. Novarr.
Study of lives by Plutarch, Walton, Johnson, Boswell, Carlyle, Freud, Strachey, Virginia Woolf, Erikson, and others. Some emphasis on the relation of biography to the novel and to history, psychology,

autobiography, and other disciplines in order to explore the main theoretical and critical problems which the art of biography poses.

409 The Rhetoric of Fiction Spring. 4 credits. Limited to 15.

T 2:30-4:30. H. Brodkey.
A study of techniques concentrating on methods by which private materials and visions are made public in fiction. The texts will include Pynchon's *V.*, Nabokov's *The Gift*, and Woolf's *The Waves*.

426 Poetry and Music in the English Renaissance (Also Music 426) Spring. 4 credits.

W F 12:20-1:35. B. Rosecrance and E. Murray.
A survey of English poems and their musical settings from late medieval times to the early seventeenth century, with emphasis on the interrelations of music and text. Some attention will also be given to historical background and social context. The course will consider selected medieval lyrics, the words and music of the early Tudor songbooks, relevant European settings and texts, the English madrigal-composers, and the Ayre. Besides anonymous settings and lyrics, settings by Fayrfax, Henry VIII, Tallis, Byrd, Gibbons, Morley, Weelkes, Wilbye, Dowland, and Campion; lyrics by Wyatt, Vaux, Surrey, Raleigh, Spenser, Sidney, Shakespeare, Campion, and Donne will be represented. No theoretical training in music is assumed.

431 The Late Eighteenth Century: Prose

Spring. 4 credits. Limited to 15.
M W F 12:20. N. H. Hertz.
Selected writings from the work of David Hume and Samuel Johnson.

433 The Eighteenth-century English Novel Fall. 4 credits. Limited to 15.

M W F 11:15. H. Shaw.
Form in the eighteenth-century English novel. We will concentrate first on the classic achievements of Richardson and Fielding, then on experiments with novel form toward the end of the century, and finally on the way in which Austen and Scott draw upon and transform elements of the eighteenth-century tradition in fiction. Works by Defoe, Richardson, Fielding, Sterne, Smollett, Burney, Radcliffe, Mackenzie, Austen, and Scott. Several short exercises and a take-home final.

434 Drama of the Restoration and Eighteenth Century Spring. 4 credits.

M W F 10:10. D. D. Eddy.
We will read twenty-two plays written by the major playwrights of the Restoration and the eighteenth century, including Dryden, Wycherley, Etherege, Otway, Congreve, Gay, Goldsmith, and Sheridan.

453 Victorian Literature: The Pre-Raphaelites and Their Circle Spring. 4 credits.

T Th 10:10-11:25. S. M. Parrish.
Readings in the poetry of D. G. Rossetti, Christina Rossetti, Swinburne, Morris, and others, and in related prose writers such as Ruskin, Pater, and Wilde.

454 Three Modern Poets and Theorists Fall. 4 credits. Limited to 15.

T Th 2:30. L. Green.
Reading modern poetry: an analysis of texts, pretexts, and contexts. We will read selectively from three modernist poets. Pound, Eliot, and Williams, as well as three modernist theorists of textuality, Saussure, Freud, and Marx. We will also attempt to arrive at some understanding of the term "modernism."

455 Arms and the Man Fall. 4 credits.

T Th 10:30-11:45. J. Stallworthy.
'Poetry is the spontaneous overflow of powerful feelings,' and few human activities through history have generated more powerful feelings than war. The poetry produced by combatants and civilians is uniquely revealing about the nature of the society

from which it comes, its values and priorities. The course will consider the heroic epic and poems from the Crimean War, the American Civil War, the Anglo-Boer War, the First World War, the 1916 Easter Rising and Civil War in Ireland, the Spanish Civil War, the Second World War, the Vietnam War, and the continuing conflict in Ireland.

456 Modern Poetry And Poetics Spring. 4 credits. Limited to 15.

M W F 12:20. S. Siegel.
Detailed study of Yeats, Eliot, and Stevens as poets and critics. Emphasis will be on their relation to the romantic tradition and the emergence of modernism. There will be some reading of Shelley and Wordsworth.

458 Yeats Fall. 4 credits. Limited to 15.

M W F 12:20. S. Siegel.
Detailed study of Yeats's poems, plays, and nonfictional prose. We will situate Yeats within the Irish as well as the English literary traditions and turn our attention to the underlying view of poetry and the poet that informs his work. There will be readings in Irish history and myth, neoplatonism, and the "occult." In addition to serving as an introduction to the study of Yeats, the seminar will address the more general question of the relation of poetry, drama, and prose to politics and belief.

461 Twentieth-century British Poetry Spring. 4 credits.

M W F 2:30. J. Stallworthy.
Starting with Hardy and Yeats, whose work provides a strong bridge from the nineteenth century, and with Hopkins, whose *Poems* were published posthumously in 1918, the course will consider the principal movements and groupings in subsequent British poetry: imagists, modernists, Georgians, poets of the First World War, Sitwellists, surrealists, poets of the 1930s, poets of the Second World War, poets of the Movement. Using *The Norton Anthology of Modern Poetry*, edited by Richard Ellmann and Robert O'Clair (1973), we will concentrate in each session on individual poems by a particular poet or group of poets, not overlooking those who, like Robert Graves, remain sturdily independent of any school or group. Finally, the course will consider the work of such contemporaries as Larkin, Hughes, Heaney, Hill, and Tomlinson, whose work is among the best now being written in the English-speaking world.

463 The Political Novel in America Fall. 4 credits. Limited to 15.

T Th 12:20. S. C. Strout.
Critical study of radical, conservative, and liberal politically oriented novels by important writers from 1869 to 1971. Examples from Adams, Twain, James, Steinbeck, Dos Passos, Hemingway, Warren, Ellison, Doctorow, and others. The novel will be considered both as a source of insight and as a historical source. Common readings and interpretive papers.

467 Studies In Afro-American Literature: Hughes, Wright, Baldwin, Morrison Spring. 4 credits. Limited to 15.

T Th 10:45-12:00. K. McClane.
An examination of the works and attitudes of four major Afro-American writers, with special emphasis on those traditions and motifs which inform Afro-American literature. Since much of Black literature is a response to historical imperatives, we shall be mindful of the weight of the past; but we shall also apply aesthetic criteria and create new definitions where we must.

468 Seminar in American Culture: The Thirties Spring. 4 credits. Limited to 15.

Th 1:25-3:20. R. H. Elias.
Social realism and documentary expression, mainly in fiction but also in photojournalism and painting, studied in the context of the social problems and political attitudes that gave rise to and sustained the New Deal.

469 Modern American Poetry Spring. 4 credits. Limited to 15.

T Th 8:00–9:15. J. B. Merod.

Our aim is to look closely at important poems of several American poets, including Whitman, Frost, Williams, Stevens, Ashberry, Ammons, and Snyder.

470 Studies in the Novel: Specialized Readings in Victorian Fiction Spring. 4 credits. Limited to 15. Prerequisite: 345 or 370, or equivalent.

W 1:25–3:20. J. F. Blackall.

Topic for 1979: Charlotte Brontë, Elizabeth Gaskell, and George Eliot. Readings to include: Brontë's *Jane Eyre*, *Shirley*, and *Villette*; Gaskell's *The Life of Charlotte Brontë*, *North and South*, and *Wives and Daughters*; and Eliot's *Middlemarch* and *Daniel Deronda*. Alternatives for those who have recently read some of the above: Brontë's *The Professor*, Gaskell's *Cranford*, Dickens' *Hard Times*, and Eliot's *Adam Bede* or *The Mill on the Floss*. The course is conceived as a sequel to 370 for the student who wishes to go more deeply into the work of a few major or representative figures.

472 Irish Literature Fall. 4 credits. Limited to 15. M W F 9:05. P. L. Marcus.

The topic for 1978 will be literature and nationalism in modern Ireland. The Irish theatre movement and the 1916 Rising will serve as focal points for an examination of the relationship between the demands of art and those of country. Particular attention will be given to Yeats, Synge, Lady Gregory, Moore, Joyce, Pearse, and O'Casey. The early weeks of the term will be devoted to study of the relevant literary and historical background from the medieval bardic era to the patriotic poetry of young Ireland.

473 Trends in Contemporary Criticism Spring. 4 credits. Limited to 15.

M W F 10:10. J. Culler.

Study of some of the major varieties of criticism since 1945. Authors to be read include Cleanth Brooks, Roland Barthes, Northrop Frye, Jean-Paul Sartre, Roman Jakobson, Paul de Man, W. K. Wimsatt, Georges Poulet, William Empson, Harold Bloom, Kenneth Burke, Frederick Crews, George Lukacs. Two short papers and a final exam.

476 The Child in Literature Fall. 4 credits. Limited to 15. With permission of the instructor.

T Th 2:30–3:45. A. Lurie.

A survey of the changing idea of childhood as reflected in significant works of British and American literature for both children and adults from 1800 to the present. Among books read will be Alcott, *Little Women*; Aldrich, *The Story of a Bad Boy*; Blake, *Songs of Innocence and Experience*; Burnett, *The Secret Garden*; Grahame, *The Golden Age*; James, *The Turn of the Screw*; McCullers, *The Member of the Wedding*; Stevenson, *A Child's Garden of Verses*; and Twain, *Tom Sawyer*.

478 The Trials of Liberalism Fall. 4 credits. Limited to 15.

M W F 9:05. T. L. Jeffers.

Studies in English and American authors' responses to political revolution since 1789. Readings will include Trollope, *Phineas Finn*; James, *Princess Casamassima*; Conrad, *Under Western Eyes*; Koestler, *Darkness at Noon*; Mailer, *The Naked and the Dead*; selected social criticism by Burke, Arnold, J. S. Mill, Morris, Orwell; and selected poems by Wordsworth, Coleridge, Yeats, Auden, et al.

480–481 Seminar in Writing 480, fall; 481, spring. 4 credits. Prerequisites: 382–383 or 384–385, and permission of instructor. Limited to 15.

T 12:20–2:15. Fall, L. Herrin; spring,

J. R. McConkey.

Intended for those writers who have already gained a basic mastery of technique. Students normally enroll for both terms and should be capable of a major project—a collection of stories or poems, a group of personal essays, or perhaps a novel—to be

completed by the end of the second semester. In general, the weekly seminars will be used for discussions of the manuscripts of its members and of certain published works that individual members have found of exceptional value.

484 E. M. Forster: A Centenary Seminar Fall. 4 credits. Limited to 15.

M W F 1:25. J. R. McConkey.

A reading of Forster's major works emphasizing a way of reading his fiction based on the implications and attitudes of his nonfictional prose. Since that method can be applied to fiction generally, the course may be of value to those interested in criticism or fiction writing. Books to be read include his novels, two collections of his stories, two collections of his essays, and *Aspects of the Novel*. A long paper will be required.

485 The Contemporary American Novel Spring. 4 credits. Limited to 15.

T Th 2:30–3:45. L. Herrin.

We will be reading and discussing post-World War II American novels, some well-known but others relatively obscure. Novelists to be read include: John Hawkes, Saul Bellow, William Gass, James Salter, Walker Percy, William Gaddis. Interpretative papers and a final exam.

491 Honors Seminar I: The Evolution of the Novel Fall. 4 credits. Limited to 15.

T Th 12:20–1:35. D. R. Schwarz.

A study of the rise of the novel in the eighteenth century and the development of the novel form in selected works of the nineteenth century. Readings will include *Moll Flanders*, *Tom Jones*, *Clarissa*, *Tristram Shandy*, *Emma*, *Vanity Fair*, *Bleak House*, and *Jude the Obscure*. Some attention will be given to theoretical problems involved in the study of fiction.

492 Honors Seminar II: History and the Literary Imagination Spring. 4 credits. Limited to 15.

T Th 2:30–3:45. S. C. Strout.

An examination of the interplay between the historical and the literary imagination in various forms of narrative (memoir, short story, drama, novel). Readings will emphasize American forms and issues with attention as well to recent theoretical discussions.

493 Honors Essay Tutorial I Fall or spring.

4 credits. Prerequisite: senior standing and permission of the chairperson of the Honors Committee.

Staff.

494 Honors Essay Tutorial II Fall or spring.

4 credits. Prerequisite: English 493 and permission of the chairperson of the Honors Committee.

Staff.

495 Independent Study Fall or spring. 2–

4 credits. Prerequisite: completion of English honors requirement, or acceptance in the Independent Major Program and consent of a department adviser. Students who do not meet these prerequisites may apply to the director of undergraduate studies for permission to take independent study. Permission will be granted only to students who present an acceptable prospectus of the study to be undertaken and who have secured the agreement of a faculty member to serve as adviser for the project throughout the term.

496 Teaching and Research Fall or spring. 1–2 credits. May not be used in satisfaction of the English major.

Staff.

For students who, with the consent of a professor, assist in the teaching of that professor's course.

Teacher Preparation Courses

570 The Teaching of English Fall or spring. 4 credits.

Time to be arranged.

Taken the semester prior to student teaching, this course focuses on the planning and design of instruction in literature, writing, language, and communication skills for secondary school students.

571 Seminar in the Teaching of English Fall or spring. 3 credits.

Time to be arranged.

This seminar focuses on the practical considerations of teaching in general, and practice teaching in particular. There are career related lectures by librarians, specialists in reading, and scholars in both English and education. To be taken concurrently with 578 or 579.

575 Directed Study: Problems in Teaching English Language and Literature Fall or spring. 4 credits.

Time to be arranged.

Students will deal with specific problems in the teaching of English on the secondary level. They are expected to combine practical classroom work at the high school or junior high school level with background readings and research.

576 Practicum in Secondary Teaching Fall or spring. 2 credits. Open to sophomores, juniors, seniors, and graduate students. Usually taken concurrently with 570.

Time to be arranged.

A variety of projects may be arranged under this rubric. Students work under the supervision of local school personnel. They may work as reading tutors (5 hours/week), or in 3 week mini-courses, in which they observe for one week and teach for two. Several different projects can be taken with this course number, during the same or different semesters.

578 Undergraduate Student Teaching Fall or spring. 6 credits. Prerequisites: admission to the department's undergraduate teacher preparation program, English 570, and an elected tutoring experience.

Time to be arranged.

Seniors spend one semester in a local secondary school, gradually assuming the responsibilities of a full-time English teacher. This is a competency-based course leading to provisional certification in New York State.

579 Graduate-Level Student Teaching Fall or spring. 6 credits.

Time to be arranged.

Similar to 578, this course is for MAT candidates who seek certification in English for New York State. It entails a full semester of student teaching under an experienced master teacher. The student will be at a local school full-time.

Courses Primarily for Graduate Students

Permission of the instructor is a prerequisite for admission to courses numbered in the 600s. These are primarily intended for graduate students, although qualified undergraduates are not excluded. Undergraduates seeking admission to a 600-level course should consult the appropriate instructor. The list of courses given below is illustrative only; a definitive list, together with course descriptions and class-meeting times, will be published in a separate department brochure at course registration time each term.

611 Readings in Old English Fall. 4 credits. T. D. Hill.

612 Beowulf Spring. 4 credits. R. T. Farrell.

613 Middle English Literature Spring. 4 credits.
R. E. Kaske.

619 Chaucer Spring. 4 credits.
R. E. Kaske.

621 Spenser Fall. 4 credits.
C. Kaske.

622 Renaissance Prose Spring. 4 credits.
D. Novarr.

623 Metaphysical Poetry Fall. 4 credits.
D. Novarr.

624 Lyric Sequences Spring. 4 credits.
C. S. Levy.

627 Shakespeare Spring. 4 credits.
H. S. McMillin.

629 Milton Spring. 4 credits.
S. B. Elledge.

632 Pope, Swift, Fielding, and Johnson Fall.
4 credits.
S. B. Elledge.

641 Studies in Romantic Poetry Spring.
4 credits.
M. H. Abrams.

648 Henry James: A Survey of Representative Works Fall. 4 credits.
J. F. Blackall.

652 Studies in the Development of Modern British Fiction Spring. 4 credits.
P. L. Marcus.

654 Modern American Poetry Spring. 4 credits.
R. Morgan.

661 American Puritanism Spring. 4 credits.
M. J. Colacurcio.

669 The James Family Spring. 4 credits.
S. C. Strout.

670 The Novel from Sterne to Scott Fall.
4 credits.
E. Rosenberg.

672 Dramatic Literature: Tragedy Fall.
4 credits.
B. O. States.

692 Problems of Literary Criticism Fall.
4 credits.
J. Culler and N. H. Hertz.

693 Research Problems and Opportunities in Literary Studies Fall. 4 credits.
D. D. Eddy.

Graduate Seminars

Permission of the instructor is a prerequisite for admission to any course numbered in the 700s; most of these courses are limited in enrollment at the discretion of the instructor. For course descriptions see the mimeographed supplement published by the department.

712 Readings in Old English Poetry Fall. 5 credits.
T. D. Hill.

742 Seminar in Wordsworth Fall. 5 credits.
S. M. Parrish.

751 Modern Poets at Work Fall. 5 credits.
J. Stallworthy.

752 Conrad Spring. 5 credits.
D. R. Schwarz.

765 Frost and Dickinson Spring. 5 credits.
R. H. Elias.

780-781 Creative Writing 780, fall; 781, spring.
5 credits each term.

793 Master's Essay Fall or spring. Noncredit.
Staff.

794 Directed Study Fall or spring. 5 credits.
Staff.

795 Group Study Fall or spring. 5 credits.
Staff.

796 Teaching and Research Fall or spring.
5 credits.
Staff.

The following courses offered by other departments will be of particular interest to English majors and graduate students.

Courses in Classical and Ancient Literature

Greek Mythology (Classics 236)

Courses in Dramatic Literature

Classic and Renaissance Drama (Comparative Literature 352, Theatre Arts 325)

European Drama 1660-1900 (Comparative Literature 353, Theatre Arts 326)

Modern Drama (Comparative Literature 354, Theatre Arts 327)

American Drama and Theatre (Theatre Arts 335)

Ibsen and Chekhov (Theatre Arts 442, Comparative Literature 472)

Seminar in Dramatic Theory (Theatre Arts 637)

Seminar in Theories of Directing (Theatre Arts 699)

Courses in the Literature of Europe and America

Word Power: Greek and Latin Elements in the English Language (Classics 100)

Introduction to Semiotics (Comparative Literature 295)

Introduction to Psychopathological Texts (Comparative Literature 311)

Comedy (Comparative Literature 312)

Literature of the Old Testament (Comparative Literature 328)

The European Novel (Comparative Literature 363-364)

Ideas And Art in Great Political Novels (Comparative Literature 388)

Readings in Modern Poetry (Comparative Literature 391)

Introduction to Twentieth-century Criticism (Comparative Literature 395)

Rhetoric and Technology (Comparative Literature 414)

Old Testament Seminar (Comparative Literature 421)

Early Romantic Poetry and Discourse (Comparative Literature 470)

Romanticism: Dialectic and Rhetoric (Comparative Literature 471)

The Bildungsroman in Modern Literature (Comparative Literature 477)

Towards Thomas Mann (Comparative Literature 487)

Towards a Theory of the Humanities: Jürgen Habermas (Comparative Literature 496)

The Romantic Ode (Comparative Literature 671)

Hermeneutics (Comparative Literature 699)

Shakespeare And Madness (Society for Humanities 419)

The Idea of India in English Literature From the Eighteenth Century to the Present (Society for Humanities 420)

Poetic Influence in the Middle Ages (Society for Humanities 422)

African Literature (Africana Studies 422)

History of Afro-American Literature (Africana Studies 431)

Modern Afro-American Literature (Africana Studies 432)

Geological Sciences

J. E. Oliver, chairman; W. A. Bassett, J. M. Bird, A. L. Bloom, L. D. Brown, J. L. Cisne, B. L. Isaacks, D. E. Karig, S. Kaufman, R. W. Kay, J. Knight, F. H. T. Rhodes, W. B. Travers, D. L. Turcotte

The Department of Geological Sciences is an intercollege department of the College of Arts and Sciences and the College of Engineering.

Distribution Requirement

The distribution requirement in physical sciences is met by Geological Sciences 101-102 or 103, 105, and 102.

Geological Sciences Major

The prerequisites for admission to a major in geological sciences are two of the two-semester sequences of courses chosen from the following, or their equivalents: Biological Sciences 101-103 or 102-104; Chemistry 207-208, Mathematics 191-192; and Physics 112-213. Geological Sciences 101-102 is recommended, but a student with a strong foundation in mathematics and science may be accepted as a major without completion of 101-102.

Majors take the six core courses in geological sciences, a summer field geology course, one additional course in geological sciences numbered 400 or above, and a third two-semester sequence chosen from the courses in biological sciences, chemistry, mathematics, and physics listed above, plus an additional course in one of these fields at an intermediate or advanced level. In addition, majors must complete a senior thesis. The core courses in geological sciences include:

325 Structural Geology and Sedimentation

345 Geomorphology

355 Mineralogy, Petrology, and Geochemistry I

356 Mineralogy, Petrology, and Geochemistry II**376 Historical Geology and Stratigraphy****388 Geophysics and Geotectonics**

Prospective majors should consult one of the following departmental major advisers: W. A. Bassett, 222 Kimball; A. L. Bloom, 211 Kimball; R. Kay, 304A Kimball; J. Oliver, 209 Kimball; or W. B. Travers, 219 Kimball, as soon as possible for advice in planning a program. Students majoring in geological sciences should attend the departmental seminars and take advantage of cruises, field trips, and conferences offered through the Department of Geological Sciences.

Certain 300-level courses in geology may be of particular interest to students of chemistry, biology, ecology, and physics. Nonscience undergraduate students are also encouraged to inquire about these courses in Room 210, Kimball Hall.

Courses are listed in the College of Engineering section under Department of Geological Sciences.

Government

G. H. Quenter, chairman; B. R. O'G. Anderson, D. E. Ashford, M. G. Bernal, S. Buck-Morss, D. J. Danielski, W. J. Dannhauser, A. T. Dotson, E. J. Eisenach, M. J. Esman, B. Ginsberg, G. McT. Kahin, M. Katzenstein, P. Katzenstein, E. W. Kelley, E. G. Kenworthy, I. Kramnick, P. Leeds, T. J. Lowi, D. P. Mozingo, T. J. Pempel, R. H. Rosecrance, M. Rush, L. Scheinman, M. Shefter, S. G. Tarrow, N. T. Uphoff, D. E. Van Houweling

The Major

For a major in government the following courses must be completed: (1) three of the following introductory courses: Government 111, Government 131, Government 161, and Government 181; (2) a minimum of twenty-four additional credits in government department courses numbered 300 or above; (3) in related subjects, a minimum of twelve credits selected with the approval of the adviser from courses numbered 300 or above in the Departments of Anthropology, Economics, History, Philosophy, Psychology, and Sociology. (S-U options are not allowed in any course needed to fulfill the government major.)

Juniors and seniors majoring in the Department of Government who have superior grade records may apply for supervised study in government with a particular instructor, whose consent is required. See the description for Government 499 (Supervised Study). To accommodate new courses or course changes, a supplementary announcement is maintained by the department. Before preregistering or registering each term, students are requested to consult the current *Supplementary Announcement of Courses in Government*, available in 125 McGraw Hall.

The Honors Program

A small number of exceptionally well-qualified students are accepted each year in the honors program. Admission is by application and is competitive. Students who wish to be considered must complete an application in the spring semester of their sophomore year. Those who are admitted will register for Government 400. Successful completion of Government 400 entitles the student to write an honors thesis (Government 494, eight credits) or honors paper (Government 494, four credits) in the senior year, provided other requirements have been met. (See honors courses, p. 78, for a description of these courses.) The decision to award honors and in

what degree will be based on the quality of the thesis or paper, the student's record in government courses, and the student's overall record at Cornell.

Interested students should consult the *Supplementary Announcement* available in the departmental office in 125 McGraw Hall. Further inquiries may be addressed to the Director of Undergraduate Studies, 130 McGraw Hall.

European Studies Concentration

Government majors may elect to group some of their required and optional courses in the area of European studies, drawing from a wide variety of courses in relevant departments. Students are invited to consult Professors Katzenstein, Scheinman, and Tarrow for advice concerning course selection; foreign study programs, etc.

Distribution Requirement

The distribution requirement in the social sciences is satisfied in government by taking two of the following courses: Government 111, 131, 161, and 181; or by taking one of 111, 131, 161, or 181 followed by a 300-level course in the same area.

Introductory Courses

111 The Government of the United States

Spring, 3 credits.

T. J. Lowi.

An introduction to government through the American experience. Concentration on analysis of the institutions of government and politics as mechanisms of social control.

131 Introduction to Comparative Politics

Spring, 3 credits.

E. G. Kenworthy.

An investigation of the foundations of politics under different political regimes; totalitarian governments and autocracy; the bases of political conflict; social movements and party systems; political processes and policy outcomes; revolutionary versus evolutionary change; political development in the Third World; the modern corporate state.

161 Introduction to Political Theory

Fall, 3 credits.

W. J. Dannhauser.

A survey of the development of Western political theory from Plato to the present. Readings from the work of the major theorists; an examination of the relevance of their ideas to contemporary politics.

181 Introduction to International Relations

Fall, 3 credits.

R. Rosecrance.

An introduction to the basic concepts and practice of international politics.

Freshman Seminars

100 Freshman Seminars

Fall or spring, 3 credits.

Seminars will be offered in both the fall and spring terms. Consult the *Supplementary Announcement* and the Freshman Seminar booklet for course descriptions and instructors.

Major Seminars

300 Major Seminars

Fall or spring, 4 credits. Consult the *Supplementary Announcement* for course descriptions and instructors. Admission by application only. Forms are provided each term to indicate seminar preferences and are available in 125 McGraw. Nonmajors may be admitted (application also required) but government majors are given priority. Majors in the department are encouraged to take at least one seminar course during the junior or senior year.

The following courses are open to sophomores, juniors, and seniors without prerequisite unless otherwise indicated.

American Government and Institutions

Government 111 is recommended.

302 The Impact and Control of Technological Change (also CRP 440 and Econ 302)

Spring, 4 credits.

J. Milch.

The use, impact, and control of technological change. Emphasis is on the dilemmas of public choice in a technological society marked by specialization and rational planning. Specific problem areas in which the problems of control are controversial will be examined.

311 Urban Politics

Spring, 4 credits.

M. Shefter.

The interaction between urban problems and the politics of city government has resulted in important public policy issues in the United States. This course provides an introduction to the politics of metropolitan areas; analysis of the central institutions and processes of urban government such as mayors, city councils, elections, and the criminal justice system; and specific public policy problem areas such as race relations, education, housing, law enforcement, and civil disorder.

312 Urban Affairs Laboratory

Fall or spring (if there is a minimum registration of 40 students), 3 credits. Open to both undergraduate and graduate students.

D. E. Van Houweling and staff.

An interdisciplinary course in urban affairs which emphasizes learning by experience in an urban game rather than lectures or reading assignments. By playing roles in a simulated city, students test their solutions for environmental and other urban problems. The roles include city councilperson, city manager, environmental quality agency director, newspaper editor, industrialist, community organizer, land speculator, and planner.

313 The Nature, Functions, and Limits of Law

Fall, 4 credits.

K. Hanslowe.

This general education course for nonlaw students presents law as a set of varied techniques for resolving conflict and dealing with social problems, not as a body of rules. The course analyzes the roles of courts, legislatures, and administrative agencies in the legal process, considering also constitutional limits on their power and practical limits on their effectiveness.

314 Common Law and Lawyers in America

Fall, 4 credits.

E. J. Eisenach.

The common law system in America will be examined from three perspectives: the relationship of the common law to political and social theory in America; the process of the reception of the common law, its supporters, opponents, and competitors; and the contemporary place and role of courts, legal education, and lawyers in political thought and action.

316 The American Presidency

Spring, 4 credits.

D. Walker.

Analysis of the politics of the presidency and the executive branch with emphasis on executive-legislative relations, executive branch policymaking, and the problems of the modern presidency.

317 Political Parties and Elections

Spring, 4 credits.

B. Ginsberg.

The relationship between citizen participation and public policy is one of the central questions of

democratic politics. This course will focus on American voting behavior, the role of political parties, and the links between citizens' choices at the polls and the behavior of public officials.

318 The American Congress Spring, 4 credits.
M. Shefter.

The role of Congress in the American political system. Topics to be discussed: the political setting within which Congress operates, the structure of Congress, the salient features of the legislative process, and recent congressional behavior in a number of policy areas.

319 American Political Behavior Fall, 4 credits.
P. G. Leeds.

Examines those factors (political, social, economic, and psychological) that affect the formation, development, and organization of political opinions and attitudes and the impact of these political attitudes on an individual's political behavior. The main focus of the course concerns the interplay between normative requirements for participation in a democratic society and the actual empirical investigation of the existing quality and level of participation in the United States.

[323 The "Fourth" Branch 4 credits. Not offered 1978-79.]

[324-325 Law and Social Science 4 credits each term. Not offered 1978-79.]

[327 Civil Liberties in the United States. 4 credits. Not offered 1978-79.]

326 The Politics of Education Spring, 4 credits.
E. W. Kelley.

Education is simultaneously America's biggest business and the set of formal and informal processes through which skills and values are passed on to the next generation. A topic involving both basic values and so much money must be the subject matter of politics. This course will deal with conflicts about and the politics of education as they occur at both national and state levels. What (including values) will be taught to whom, who will benefit from formal education as a vehicle for entry into economic opportunity? What are the powers and restrictions on both state and national government in this area? How does the American system—in particular its politics—differ from other systems? These and other questions like the effects of constitutional, electoral, and legislative rules and structures on educational politics will be considered.

328 Constitutional Politics Fall, 4 credits.
D. Walker

An analysis of constitutional interpretation and policymaking by the Supreme Court.

[329 Politics, Race, and Education 4 credits. Not offered 1978-79.]

411 Political and Economic Power in Cities Fall, 4 credits.
M. Shefter.

This seminar will explore the interaction between political and economic forces in American cities. Particular attention will be paid to the political background and consequences of New York City's current fiscal crisis.

426 Science, Technology, and Public Policy Spring, 4 credits.
R. Brickman.

An examination of science and technology in the United States with extensive comparison with other industrialized countries; the emergence of government's role in research and development and its impact on universities, industry, and government institutions and processes; the role of scientists in public policy.

428-429 Government and Public Policy: An Introduction to Analysis and Criticism 428, fall; 429, spring, 4 credits each term. Open to undergraduates with permission of instructor.
T. J. Lowi.

The first semester stresses analysis and criticism of public policies and the governments and politics responsible for them. Second semester will be comprised of a weekly workshop for a smaller group, concentrating on problems for research, writing, and publication.

Comparative Government

Government 131 is recommended.

332 Society and Politics in France and Italy Spring, 4 credits.
S. G. Tarrow.

A comparative analysis of two Latin countries with centralized states, multiparty systems, and low political consensus, with particular emphasis on the development of historical cleavages, the modern party system and its conflicts, and the growing role of the state.

333 Government and Politics of the Soviet Union Fall, 4 credits.
M. Rush.

A focus on the politics of the top leaders, the institutions through which they operate, and the impact of their policies on the Soviet people. Emphasis also on phases in the development of the Soviet system and on the ways in which the Soviet Union served as the prototype for all subsequent Communist states, as well as on the variant forms that have appeared in other states.

[336 The Ethnic Dimension in Politics 4 credits. Not offered 1978-79.]

[340 Government and Politics of Latin America 4 credits. Not offered 1978-79.]

342 Government and Politics of Canada Fall, 4 credits.
M. J. Esman.

This course is an introduction to the government and politics of Canada. It will emphasize the following subjects: 1) the operations of a Federal system in a large and heterogeneous country within the framework of a cabinet-parliamentary system of government at both the Federal and Provincial levels; 2) tensions between English and French speaking Canadians and their effects on the political and economic unity of the country; 3) Canada's experience with economic management and comprehensive welfare state programs; and 4) the changing pattern of relations between Canada and the United States.

[344 Government and Politics of Southeast Asia 4 credits. Not offered 1978-79.]

346 Politics in Contemporary Japan Fall, 4 credits.
T. J. Pempel.

The focus will be on the political, social, and economic delimiters of policymaking in postwar Japan, with some particular attention given to ideological conflict, political parties and elections, the bureaucracy, the consumer movement, student protest, defense policy, and economic penetration of Southeast Asia.

347 Chinese Government and Politics Fall, 4 credits.
D. P. Mozingo.

An examination of the politics of modern China including the breakdown of the traditional order and the revolutionary struggle of the Chinese Communist party. Primary emphasis on the institutions, methods, policies, and problems of the Communist regime since 1949.

[348 Politics of Industrial Societies 4 credits. Not offered 1978-79.]

[349 Political Role of the Military 4 credits. Not offered 1978-79.]

350 Comparative Revolutions Fall, 4 credits.
D. P. Mozingo.

An analysis of major revolutionary movements since World War II; their sociopolitical origins, ideology, and organization, with special emphasis on contrasting strategies and roads to power.

[353 Women and Politics (also Women's Studies 353) Not offered 1978-79.]

[355 From Politics to Policy: the Political Economy of Choice 4 credits. Not offered 1978-79.]

[356 Elites and Society: The Political Economy of Power 4 credits. Not offered 1978-79.]

357 Political Development in Western Europe Fall, 4 credits.
S. G. Tarrow.

A discussion of the rise of the modern state in the West. Bourgeois and postbourgeois cleavage systems. Nation, state, and coalition building. The emergence and transformation of proletarian mass movements. Neocapitalism and state economic planning.

358 Politics of the Middle East Fall, 4 credits.
An explanation of the Middle East conflict including domestic and foreign determinants of Arab and Israeli policy. Lectures will cover the impact of major-power conflict on Middle Eastern politics, the sources of instability in local regimes, and the problem of small-state dependence on superpowers.

[430 The Politics of Productivity: Germany and Japan 4 credits. Not offered 1978-79.]

435 Politics of Decentralization and Local Reform Fall, 4 credits. Open to both undergraduate and graduate students. Graduate students attend lecture and meet weekly as arranged to review research on decentralization and local politics.
D. E. Ashford.

Comparative analysis of municipal and local government policies in Britain, France, and selected developing countries. Emphasis is on national-local linkage and how decentralization policies affect the power structure, economic planning, and representative government. The major efforts to reform urban, local, and regional planning and procedures since World War II will be examined and their effects assessed.

446 Comparative Communism Spring, 4 credits.
D. P. Mozingo and M. Rush.

This seminar deals with regimes that claim to be committed to the Marxist-Leninist program for the realization of socialism and communism. After considering several approaches to the subject, the seminar will investigate similarities and differences among countries of the Soviet bloc, China, and Yugoslavia. This is mainly a reading and discussion seminar.

456-457 Policymaking in Industrial Societies 456, fall; 457, spring, 4 credits each term.
D. Ashford.

Examines the consequences of policy formation and modern governmental bureaucracy for the expression and revisions of democratic political norms. Cases will include Great Britain, Germany, Japan, and France and will involve policy information in the areas of local government, education, labor relations, minorities, economic policy, and administrative reform. Students will work with primary materials on administrative decisionmaking in each case study.

459 Politics in Contemporary Europe: The Politics of the Left Fall. 4 credits.

S. G. Tarrow.

An attempt to understand the changing role of left parties and movements in the context of recent European developments and in the current crisis of Western European systems. Emphasis is on Britain, France, Italy, and Germany, with some attention to Scandinavia and Iberia. Topics include economic change and changes in party organization and ideology, left parties in local and national government, the distributional consequences of left parties in power, eurocommunism, and the left in relation to trade unions and other mass movements. A term paper will be required.

[462 Capitalism and Communism: Chinese and Japanese Patterns of Development 4 credits. Not offered 1978-79.]**Political Theory**

Government 161 is recommended.

361 Modern Ideologies: Liberalism and Its Critics Fall. 4 credits.

I. Kramnick.

Since the rise of capitalism, one political ideology has been dominant in the Western world—liberalism. However, its hegemony has been questioned by a series of critics: conservatism, democracy, socialism, anarchism, fascism, Freudianism, and feminism. This course will study the tensions between liberalism and these critics and speculate on the possible survival or extinction of this venerable and very American ideology.

363 Classics in Political Thought Spring. 4 credits.

W. J. Dannhauser.

Close textual analysis of Plato's *Laws*, Aristotle's *Ethics*, and Aristotle's *Politics*.

[367 The Logic of Liberalism 4 credits. Not offered 1978-79.]**368 Economic Models of Politics** Fall. 4 credits.

E. W. Kelley.

Economic factors influencing the structure of political systems and economic models of such systems will be considered. The rationalistic presumptions underlying some such models will be introduced and modified. Applications to enduring policy arenas made.

373 Feminist Political Thought Spring. 4 credits.

K. Beckwith.

A seminar on the study of ideologies and theories used by feminists in support of their political goals, of the development and transformation of feminist political thought, and of the relationship between thought and action in the contemporary feminist movement. Among schools of feminist political thought to be studied are the feminist adaptations of natural rights theory, androgyny, socialist- and anarchist-feminism, and bourgeois feminist theory.

375 American Political Thought Spring. 4 credits.

E. J. Eisenach.

Survey of American political thought with stress on puritan thought, constitutional theory, selected nineteenth-century literature, and contemporary political science.

376 Marx and Socialist Thought Fall. 4 credits.

S. Buck-Morss.

An examination of the writings of Karl Marx and the socialist tradition of the nineteenth and twentieth centuries.

International Relations

Government 181 is recommended.

[383 Theories of International Relations 4 credits. Not offered 1978-79.]**385 Contemporary American Foreign Policy** Spring. 4 credits.

R. Rosecrance.

An analysis of the dilemmas that have confronted American foreign policy since 1945, both specific problems and more general questions of capabilities, priorities, and morality.

386 Economic Issues in International Relations Fall. 4 credits.

T. Ilgen.

The underlying premise is that international economic issues have an important political component that has for too long been ignored by economists and overlooked by students of politics and international relations. Discussion of elementary international economic concepts, the origins of the postwar monetary and trading system; the dilemmas of the dollar and the reform of the international monetary systems; liberalism and protectionism in Western trade relations; the impact of transnational enterprise on the world economy; the potential for integrating the Eastern socialist bloc into the Western economy; and the north-south dialogue about a new international economic order.

387 The United States and Asia Spring. 4 credits.

G. McT. Kahin.

An analysis of the relations of the United States with the major states of Asia and with those smaller countries (especially Vietnam) with which it has been particularly concerned; attention is also given to the relationship of American policy to the Asian policies of France, Great Britain, and Soviet Russia.

389 International Law Spring. 4 credits.

L. Scheinman.

Characteristics of international law: its theoretical foundations, principles, processes, and relationship to international politics. Emphasis on law-in-action. Attention to both traditional problems (intervention, coercion, the scope and limits of adjudication) and contemporary trends and processes (arms control, outer space, exploitation of seabed resources, the individual in international law, and cooperative patterns of socioeconomic relations at global and regional level). Content may vary according to international events.

390 The Foreign Policy of China Spring. 4 credits.

D. P. Mozingo.

An analysis of Chinese concepts of foreign relations and the policymaking process in the People's Republic of China. Emphasis will be placed on such topics as the contemporary Chinese view of their position in the international community and a comparison of the making and implementation of contemporary Chinese policies with respect to such areas as the Soviet bloc, Afro-Asian countries, and the West.

[480 Foreign Economic Policies of Advanced Industrial Societies 4 credits. Not offered 1978-79.]**481 Foreign Policy of the U.S.S.R.** Spring. 4 credits.

M. Rush.

An analysis of Soviet foreign policy as it developed out of the revolution and accommodated to the prevailing international system, with a focus on the period since 1945. Particular topics include causes and prospects of the cold war, impact of nuclear weapons on Soviet defense and foreign policy, sources and goals of Soviet hegemony in East

Europe, causes of the dispute with China, and impact of domestic politics on the formation of foreign policy.

[482 Imperialism 4 credits. Not offered 1978-79.]**483 Political and Economic Interdependence** Spring. 4 credits.

R. Rosecrance.

A study of political and economic interdependence among nations, both historical and contemporary. The course will briefly review the international systems of mercantilism, 19th century *laissez-faire* and economic nationalism of the 1930s. Emphasis will be on contemporary situations and data. Students will prepare major research papers.

484 Defense Policy and Arms Control Spring. 4 credits.

An analysis of the requirements for military defense and the problems caused thereby. Subjects to be covered will include nuclear deterrence reasoning, military strategy, approaches to disarmament, the working of military-industrial complexes, and defense budgeting and policy procedures. Lectures and discussion sessions, with guests from among participants in the Cornell Peace Studies Program.

Political Methodology**[391 Human and Social Statistics** 4 credits. Not offered 1978-79.]**Honors Courses**

See earlier note on honors program.

400 Honors Seminar: Political Analysis Fall. 4 credits.

M. Shefter.

The application of behavioral and structural models to the analysis of three problems in political science: the social foundations of democratic regimes; the emergence of mass political movements and their institutionalization, suppression, or decay; and the politics of race and ethnicity.

494 The Honors Thesis Fall or spring. 8 credits.

In their senior year, honors students will be required to take Government 494, in which they will prepare and write an honors thesis—an extended piece of original independent research. Before the end of the semester that precedes the semester in which the thesis is to be written, each participant must submit an approved proposal to the department office. Proposal forms may be obtained from the undergraduate secretary in 125 McGraw Hall. Honors theses will be given to a second reader for evaluation and students will be examined orally on their work by the two faculty members involved. In cases where students feel the need for a period of preparatory work before undertaking an honors thesis, they may make use of the option available under Government 499.

Supervised Study

Except under very unusual circumstances supervised study (499) is open only to Government majors doing superior work in the major. There is no limit established for the total number of hours of 499 a government major may take while at Cornell, but he or she may count no more than 4 hours towards fulfillment of the major. Students who wish to continue taking 499 for more than one semester must select a new theme or subject each semester, and applicants must present a well-defined program of study that cannot be satisfied by taking regular courses. Credit can be given only for work which results in a satisfactory amount of writing. Emphasis will be placed on the capacity to subject a body of related readings to analysis and judgment. The consent of the instructor is required.

499 Readings Fall or spring. 1 to 4 credits.
Staff.

Graduate Seminars

Qualified undergraduates are encouraged to apply for seminars listed with 600 course numbers. Consult *Supplementary Announcement of Graduate Courses* available in the department office.

Field Seminars

601 Scope and Method of Political Analysis
Fall. 4 credits.

P. Katzenstein and P. Leeds.
This seminar offers an overview of the main problem areas and theoretical orientations in the four subfields of contemporary political analysis: political theory, American politics, comparative politics, and international relations. Selected topics, including questions of research design, will be treated through a reading of the best contemporary literature. The seminar may also address issues dealing with either the broad issues of the philosophy of social science or with specific techniques of analysis.

602 Field Seminar in Methodology Spring.
4 credits.

E. W. Kelley.
Some attention will be given to general problems of research design and hypothesis formulation. The main emphasis will be on measurements and hypothesis testing. Topics to be covered include statistics, both parametric and nonparametric; unidimensional and multidimensional scaling; data theory; and causal modeling.

603 Field Seminar in American Politics Fall.
4 credits.

B. Ginsberg and P. Leeds.
Introduction to the basic issues and institutions of American government and the various subfields of American politics. The focus is on substantive information and theoretical analysis, and on problems of teaching and research.

605 Field Seminar in Comparative Politics
Spring. 4 credits.

S. G. Tarrow.
An introduction to selected theoretical problems in the study of comparative politics and to their application in empirical analysis. Basic problems are social class and politics; authority and legitimacy; participation and mobilization; economic development and democracy; authoritarian and totalitarian politics; corporatism and pluralism; nation-building and political integration.

606 Field Seminar in International Relations
Fall. 4 credits.

R. Rosecrance.
607 Field Seminar in Political Thought Fall.
4 credits.
I. Kramnick.
An introduction to political theory through a reading of selected classics in political thought from Plato to Marx.

American Government and Institutions

618 American Political Behavior Spring.
4 credits.

P. Leeds.
An examination of current research in such areas of American politics as political socialization, ideology, political participation, elite recruitment, and political behavior in small groups. Both substantive and methodological issues will be discussed with particular attention to the gaps in existing studies and the goals of future research.

621 Elections and Public Policy Spring.
4 credits.

B. Ginsberg.
The relationship between citizen voting and public policy is one of the central questions of democratic politics. This course will focus on American voting behavior, the role of political parties, and the linkages between citizen choices and the behavior of public officials.

Public Policy

628-629 Politics of Technical Decisions I and II (also Business and Public Administration NPA 515 and 516 and CRP 541 and 542) 628, fall; 629, spring. 4 credits.

D. Nelkin and J. Milch.
The political aspects of public policy decisions traditionally regarded as technical problems. Exploration of the concept of technical decisions and the characteristics of a technological society, with discussion of how decisions are determined or limited by the technologies involved, the institutions of technical decision making, the sources and implications of depoliticization, and the rise of citizen opposition to technological development.

Comparative Government

645 Politics of China Spring. 4 credits.

M. G. Bernal.
Seminar on post-1949 Chinese political system. Each student prepares a substantial research paper on some aspect of contemporary Chinese policy.

655 Latin American Society and Politics (also Soc 655) Spring. 4 credits. Reading knowledge of Spanish or Portuguese recommended.

E. G. Kenworthy and J. Kahl.
Reading and discussion of various recent books on the social and political situation in Latin America.

Political Theory

668 Foundations of English Liberalism Fall.
4 credits.

E. J. Eisenach.
Analysis of the political, religious, and legal theories of Hobbes and Locke and the relationship of those writings to the Puritan Revolution and 1688.

673-674 Economic Models of Politics 673, fall; 674, spring. 4 credits each term.

E. W. Kelley.
Both economic factors influencing the structures of political systems and economic models of such systems will be considered. The rationalistic presumptions underlying such models will be introduced and modified. There will be applications to enduring policy areas.

679 Early Modern Political Thought Spring.
4 credits.

W. J. Dannhauser.
Bacon, Descartes, Spinoza. Textual analysis of *Discourse on Method*, *Theologico-Political Treatise* and other texts. Topics include: the rejection of classical thought; the striving for a scientific, secular and democratic politics.

International Relations

687 The U.S. and Southeast Asia Spring.
4 credits.

G. McT. Kahin.
American Southeast Asian policies: their genesis, character, impact, and long-term consequences. Elements involved in the formation of American policies toward Southeast Asia by the several postwar administrations (Truman through Carter) including international factors and considerations of American domestic politics. The ways in which these policies have been applied and their influence on political forces within the countries of Southeast Asia and upon American policies towards other countries.

692 The Administration of Agricultural and Rural Development Spring. 4 credits.

M. Esman and others.
The political, bureaucratic, economic, and technical environments of administration for agricultural and rural development; the various functions involved in administration (personnel management, planning, budgeting, economic analysis, information systems); several major tasks (research, extension, services, and infrastructure development); and specific problems of integrating activities, interfacing with rural populations, and utilizing external assistance. Intended primarily for persons who expect to have some future responsibilities in agricultural and/or rural development administration in Third World countries.

History

R. Polenberg, chairman; D. A. Baugh, A. H. Bernstein, S. Blumin, S. G. Cochran, T. H. Holloway, C. Holmes, I. V. Hull, J. J. John, M. Kammen, S. L. Kaplan, D. C. LaCapra, W. F. LaFeber, P. R. Metcalf, R. L. Moore, J. Najemy, M. B. Norton, C. A. Peterson, W. M. Pintner, W. B. Provine, P. A. Rahe, J. H. Silbey, F. Somkin, B. Tierney, J. Weiss, L. P. Williams, O. W. Wolters, D. K. Wyatt

The Major

To complete the history major, a student should (1) have completed either the Introduction to Western Civilization (History 151-152) or the introduction to Asian Civilizations (History 190-191); (2) have taken history courses totalling thirty-four credits, completing all these courses with a grade of C or better; of the thirty-four credits, sixteen must be in courses numbered above 300, and of these sixteen, eight must be in one particular field of history (e.g. modern American, ancient, early modern European); (3) have taken two courses above the elementary level offered by other departments that relate to the eight-credit concentration in one particular field of history.

Prospective majors may wish to discuss their projected program with the director of undergraduate studies before formally enrolling with the department.

Distribution Requirement

The distribution requirement is satisfied by any two courses in history.

The Honors Program

History majors with an overall B+ average in all their history courses are eligible to enroll in History 400, the Honors Proseminar, which is normally taken in the junior year, or at the latest in the fall of senior year. (Honors candidates are strongly encouraged to take another 400-level seminar during their junior year.) Students with a grade of B+ or higher in the proseminar may then become candidates for the degree of Bachelor of Arts with honors in history by submitting to a prospective faculty adviser a written thesis proposal delineating the general area of inquiry for an honors essay, and by having the proposal approved by the adviser. The proposal should be submitted as soon as possible after the completion of History 400, normally during the junior year or at the beginning of the senior year.

After acceptance of the proposal by an adviser, honors candidates should then enroll with their advisers in History 302, Supervised Research, during the first term of their senior year. History 302 is a four-credit course which permits honors candidates to conduct research and to begin writing the honors essay. At the end of the first semester of the senior year, as part of the requirements for

History 320, the student will submit to his or her adviser a 10–15 page overview of the entire thesis or a draft of some substantial section of the thesis, and will undergo an oral examination on the broad field of history in which the student has conducted research. The examination will be administered by a committee consisting of the student's adviser and one other department member, who will eventually serve as a reader of the thesis. The committee will then recommend whether the student may proceed to enroll in History 401, Honors Guidance during the final semester of senior year. History 401 is a four-credit course which permits honors candidates to complete the honors essay and to prepare both to defend the essay and to demonstrate their understanding of the general historical interests they have pursued within the major. Students who do not take History 400 in their junior year must submit both the thesis proposal and the prospectus by the end of the fall semester of their senior year in order to be eligible for enrollment in History 401 by their final semester.

Honors candidates must complete a minimum of 38 hours in history, 8 of which must be History 400–401. The completed thesis will be examined by three readers, including the two faculty members who administered the preliminary oral examination.

The text of the honors essay may not exceed sixty pages except by permission of the chairperson of the honors committee and the student's adviser. Two copies will be due during the third week of April. In May each honors candidate will be given an oral examination administered by the major adviser and one or both of the essay readers. The examination will focus on the specific issues of the essay as well as the broad field of history in which the student has concentrated his or her research (e.g. Periclean Athens, seventeenth-century science, nineteenth-century America).

To qualify for a Bachelor of Arts degree with honors in history, a student must (1) sustain at least a B+ cumulative average in all history courses; and (2) earn at least a *cum laude* grade on the honors essay and on the oral examination.

Students considering the honors program should consult with Professors Wyatt, Holmes, or Weiss during the second term of their sophomore year or early in their junior year.

400 Honors Proseminar Fall or spring, 4 credits. For prospective honors candidates with permission of instructor.

Fall: W 2:30–4:25, D. Wyatt; Th 2:30–4:25, C. Holmes. Spring: Hours to be arranged. J. Weiss
An introduction to historical writing and modes of research, emphasizing the possibilities and limitations of historical inquiry.

401 Honors Guidance Fall or spring, 4 credits. Prerequisites: History 400 and permission of instructor.

Underclass Seminars

The orientation of these introductory seminars will be historical, with considerable attention given to writing skills and the critical discussion of humanistic values. Particular attention will be given to questions of public policy, problems of social change, and the dimensions of comparative historical analysis.

Freshmen and sophomores are eligible for the seminars. No special background in history is required, but students who wish to enroll must obtain the permission of the instructor. The seminars will be limited in size to about ten students each. Some of the seminars may be taken, with the instructor's consent, to fulfill the Freshman Seminar requirement.

The following list of seminars is subject to revision; a full list will be available in the history department office.

205 The Growth of Political Democracy in the United States Fall, 4 credits.

T 2:30–4:25, J. H. Silbey.
An examination of the democratization of American political life since the American Revolution. Such topics as the expansion of white, black, and women's suffrage and the changing concepts of participation and leadership in American politics will be explored. A number of books and documents covering the topic will be read and discussed and several short papers written. This course may be taken as a Freshman Seminar.

212 The North Atlantic Community and the Wider World Fall, 4 credits.

T 2:30–4:30, T. H. Holloway.
The theme is the relationship between the attitudes and values of Europeans, and the emergence of the global economic and political network since the Age of Discovery. Beginning with background lectures and readings, the course will progress through the voyages of exploration, commercial expansion, and the consolidation and dissolution of modern empires. Texts contemporaneous with these periods will be read and discussed to explore ways members of the North Atlantic community have explained and justified their emerging world influence in religious, racial, technological, and "cultural" terms. This course may be taken as a Freshman Seminar.

214 American Foreign Policy Today and the Uses of History Fall, 4 credits.

Th 2:30–4:30, W. LaFeber.
The seminar will examine a contemporary American foreign policy problem, analyzing its various parts and charting the possible alternatives open to policymakers by placing the problem in its historical framework and using, in part, the methods of comparative history. History will be used as a tool to analyze the complexities of present foreign policy dilemmas. This course may be taken as a Freshman Seminar.

232 Urban Problems and Policy in Historical Perspective Spring, 4 credits.

Th 10:10–12:05, S. Blumin.
This seminar seeks to better understand contemporary urban problems and the policies aimed at solving them by tracing their development over long periods of time in the context of the more general history of the American city. Common readings in American urban history will be followed by individual research projects in particular problem and policy areas.

246 America in the Camera's Eye Fall, 4 credits.

MW 1:25, R. L. Moore.
The seminar will attempt to assess the value of visual material (especially photography, and some film) in understanding 20th century American history. Beginning with the important journal *Camera Work*, students will read and view the work of some leading American photographers in an effort to understand how the camera has both reflected and helped create America's perception of itself. Secondary commentary will be used as an interpretive aid. Stress will be placed on helping students develop a vocabulary to articulate their reactions to visual material. This course may be taken as a Freshman Seminar.

250 English Constitutional History to 1485 Fall, 4 credits.

MW 9:05, F. G. Marcham.
A study of Anglo-Saxon law and government; Norman administrative and legal ideas as they relate to monarchy and feudalism; evolution of central government under Henry II; Magna Carta; the evolution of Parliament and the central court system. Examination of law, charters, royal decrees, financial records, and parliamentary documents, all in translation. All reading and discussion will focus on original documents. Occasional lectures to supply

political narrative. From time to time each student will present an oral analysis of a document; each will write a term paper.

255 English Constitutional History 1485 to the Present Spring, 4 credits.

MW 9:05, F. G. Marcham.
A study of the Tudor monarchy; constitutional conflicts of the seventeenth century; the Glorious Revolution; evolution of cabinet government; general governmental reform of the nineteenth century; twentieth-century democracy, the welfare state, and a nationalized economy. The seminar will examine statutes, parliamentary debates, court decisions, and the reports of commissions. All reading will be in original documents. Occasional lectures to supply political narrative. Each student will make oral reports analysing documents; each will write a term paper.

259 Public Life and Literature in Nineteenth-Century Great Britain Fall, 4 credits.

TTh 9:05, F. G. Marcham.
A study of British political, constitutional, economic, and imperial history, set beside the reading of Victorian prose, poetry, and drama. Alternate meetings of the seminar will consider history and literature; the history in the form of a lecture and the discussion of constitutional documents; the literature through comment upon readings. Authors assigned will include Macaulay, Carlyle, Tennyson, Mill, Darwin, Huxley, Gilbert and Sullivan, and Shaw.

260 Public Life and Literature in Twentieth-Century Great Britain Spring, 4 credits.

TTh 9:05, F. G. Marcham.
A study of British political, social, and constitutional history set beside the reading of plays. Alternate meetings of the seminar will consider history and literature. The presentation of history will deal with the development of parliamentary democracy in Great Britain, the consequences for her of the two World Wars, the emergence of the welfare state and the application to the economy of nationalization, as well as Great Britain's withdrawal from imperialism. Among the writers read and discussed will be Shaw, Barrie, Maugham, O'Casey, Sherriff, and Eliot. Each student will make oral reports and write a term paper.

261 The Ancient City: Plato and Machiavelli Fall, 4 credits.

TTh 1:25, P. Rahe.
Close textual analysis and comparison of Plato's *Apology* and *Republic* and Machiavelli's *Prince* and *Discourses* with an eye to the history of Greece and Rome. This course may be taken as a Freshman Seminar.

274 Foodways: A Social History of Food and Eating Spring, 4 credits.

To be arranged, S. L. Kaplan.
An interdisciplinary examination of the validity of the adage "man is what he eats." Among the topics: food and nutrition; food and social structure; the politics of food control; food and modernization taste making; food in religion and literature. Cases will be drawn widely across space and time, from Pharaoh's Egypt to the 1970s.

293 China and the European Psyche Fall, 4 credits.

Th 2:30–4:25, C. A. Peterson.
This seminar traces the rise and fall of China in the eyes of Europe before the age of imperialism, exploring the tremendous China vogue in the seventeenth and eighteenth centuries in thought, literature, and art. This course may be taken as a Freshman Seminar.

294 Chinese Views of Themselves Spring, 4 credits.

F 1:25–3:30, S. G. Cochran.
An approach to the history of China since the seventeenth century through autobiographical

statements in translation—not only formal autobiographies but also political figures' journals and memoirs, professional writers' short stories, criminals' confessions, workers' short stories, and peasants' collective autobiographies, and other documents. The aim of the course will be to evaluate autobiographical writing as a basis for the study of history. This course may be taken as a Freshman Seminar.

Comparative And Interdisciplinary Courses

269 Historical Studies in the Origins of War

Spring, 4 credits.

T Th 1:25; discussion hour to be arranged. Open to freshmen. P. A. Rahe.

A comparative study of the causes of the Peloponnesian War, World War I, the Second Punic War, and World War II. We will also discuss the Cuban Missile Crisis.

360 Warfare in Premodern Societies

Spring, 4 credits.

T 1:25 and seminar to be arranged. C. A. Peterson. A study of the principal modes of warfare found both in the East and the West from ancient times up to the eighteenth century. Tactical evolution and the impact of innovations receive much attention, but the role of nonmilitary factors in determining victory or defeat is also emphasized.

[404 Anthropology and History (also Anthr 414)

Not offered 1978–79.]

[405 Population and History

S. L. Kaplan. Not offered 1978–79.]

407 Death in Past Time

Spring; 4 credits.

Hours to be arranged. S. L. Kaplan. Every culture has felt an urgent need to deal with death: to disarm, rationalize, and integrate it by giving it a sense. How a culture perceives and propitiates death reveals a great deal about its organization (social and political structure), values (religion or the arts), or goals (economic activity and scientific progress). This course will be an examination of the nature of death and the discourse on death, in comparative perspective across time and space.

American History

201 Introduction to American History: From the Beginning to 1865

Fall, 3 credits.

M W F 1:25. F. Somkin. A survey for both prospective majors and others.

202 Introduction to American History: From the Civil War to Recent Times

Spring, 3 credits.

T Th 10:30–12:05. P. R. Metcalf and staff. A survey for both prospective majors and others. Topical lectures with emphasis on reading and discussion.

208 Freshman Seminar: Civil Liberties in the United States

Spring, 4 credits. Prerequisite: permission of the instructor.

T Th 2:30. R. Polenber. Freedom of speech and dissent from Jefferson's time to the present, with emphasis on the twentieth century. Topics include Jefferson and Burr; Lincoln and martial law; war and the Supreme Court; the Sacco-Vanzetti and Scottsboro cases; the ACLU and the New Deal; the relocation of Japanese-Americans; the Cold War and anti-communism; civil disobedience and censorship; John Stuart Mill, Herbert Marcuse, and the critique of libertarianism.

[311–312 The Structure of American Political History

311, fall; 312, spring. Offered in alternate years. H. Silbey. Not offered 1978–79.]

[313–314 History of American Foreign Policy 313, fall; 314, spring, 4 credits each term. 313 is not prerequisite to 314. Not offered 1978–79. W. LaFeber.]

[316 American Cultural and Intellectual History to 1820 Not offered 1978–79. F. Somkin.]

317 Thought and Feeling in the Nineteenth Century

Spring, 4 credits.

M W F 11:15. F. Somkin. Ideas, movements, and thinkers. Topics include the conflict between ideals and reality; the individual and society; Mormonism; reform movements such as temperance, women's rights, communitarianism, and antislavery; Darwinism; the Gospel of Wealth; and the rise of originality and radicalism in art and social thought.

318 American Constitutional Development

Spring, 4 credits.

M W F 9:05. M. B. Norton. A study of the major themes of the constitutional history of the United States. Among the topics to be considered are: the drafting of the Constitution, the Marshall and Taney courts, civil rights decisions of the nineteenth century, the rise of substantive due process, and the Warren court.

321 The Origins of American Civilization

Spring, 4 credits.

M W F 1:25. M. Kammen. The European and colonial genesis of American culture and society, with emphasis upon the emergence of distinctive institutions, attitudes, and social patterns. Topics include race relations, theology and ecclesiastical organization, politics, movements of social protest, and cultural development.

[323–324 The American Indian in the American Experience Offered in alternate years. Not offered 1978–79.

P. R. Metcalf.]

325 Age of the American Revolution, 1763–1815

Fall, 4 credits.

T Th 12:20–2. M. B. Norton. An examination of the process by which the thirteen English colonies became an independent and united nation, with emphasis on political thought and practice, social and economic change, and cultural development.

327–328 The American West 327, fall; 328, spring, 4 credits each term. Offered in alternate years. History 327 not prerequisite to 328.

T Th 2:30–4. P. R. Metcalf. History of the frontier and westward expansion, emphasizing the trans-Mississippi region. First term covers early explorations and settlements, frontier rivalries of European imperial powers, and Anglo-American expansion from the colonial period through the mid-nineteenth century. The second term covers the settlement and growth of the trans-Mississippi West from the era of the California gold rush until the present. Topical lectures with emphasis on reading and discussion.

330 The United States in the Middle Period, 1815–1850

Fall, 4 credits.

T Th 10:10; discussion to be arranged. J. H. Silbey. An analysis of American society from the end of the second war with England to the crisis of 1850, stressing the developing trends of nationalism and sectionalism, the rise and results of Jacksonian democracy, and the internal tensions produced by physical growth and slavery.

331 The American Civil War and Reconstruction

Spring, 4 credits.

T Th 10:10; discussion to be arranged. J. H. Silbey.

An analysis of the factors leading up to the breakup of the Union, the impact of the war in North and South, and the problems of restoration and reconstruction of the seceded states.

[332–333 The Urbanization of American Society S. Blumin. Not offered 1978–79.]

336 Survey of American Social History: Family, Community, Religion, Work, and Class, 1607–1860

Spring, 4 credits.

M W F 11:15. S. Blumin. This course will survey the changing social circumstances of "anonymous Americans" from the early European settlements to the Civil War. Emphasis will be placed on the last four or five decades of this period, and on the changes in class, community, and institutional structures accompanying the revolution in transportation and industry.

340–341 Recent American History, 1920 to the Present 340, fall; 341, spring, 4 credits each term. 340 is not prerequisite to 341.

T Th 12:20; disc to be arranged. R. Polenber. Fall term topics include individualism and conformity in the 1920s; class, race, and ethnicity in the 1930s; Franklin Roosevelt and the New Deal; World War II, the atomic bomb, and the Nuremberg trials. Spring term topics include the Supreme Court and civil rights; McCarthyism and civil liberties; Kennedy, Johnson, and social reform; Vietnam and the protest movement; Watergate and the imperial presidency.

345 The Modernization of the American Mind

Fall, 4 credits.

M W 11:15; disc to be arranged. R. L. Moore. American thought and culture from 1890 to the present. Course emphasizes ideas in the context of a Western intellectual community, the cultural impact of major political and economic events, and the adaptation of social ideas and values to new conditions.

346 Major Themes in American Religious History

Spring, 4 credits.

M W 11:15; disc to be arranged. R. L. Moore. Religious thought and practice in America from the seventeenth century, related to intellectual, social, and political trends. Special emphasis on the interaction between religion and the cause of social reform.

[411 Undergraduate Seminar in American Political History Not offered 1978–79. J. H. Silbey.]

414 Motivations of American Foreign Policy Fall, 4 credits. Prerequisite: Hist 314 and permission of instructor.

T 1:25–3:15. W. LaFeber. Topic and bibliography will be posted at McGraw 432 during course registration in the spring.

[416 Undergraduate Seminar in American Cultural History: Six Americans Not offered 1978–79. F. Somkin.]

418 Undergraduate Seminar in the History of the American South Spring, 4 credits. Prerequisite: permission of the instructor.

T 2:30–4:25. J. H. Silbey. Topic for 1978–79: slavery, the slave system, and the crisis of the Union, 1846–1861.

419 Undergraduate Seminar in American Social History Spring, 4 credits. Prerequisite: permission of the instructor.

Hours to be arranged. S. Blumin. Topic for 1978–79: industrialization and society.

423 Seminar in Native American Cultural

History Fall. 4 credits. Offered in alternate years. Prerequisite: 323-324 or permission of the instructor.

Hours to be arranged. P. R. Metcalf.

Topical analysis of the origins and development of aboriginal American Indian cultures, their responses to the encroachment of European and American civilizations, and the changes and continuities that resulted. Intensive reading and a research essay required.

[424 Seminar in the History of Indian-White

Relations Spring. Offered in alternate years. Not offered 1978-79.

P. R. Metcalf.]

426 Undergraduate Seminar in Early American

History Spring. 4 credits. Prerequisite: consent of instructor.

M 3:35-5:25. M. B. Norton.

Topic for 1979: women and the family in early America. An examination of the early history of the American family, with particular reference to the status of women in seventeenth- and eighteenth-century America.

[427 Seminar in American Frontier History

Fall. Offered in alternate years. Not offered 1978-79.

P. R. Metcalf.]

[428 Seminar in the History of the American

West, 1850-1976 Spring. Not offered 1978-79.

P. R. Metcalf.]

430 Law and Authority in Nineteenth-Century

America Spring. 4 credits. Prerequisite: permission of instructor.

Th 2:30-4:25. F. Somkin.

Selected topics on the relationship between legal authority and moral and social standards. Cases and materials may deal with treason, murder, mutiny, resistance to civil authority, Indian removal, anarchism, and the pursuit of happiness.

[440 Undergraduate Seminar in Recent

American History Not offered 1978-79.

R. Polenberg.]

445 Undergraduate Seminar: Deviance and

Conformity in a Liberal Society Spring. 4 credits.

Prerequisite: permission of instructor.

T 1:25-3:20. R. L. Moore.

Historical reading and research on the constraints placed upon individual and group behavior in a democratic America. Topics of special study drawn from all periods of American history.

516 The Popular Mind in the United States

Fall. 4 credits. Prerequisite: permission of instructor.

Th 2:30-4:25. F. Somkin.

For graduate students and advanced undergraduates. Approaches and topics in American popular culture: from the image of the hero and the myth of success to the world of the poolroom, the circus, the minstrel show, the dramatic and vaudeville stage, and the cowboy epic.

521 Culture and Tradition in American Life

Fall. 4 credits. Prerequisite: permission of the instructor.

T 3-5:30. M. Kammen.

A seminar open to graduate students and qualified senior history majors. The discussions will examine various definitions of high, popular, and mass culture; the role of government in national culture; the cultural roles of evangelical and "civil" religion; leisure as a cultural force; the uses of American history in schoolbooks, in court decisions, and in U.S. foreign policy; the shifting reputations of heroes (Lincoln, Lee, and Custer); Mark Twain's perception of American culture and changing perceptions of Mark Twain.

613 Graduate Seminar in American Foreign

Relations Fall. 4 credits.

Hours to be arranged. W. LaFeber.

[614 Seminar in the History of American Foreign

Relations. Spring. 4 credits. Not offered 1978-79.

W. LaFeber.]

[615-616 Seminar in American Cultural and

Intellectual History 615, fall; 616, spring. 4 credits

each term. Not offered 1978-79.

F. Somkin.]

[617-618 Seminar in Recent American Cultural

History Not offered 1978-79.

R. L. Moore.]

[619 Seminar in American Social History

Not offered 1978-79.

S. Blumin.]

626-627 Seminar in the History of American

Women 626, fall; 627, spring. 4 credits each term.

T 3:35-5:25. M. B. Norton.

[633-634 Seminar in Nineteenth-Century

American History. Not offered 1978-79.

J. H. Silbey.]

710 Colloquium in American History

Fall. 4 credits. Required of all first-year American history graduate students.

M 3:35-5:25. Staff.

Examination of the major themes, epochs, and interpretations of American history.

Asian History**190 Introduction to Asian Civilizations: Origins**

to 1600 Spring. 4 credits.

T Th 11:15 and additional hour to be arranged.

C. A. Peterson and O. W. Wolters.

Provides an introduction to the distinctive cultures of China, Japan, India, and Southeast Asia by considering how each characteristically dealt with some central problems of human existence.

191 Introduction to Asian Civilizations in the

Modern Period Fall. 4 credits.

T Th 11:15 and additional hour to be arranged.

D. K. Wyatt and S. G. Cochran.

An introduction to the history of Asian civilizations in modern times, focusing on the relationship between key figures and societies. English translations of autobiographies, novels, short stories, diaries, and other documents written by Asians will be used to assess the perspectives, social priorities, and historical significance of intellectual and political leaders.

393 History of China Up to Modern Times

Fall. 4 credits.

T Th 10:10 and additional hour to be arranged.

C. A. Peterson.

A broad examination of the major aspects of Chinese culture and civilization from earliest times to the late imperial period. Seeks to expose both those features maintaining continuity and the significant (but frequently overlooked) instances of change.

394 History of China in Modern Times

Spring. 4 credits.

T Th 10:10 and additional hour to be arranged.

S. G. Cochran.

A survey which concentrates on the rise of the last imperial dynasty in the seventeenth and eighteenth centuries, the upheavals resulting from domestic rebellions and foreign imperialism in the nineteenth century, and the twentieth-century efforts to create a strong and unified nation.

395 Southeast Asian History to the Fourteenth

Century Fall. 4 credits.

T Th 11:15; and additional hour to be arranged.

O. W. Wolters.

A survey of early Southeast Asian history with particular reference to questions raised in the source material concerning religious beliefs and political and social assumptions.

396 Southeast Asian History from the Fifteenth

Century Spring. 4 credits.

T Th 11:15; and additional hour to be arranged.

D. K. Wyatt.

A survey focusing on cultural, social, and economic change in Southeast Asia.

399 Food and Famine in Indian History

Fall. 4 credits.

T 2:30-4:25, and seminar hour to be arranged.

C. Breckenridge.

In the history of India, food has played a central role in the Vedic sacrifice, Indian social structure, and trade. Designed as a proseminar, this course will focus on food and food categories, such as diet and land use, in the context of a changing political order under Hindu, Muslim, and British dominance. Readings will draw on archaeological, anthropological, and historical literature.

492 Undergraduate Seminar in Medieval

Chinese History Spring. 4 credits. Prerequisite:

Hist 190, 393, or consent of instructor.

Hours to be arranged. C. A. Peterson.

Topic for 1979: the social, intellectual, and cultural life of the medieval Chinese literati as seen through their literature, biographies, and other relevant historical material.

493 Self and Society in Late Imperial and

Twentieth-Century China Fall. 4 credits.

Prerequisite: Hist 191, 394, or permission of instructor.

Hours to be arranged. S. G. Cochran.

Conceptions of self and relationships between the individual and society in China from Ming times to the present.

[497 Undergraduate Seminar in Southeast

Asian History in the Nineteenth Century Fall.

4 credits. Not offered 1978-79.]

498 Undergraduate Seminar in Southeast Asian

History Fall. 4 credits. Prerequisite: Hist 395 or

permission of instructor.

Hours to be arranged. O. W. Wolters.

Systematic consideration of selected problems and episodes in Southeast Asian history, using indigenous historical sources in translation and relevant secondary sources.

691 Chinese Historiography and Source

Materials Fall. 4 credits. Prerequisite: permission

of instructor.

Hours to be arranged. C. A. Peterson.

693-694 Problems in Modern Chinese History

693, fall; 694, spring. 4 credits each term.

Prerequisite: permission of instructor.

Hours to be arranged. S. G. Cochran.

695-696 The Historiography of Southeast Asia

695, fall; 696, spring. 4 credits each term.

Prerequisite: permission of instructor.

Hours to be arranged. O. W. Wolters and

D. K. Wyatt.

791-792 Seminar in Medieval Chinese History

791, fall; 792, spring. 4 credits each term.

Prerequisite: permission of instructor.

Hours to be arranged. C. A. Peterson.

793-794 Seminar in Modern Chinese History

793, fall; 794, spring. 4 credits each term.

Prerequisite: permission of instructor.

Hours to be arranged. S. G. Cochran.

795-796 Seminar in Southeast Asian History

795, fall; 796, spring. 4 credits each term.

Hours to be arranged. D. K. Wyatt and O. W. Wolters.

European History**151-152 Introduction to Western Civilization**

151, fall; 152, spring. 4 credits each term. 151 not prerequisite to 152. Freshmen may count either term or both toward satisfaction of the Freshman Seminar requirement.

Fall: T Th 9:05, disc to be arranged; C. Holmes.

Spring: T Th 9:05, disc to be arranged;

L. P. Williams.

A survey of European history. 151 covers antiquity to the Reformation; 152 from the sixteenth century to the present day. Attention is given equally to the major political and social developments and to the intellectual heritage of the West. A considerable portion of the reading is in contemporary sources.

Ancient European History**[265 The Emergence of Greek Democracy** Not offered 1978-79.

P. A. Rahe.]

[266 The Crisis of Greek Civilization Not offered 1978-79.

P. A. Rahe.]

267 The Roman Republic Fall. 4 credits. Open to freshmen.

W F 10:10; disc to be arranged. A. H. Bernstein.

A survey of Roman Republic history from the origin of the city to the assassination of Julius Caesar. Special attention will be paid to the development and nature of republican forms of government; to Rome's unification of the Italian peninsula and conquest and governance of the Mediterranean; to the course of the revolution that replaced the Republic with the imperial autocracy of the Caesars. Students will read from the works of Polybius, Sallust, Cicero, Caesar, Livy, and Plutarch.

268 Rome of the Caesars Spring. 4 credits.

Open to freshmen. 267 not prerequisite to 268.

W F 10:10; disc to be arranged. A. H. Bernstein.

A survey of Roman imperial history from the assassination of Julius Caesar to the collapse of effective governance in the West in the eighth century. Special attention will be paid to the governing methods of the dictatorship; to provincial administration; to the conflict between paganism and Christianity and the latter's triumph; to the inevitable theme of decline and fall. Students will read from Tacitus, Suetonius, the *Historia Augusta*, and Ammianus Marcellinus.**[450 Archaic Greece, 776-500 B.C.** Not offered 1978-79.

P. A. Rahe.]

452 Greece from Cleisthenes to Cleon, 514-429 B.C. Fall. 4 credits. Enrollment limited to 25. Prerequisite: 265 or 266 or permission of instructor.

Hours to be arranged. P. A. Rahe.

An undergraduate seminar on ancient Greek history from the eve of the Persian Wars to the outbreak of the Peloponnesian War. Special attention will be paid to the social, political, and intellectual transformation of Athens during the period and to diplomatic relations between Athens, Sparta, and Persia.

453 Thucydides and the Peloponnesian War, 432-404 B.C. Spring. 4 credits. Enrollment limited to 25. Prerequisite: 265 or 266 or permission of instructor.

Hours to be arranged. P. A. Rahe.

An undergraduate seminar dealing with the great war between Athens and Sparta. Special attention will be paid to military developments, to the impact

of the war on the political and social development of Athens and Sparta, and to Thucydides' reflections on these changes.

[454 Greece in the Age of Lysander and Agesilaus, 410-360 B.C. Not offered 1978-79.

P. A. Rahe.]

[455 Philip of Macedon and Alexander the Great Not offered 1978-79.

P. A. Rahe.]

460 Roman Imperialism Fall. 4 credits. Enrollment limited to 20. Prerequisite: 267 or permission of instructor. An undergraduate seminar.

Hours to be arranged. A. H. Bernstein.

An inquiry into the why and how of the Roman conquest of the Mediterranean world, from 387 to 146 B.C. Students will read from Polybius, Livy, and Plutarch and study modern analyses of the Romans' notions of power, diplomacy, and empire. Where relevant, comparative materials will be used, especially on the Mafia.

461 The Roman Revolution Spring. 4 credits. Enrollment limited to 20. Prerequisite: 267 or permission of instructor. An undergraduate seminar.

Hours to be arranged. A. H. Bernstein.

An inquiry into the causes and course of the Roman revolution from 146 to 44 B.C. Students will read from Sallust, Cicero, Caesar, Livy, Plutarch, and Appian, and will study modern analyses of the revolution. Where relevant, comparative materials will be used, especially on revolutions in twentieth century agrarian societies.

[462 The High Roman Empire Not offered 1978-79.

A. H. Bernstein.]

[463 Decline and Fall of the Roman Empire Not offered 1978-79.

A. H. Bernstein.]

[561 Social and Economic History of Ancient Rome Not offered 1978-79.

A. H. Bernstein.]

[562 Roman Africa Not offered 1978-79.

A. H. Bernstein.]

[661 Graduate Seminar in Ancient Classical History Not offered 1978-79.

A. H. Bernstein.]

Medieval and Early Modern European History**[257 English History from Anglo-Saxon Times to the Revolution of 1688** Not offered 1978-79.

C. Holmes.]

263 The Earlier Middle Ages Spring. 4 credits. M W F 12:20. J. J. John.

A survey of medieval civilization from c. 300 to c. 1100, dealing with religious, intellectual, political, and economic developments in Western Europe.

264 The High Middle Ages Fall. 4 credits.

T Th 3-4:15. B. Tierney.

A survey of medieval civilization from c. 1100 to c. 1450, dealing with religious, intellectual, political, and economic developments in Western Europe. Lectures and class discussions.

[350 Early Renaissance Europe Not offered 1978-79.

J. Najemy.]

[351 Reformation and Counter-Reformation Europe Not offered 1978-79.

J. Najemy.]

359 The Early Development of Anglo-American Common Law Spring. 4 credits. Prerequisite: 257 or permission of instructor.

C. Holmes.

A survey of the English legal system from the Anglo-Saxon period to the age of Blackstone. The class will consider the development and the powers of the major legal institutions; the relationship between precedent, equity, and positive legislation in English law; and those constitutional conflicts that vitally affected the nature of the system.

[365 Medieval Culture, 400-1150 Not offered 1978-79.

J. J. John.]

366 Medieval Culture, 1100-1300 Spring. 4 credits. Prerequisite: 264 or permission of instructor.

T Th 2:30-3:45. J. J. John.

The origin and development of the universities will be studied as background for a consideration of the scholastic mentality and its influence on the art, literature, philosophy, science, script, and theology of the period. Readings from Abelard, Hugh of St. Victor, Bonaventure, Thomas Aquinas, Dante, etc.

368 Francis of Assisi and the Franciscans Fall. 4 credits. Prerequisite: any introductory course in a medieval subject.

W 2:30-4:30. B. Tierney.

A seminar with lectures, class papers, and class discussions. The course will begin with a detailed study of the early lives of Francis in translation, then consider the impact of the Franciscans on the medieval church and vice-versa.

[369 The History of Florence, 1250-1530 Not offered 1978-79.

J. Najemy.]

371 History of England under the Tudors and Stuarts Spring. 4 credits. Prerequisite: permission of the instructor.

M W 1:25-3:20. C. Holmes.

An examination of the relation between the intellectual developments of the period and political, social, and religious change. Topics for discussion will include political thought, religious toleration, witchcraft, and the role of women and the family.

[468 Undergraduate Seminar in Renaissance History Not offered 1978-79.

J. Najemy.]

[469 Undergraduate Seminar in European History in the Age of the Reformation and the Counter-Reformation Not offered 1978-79.

J. Najemy.]

[475 The English Civil War, 1640-1660 Not offered 1978-79.

C. Holmes.]

[663 Graduate Seminar in Renaissance History Not offered 1978-79.

J. Najemy.]

664-665 Seminar in Latin Paleography 664, fall; 665, spring. 4 credits each term.

Hours to be arranged. J. J. John.

[666 Seminar in Medieval History Not offered 1978-79.

J. J. John.]

668-669 Seminar in Medieval History Open to qualified undergraduates.

Hours to be arranged. B. Tierney.

[670 Seminar in Tudor and Stuart History C. Holmes. Not offered 1978-79.]

Modern European History

253 Russian History to 1800

Fall. 4 credits.
T Th 10:10–11:25. W. M. Pintner.
The origin and development of the fundamental social, political, economic, and cultural institutions that determined the nature of contemporary Soviet society.

254 Russian History since 1800

Spring. 4 credits.
T Th 10:10–11:25. W. M. Pintner.
Nineteenth and twentieth century Russia with emphasis on the major social, political, and economic changes that have transformed Russia since the mid-nineteenth century.

258 English History from the Revolution of 1688 to the Present

Fall. 4 credits.
M W F 11:15; disc to be arranged. D. A. Baugh.
An introduction to the making of modern England, emphasizing constitutional, intellectual, economic, and imperial developments.

271 Revolution and Russian Society

Fall. 4 credits. Freshman Seminar.
M W 1:25–2:20. W. M. Pintner.
This course will examine the state's attempts to maintain stability, and the tension between the dissenting intelligentsia and the mass of the population. Both pre- and post-1917 Russia will be discussed.

353–354 European Intellectual History in the Nineteenth and Twentieth Centuries

353, fall; 354, spring. 4 credits each term. First term not prerequisite to the second.
T Th 12:20–1:35. D. C. LaCapra.
The focus is on social and cultural thought in France, Germany, and England. Topics include: reactions to the French Revolution and industrialization; the definition of conservative, liberal, and radical perspectives; literature and social thought; varieties of existentialism; the birth and development of the social sciences; psychoanalysis and post-Freudian psychology; linguistic philosophy; and structuralism. Readings for the first term include Tocqueville, Mill, Hegel, Marx, Stendhal, Flaubert, Dostoevsky, Nietzsche, and Durkheim. Readings for the second term include Weber, Freud, Wittgenstein, Sartre, Camus, Mann, and Levi-Strauss.

355 The Old Regime, France in the Seventeenth and Eighteenth Centuries

Fall. 4 credits.
T Th 2:30–3:50. S. L. Kaplan.
A systematic examination of the social structure, economic life, political organization, and collective mentalities of a society which eclipsed all others in its time and then, brutally and irreversibly, began to age. France, in European perspective, from the wars of religion through the Age of Voltaire.

356 The Era of the French Revolution and Napoleon

Spring. 4 credits.
T Th 2:30–3:50. S. L. Kaplan.
A study of the failure of the traditional system, its dismantling and replacement in France, and the international consequences. Focus will be on the meaning of the revolutionary experience, the tension between the desires to destroy and to create, and the implications of the Revolution for the modern world.

357 Survey of German History, 1648–1890

Fall. 4 credits.
M W F 10:10. I. V. Hull.
An examination of the social, political, intellectual, and diplomatic history of the German states from the devastation of the Thirty Years' War through absolutism, the bourgeois revolutions of 1848, the struggle for unification, and to the beginning of the modern, industrial state.

358 Survey of German History, 1890 to the Present

Spring. 4 credits.
T Th 10:10; disc, W 2:30 or Th 3:35. I. V. Hull.
The "German Problem." Major topics are: tensions caused by rapid industrialization presided over by a preindustrial, political elite; origins of World War I; growth of anti-Semitism; social dislocations of World War I; failure of the socialist revolution of 1918–1919; unstable Weimar democracy and the rise of Nazism; the Nazi state; World War II; the two Germanies.

[Europe in the Twentieth Century.

Not offered 1978–79.

[372 Social and Cultural History of Contemporary Europe

Not offered 1978–79.

374 War, Trade, and Empire, 1500–1815

Spring. 4 credits.
M W F 10:10. D. A. Baugh.
Maritime enterprise, imperial policy, and naval power in the age of expansion. The rise and decline of the Portuguese and Spanish empires are considered, but the emphasis is on English, French, and Dutch rivalry in the Atlantic and Caribbean.

375 Twentieth-Century Britain

Spring. 4 credits.
M W 2:30–3:50. D. A. Baugh.
Lectures and discussion. Topics include: political parties, class attitudes, the nature of British democracy, the impact of the world wars, the decline of empire, Britain's economic problems, and the welfare state.

380 Social History of Western Technology

Spring. 4 credits.
M W F 1:25. J. H. Weiss.
Studies in the interaction between technological changes and social changes in Western Europe and America since the eighteenth century. Readings and lectures will deal with both instances of social transformation that accompanied technological changes and with the role of technology in social thought and cultural expression. Course gives special attention to three periods: Britain during the Industrial Revolution, America in the nineteenth century, and America during the Vietnam War.

[451 Lord and Peasant in Europe: A Seminar in Social History

Not offered 1978–79.

456 Seminar on Germany, 1890–1918

Fall. 4 credits. Prerequisite: permission of instructor.
M 2:30–4:30. I. V. Hull.
A consideration of the many paradoxes of the Wilhelminian age—the last decades of the monarchy as it wrestled with economic and social change.

457 Seminar in European Fascism

Spring. 4 credits. Prerequisite: permission of instructor.
T 2:30–4:30. I. V. Hull.
An attempt to define and understand the social, political, and intellectual origins, mechanisms, and goals of European fascist movements of the 1920s and 1930s by detailed study of German National Socialism, Italian Fascism, and the *Action Francaise*.

[470 War and Revolution, 1912–20

Not offered 1978–79.

471 Russian Social and Economic History

Spring. 4 credits.
M 2:30–4:30. W. M. Pintner.
A seminar devoted to an examination of the transformation of Russia from a "backward," agrarian nation to the second of the world's superpowers.

[472 Undergraduate Seminar in Russian Foreign Relations

Not offered 1978–79.

474 Topics in Modern European Intellectual History

Spring. 4 credits.

[475 Resistance, Collaboration, and Retribution in World War Two

Not offered 1978–79.

[476 The Depression on Film

Not offered 1978–79.

[477 The Politics of the Enlightenment

Not offered 1978–79.

[478 Seminar on Eighteenth-Century French Social History

Not offered 1978–79.

[655 Seminar in Eighteenth-Century British History

Not offered 1978–79.

656 Seminar in Nineteenth-Century British History

Fall. 4 credits.

671 Seminar in the French Revolution

Fall. 4 credits. Prerequisites: reading knowledge of French and permission of the instructor.

672 Seminar in European Intellectual History

Fall. 4 credits.

676–677 Seminar in Russian History

Fall. 4 credits.

678 Seminar in Modern European Social History

Spring. 4 credits.
Hours to be arranged. J. H. Weiss.
Research seminar. Topic 1978–79: education, occupation, and social stratification since 1800.

679 Seminar in European History

Fall. 4 credits. Prerequisites: reading knowledge of French and permission of instructor.
Hours to be arranged. S. L. Kaplan.
Research seminar. Topic 1978–79: origins of the French working class.

History of Science

[281–282 Science in Western Civilization

Not offered 1978–79.

[284 Undergraduate Seminar in the History of Biology (also Bio S 204 and College Scholar 284)

Not offered 1978–79.]

287–288 History of Biology (also Bio S 201–202)

287, fall; 288, spring. 3 credits each term.
Prerequisite: one year of college biology. 287 is not prerequisite of 288.

[380 Social History of Western Technology

Not offered 1978–79.

[385–386 Problems in the History of Biology

Not offered 1978–79.

[481–482 Science in Classical Antiquity

Not offered 1978–79.

[680 Seminar in the History of Nineteenth-Century Physical Science Not offered 1978-79. L. P. Williams.]

See also:

Biology and Culture (Society for the Humanities 425-426)

Latin American History

210 Latin American History to 1825 Fall. 4 credits.

M W F 10:10. T. H. Holloway.
Survey of Latin America from the rise of pre-Columbian civilizations through the European conquest, establishment of the Spanish and Portuguese colonial societies, imperial rivalries in the New World, background of the independence movements, and the achievement of political independence.

211 Latin American History Since 1825 Spring. 4 credits.

M W F 10:10. T. H. Holloway.
Survey of the Latin American nations from independence to the present. Major themes include the persistence of neocolonial economic and social institutions, the development of nationalist and populist politics, revolutionary movements of the twentieth century, and United States-Latin American relations.

[347 Agrarian Societies in Latin American History Spring. 4 credits. Conducted as a seminar. Not offered 1978-79.]

[348 Contemporary Brazil (Also Soc 368) Not offered 1978-79.
T. H. Holloway, J. Kahl.]

[449 Undergraduate Seminar in Latin American History Not offered 1978-79.
T. H. Holloway.]

[649 Seminar in Latin American History Not offered 1978-79.
T. H. Holloway.]

Reading and Research Courses

301 Supervised Reading Fall or spring. 2 credits. Open only to upperclass students. Permission of instructor required.

302 Supervised Research Fall or spring. 3 or 4 credits. Open only to upperclass students. Permission of instructor required.

703-704 Supervised Reading 703, fall; 704, spring. 4 credits each term. Open only to graduate students. Permission of instructor required.

Society for the Humanities Seminars of Interest to History Students

Readings in Medieval Natural Philosophy (Society for the Humanities 417)

From Natural Philosophy to Modern Science, 1200-1600 (Society for the Humanities 418)

History of Art

R. G. Calkins, chairman; T. M. Brown, E. G. Dotson (on leave), J. V. Falkenheim, C. E. Gilbert, R. C. Hobbs, H. P. Kahn, T. W. Leavitt, S. J. O'Connor, A. Ramage (on leave), N. Ramage, A. S. Roe, M. W. Young

The Major

Students who wish to major in the history of art, should plan to have completed two courses in the Department of the History of Art by the end of their sophomore year. Students who have taken only one course may petition the chairman to major in the department if that course is at the 200 level or above and is completed with a grade of C or better.

In their junior and senior years, majors will work closely with their major advisers to determine acceptable programs of courses in the major field. Normally the program will include at least thirty additional credits in history of art courses, of which twenty-four should be at the 300 or 400 level (chosen from those listed below) and a minimum of two additional courses in the department or a related area approved by the major adviser. Courses at the 200 or 300 level taken in the department during the freshman or sophomore years may be counted toward the major, providing such courses are in addition to the two courses offered in satisfaction of the prerequisite to the major. Majors are encouraged to take studio courses in painting and sculpture offered by the Department of Art, but such courses will be considered electives and may not count toward the basic thirty credits normally required in the major.

The Honors Program

In order to become a candidate for the degree of Bachelor of Arts with honors in the history of art, a student must have a cumulative average of B for all courses in the Department of the History of Art. Admission into the program requires the consent of the department chairman during the second term of the student's junior year. In the senior year the honors candidate will include among the regular requirements Art History 493-494, involving the preparation of a senior thesis under faculty supervision.

Distribution Requirement

The distribution requirement in expressive arts is satisfied by a combination of any two history of art courses at the 200 level or above, or Archaeology 100 and one of the history of art courses listed under archaeology.

Freshman Seminars

103 Freshman Seminar in Visual Analysis Fall or spring. 3 credits. Offered in the Freshman Seminar Program and as a freshman elective, but not in satisfaction of the distribution requirement.

Fall: M W F 9:05, 10:10, 11:15, 12:20, T Th 10:10-11:25; staff. Spring: M W F 9:05, 10:10, 11:15, 12:20; staff.

Understanding the nature of man-made objects, from tools to cities and including conventional categories of painting, sculpture, and architecture. An introduction to the problems of perceiving such objects and articulating the visual experience. A supplement, not a prerequisite, to art history, organized by media and themes rather than chronologically.

104 How to Look at Works of Art Spring. 3 credits. Offered in the Freshman Seminar Program and as a freshman elective, but not in satisfaction of the distribution requirement.

T Th 12:20-1:35. J. V. Falkenheim.
A detailed examination of several major works of art, primarily paintings, taking into consideration the cultural and historical contexts in which the works were created, as well as their unique qualities as works of art.

Introductory Courses

The following courses are designed to introduce students to the processes and methods of art history by means of a systematic examination of a closely related body of visual material. The courses need not be taken in any particular sequence. One 200-level course is normally the prerequisite to courses at the 300 level.

[210 Introduction to Art History: Beginnings of Civilization 3 credits. Not offered 1978-79.]

211 Introduction to Art History: Art of Egypt and Mesopotamia Fall. 3 credits.

M W F 10:10. N. Ramage.
A survey of the art and architecture of Mesopotamia and Egypt from the Stone Age to the Greco-Roman period. Common ideas and motifs will be explored as well as historical relationships.

212 Introduction to Art History: Art of the Etruscans and Romans Spring. 3 credits.

T Th 10:10-11:25. N. Ramage.
A study of the arts of the people of Italy from the 7th century B.C. to the time of Constantine. The course will look at the growth of the Roman State, among powerful neighbors, to its domination of the Mediterranean world. The artistic contribution of the Italic and Etruscan peoples will be emphasized.

220 Introduction to Classical Archaeology (also Class 220) Fall. 3 credits.

M W F 9:05. J. E. Coleman.
Life in the Classical world as revealed by the archaeologist's spade, from the pioneering discoveries to the results of modern scientific excavation: market places and sanctuaries; everyday objects and dedications to the gods; tombs and their treasures.

221 Minoan-Mycenaean Art and Archaeology (also Class 221) Spring. 3 credits.

M W F 9:05.
The early age of Greece from the Neolithic period to the end of the Bronze Age, with special emphasis on Minoan and Mycenaean civilizations.

[230 Introduction to Art History: Medieval Art Spring. 3 credits. Not offered 1978-79.
R. G. Calkins.]

[240 Introduction to Art History: The Renaissance Spring. 3 credits. Not offered 1978-79.

E. G. Dotson.]

250 Introduction to Art History: The Baroque Era Spring. 3 credits.

T Th 10:10-11:25. A. S. Roe.
A survey of the major artistic trends in Western Europe during the seventeenth century. The course will begin with the consideration of architecture, sculpture, and painting in Italy during the first half of the century. The schools of painting of Spain, Flanders, Holland, and France will then be considered. Emphasis will be on major masters of the period: Annibale Carracci, Caravaggio, Bernini, El Greco, Velazquez, Rubens, Hals, Vermeer, Rembrandt, Poussin.

261 Introduction to Art History: Modern Art Fall. 3 credits. Not open to students who have taken 260.

T Th 10:10-11:25. J. V. Falkenheim.
A topical discussion of some of the major artists, movements, ideas that make up modern art. Emphasis on European and American painting in relationship to cultural and intellectual concerns of the period spanning approximately 1800 to 1950.

270 Introduction to Art History: American Art of the Colonial Period and the Nineteenth Century Fall. 3 credits.

M W F 9:05. A. S. Roe.

Art in the British colonies and in the United States from seventeenth century beginnings to the early years of the present century. While there will be introductory material dealing with the earliest forms of architecture and the decorative arts (furniture, silver, etc.) the emphasis of the course will be on the development of American painting during the late eighteenth and throughout the nineteenth century.

280 Introduction to Art History: Asian Traditions Fall. 3 credits.

M W F 1:25. S. J. O'Connor.

Designed to introduce students to the varied responses of the Asian artist in differing times and geographical contexts, the course will include material on the Buddhist tradition, the Hindu temple, miniature paintings, Chinese Bronze Age art, and the development of Chinese landscape painting.

[290 Introduction to Art History: Architecture and Environment Fall. 3 credits. Not offered 1978-79.

T. M. Brown.]

Intermediate Courses

The following courses are intended primarily for upperclass students and qualified sophomores, and, except as noted, all require as a general prerequisite one course at the 200 level. Some of the courses have discussion sections.

320 Arts and Monuments of Athens (also Class 320) Fall. 4 credits. Prerequisite: Classics 220 or permission of instructor.

T Th 2:30-4. P. I. Kuniholm.

Detailed study of the monuments and crafts of Athens from the Geometric to the Roman period; the Acropolis and the Agora, Attic pottery and sculpture, etc., considered within their cultural context. Lectures and student reports.

[321 Archaeology of Cyprus (also Class 321) Not offered 1978-79.]**[322 Arts of the Roman Empire** Fall. 4 credits. Not offered 1978-79.

A. Ramage.]

[323 Painting in the Greek and Roman World Fall. 4 credits. Not offered 1978-79.

A. Ramage.]

[324 Architecture in the Greek and Roman World Spring. 4 credits. Not offered 1978-79.

A. Ramage.]

[325 Greek Vase Painting Fall. 4 credits. Not offered 1978-79.

A. Ramage.]

[326 Art and Archaeology of Archaic Greece (also Class 326) Not offered 1978-79.]**[332 Architecture of the Middle Ages** Fall. 4 credits. Not offered 1978-79.

R. G. Calkins.]

[333 Early Medieval Art and Architecture Spring. 4 credits. Not offered 1978-79.

R. G. Calkins.]

334 Romanesque Art and Architecture Fall. 4 credits.

M W F 10:10. R. G. Calkins.

The painting, manuscript illumination, sculpture, and architecture of the eleventh and twelfth centuries, primarily in France, England, and Spain. Particular attention will be paid to the art of the Pilgrimage

Roads, the manifestation of specific regional styles, the problems of Byzantine influence, the significance of the art of the church treasures, and the factors which brought about the transition to the early Gothic.

335 Gothic Art and Architecture Spring. 4 credits.

M W F 10:10. R. G. Calkins.

The painting, sculpture, and architecture of the thirteenth and fourteenth centuries, primarily in France and England, but with reference to important manifestations of the spread of the Gothic style across western Europe.

[336 Late Medieval Italian Art and Architecture Fall. 4 credits. Not offered 1978-79.

C. E. Gilbert.]

[337 The Medieval Illuminated Book Spring. 4 credits. Not offered 1978-79.

R. G. Calkins.]

341 Flemish Painting Spring. 4 credits.

M W F 11:15. C. E. Gilbert.

The primary attention will be given to such major artists as Robert Campin, Jan van Eyck, Roger van der Weyden, Jerome Bosch, and Pieter Bruegel.

[342 Medieval and Renaissance German Art Fall. 4 credits. Not offered 1978-79.

R. G. Calkins.]

[343 Italian Renaissance Art of the Fifteenth Century Spring. 4 credits. Not offered 1978-79.

C. E. Gilbert.]

344 Italian Renaissance Art of the Sixteenth Century Fall. 4 credits.

M W F 11:15. C. E. Gilbert.

Emphasis on the great personalities of Florence and Rome (Leonardo da Vinci, Michelangelo, Raphael) and of Venice (especially Titian).

[345 Sculpture of the Italian Renaissance Fall. 4 credits. Not offered 1978-79.

A. S. Roe.]

[355 French Art of the Sixteenth and Seventeenth Centuries Fall. 4 credits. Not offered 1978-79.

E. G. Dotson.]

[357 European Art of the Eighteenth Century Fall. 4 credits. Not offered 1978-79.

E. G. Dotson.]

359 Major Masters of the Graphic Arts Spring. 4 credits.

T Th 2:30-3:45. H. P. Kahn and A. S. Roe.

The development of graphic media and techniques will be discussed, as well as the social and historical factors which conditioned the work of outstanding masters of the graphic arts. Artists considered will include Schongauer, Dürer, Mantegna, Brueghel the Elder, Rembrandt, Goya, Hogarth, Blake, Gillray (and English political and social satirists), Manet, Daumier, Homer (and the development of early graphic arts in America), Rouault, Picasso, and others.

[361 Modern Artists and Their Critics Fall. 4 credits. Not offered 1978-79.

J. V. Falkenheim.]

362 Topics in Modern Art Spring. 4 credits.

Prerequisites: 261, or 260 and 363, and some background in modern intellectual or cultural history, or permission of instructor. Enrollment limited to 30.

T Th 10:10-11:25. J. V. Falkenheim.

Topic for 1979 to be announced.

364 Modern Sculpture: From Rodin to Rickey Fall. 4 credits.

T Th 12:20-1:35. R. C. Hobbs.

The development and status of sculpture in Europe and the United States from Rodin to the present will be the focus of this course. Some emphasis will be placed on techniques and materials, and comparisons will be made between sculpture and painting. The course will not attempt to be comprehensive in scope; it will feature major figures and dwell on selected topics.

[365 Art 1940 to the Present: From Hofmann to Haacke 4 credits. Not offered 1978-79.

R. C. Hobbs.]

374 American and European Decorative Arts of the Renaissance and Early Nineteenth Century Fall. 4 credits.

M W 12:20-1:35. A. S. Roe.

The evolution of the successive major styles in European interior design and furnishing will be studied in relation to their impact upon the arts and crafts of the colonies and of the United States, from the earliest period until the advent of mechanized production.

[376 Painting and Sculpture in America: 1850-1950 4 credits. Not offered 1978-79.

T. W. Leavitt.]

378 American Architecture, the City, and American Thought: 1850-1950 Spring. 4 credits.

T Th 12:20-1:35. T. M. Brown.

American architecture and urbanism approached as cultural history, focusing on such topics as "technology: pro and con," "architecture as metaphor," "cities: source of virtue or vice?" Extensive reading will be required from works of Jefferson, Thoreau, Greenough, Sullivan, Henry Adams, Whitman, Wright, and from such secondary sources as Leo Marx's *The Machine in the Garden* and M. and L. White's *The Intellectual Versus the City*.

379 Art and Technology: 1850-1950 Fall. 4 credits.

T Th 12:20-1:35. T. M. Brown.

Approached topically, an examination of the issues of the two- and three-dimensional visual art and design within the context of a mass-technological world. Discussion will revolve around topics presented, as well as required weekly reading.

381 Buddhist Art in Asia Spring. 4 credits.

M W F 1:25. S. J. O'Connor.

A study of art in the service of Buddhism, the course will be organized around the development and spread throughout Asia of characteristic types of Buddhist art. Among the subjects to be considered will be the image of the Buddha, the monastery and stupa, narrative works and systems of symbolization. An effort will be made to relate the development of forms to the major currents of Buddhist thought.

383 The Arts of Early China Fall. 4 credits. No prerequisites.

M W 12:20; an additional discussion/museum hour to be arranged. M. W. Young.

An introduction to the arts of China intended for students with no previous experience of China or art history. The course will begin with the late Neolithic pottery cultures and then examine in detail the arts of the Bronze Age and the Buddhist period, ending with the beginning of painting in the ninth century. The collection of the Johnson Art Museum will be used in conjunction with the discussion sections. Term paper option for the final exam.

[385 Chinese Painting and Ceramics Spring. 4 credits. No prerequisites. M. W. Young. Not offered 1978-79.]

[386 Studies in Indian and Southeast Asian Art] Spring. 4 credits. Not offered 1978-79.
S. J. O'Connor.]

Seminars

Courses at the 400 level are open to upperclass students and majors; seminars at the 500 level are for qualified upperclass and graduate students. All seminars involve the writing and presentation of research papers. Enrollment is limited, and consent of the department or instructor is normally required. The 500-level courses with announced topics may be repeated.

401 Independent Study Fall or spring. 2 credits. Prerequisite: permission of a department faculty member.
Hours to be arranged. Staff.
Individual investigation and discussion of special topics not covered in the regular course offerings, by arrangement with various members of the department. May be repeated for credit.

402 Independent Study Fall or spring. 4 credits. Prerequisite: permission of a department faculty member.
Hours to be arranged. Staff.
Individual investigation and discussion of special topics not covered in the regular course offerings, by arrangement with various members of the department. May be repeated for credit.

405 Original Works of Art Spring. 4 credits.
T 2:30-4:30. C. E. Gilbert.
Tentative project: study of Dutch seventeenth century drawings and preparation of the catalog of an exhibition from a private collection.

406 Introduction to Museums Fall. 2 credits. Prerequisite: permission of instructor.
M 3:35. T. W. Leavitt and staff.
The history, philosophy, form, and operation of museums will be considered, using the resources of the Herbert F. Johnson Museum. This course is for art history majors and museum guides.

411 Techniques and Materials: Painting Spring. 4 credits. Prerequisites: four art history courses and permission of instructor.
T Th 10:10-12:05. H. P. Kahn.
The techniques of painting in their historical and formal contexts. Studies and laboratory exercises and experiments as well as historical, analytical research of materials and conservation.

[412 Techniques and Materials: Graphics] Spring. 4 credits. Not offered 1978-79.
H. P. Kahn.]

413 Books, Prints, and the Graphic Image Fall. 4 credits. Prerequisites: four art history courses and permission of instructor.
T Th 10:10-12:05. H. P. Kahn.
The history and formal evolution of letters, types, illustrations, books, and publications. Graphic exercises in workshop: calligraphy, typography, graphic processes. Theories of design and message.

421 The History of Art Criticism Fall. 4 credits.
Th 2:30-4:30. J. V. Falkenheim.
Topic for 1978: formalism. A consideration of the ideas of selected nineteenth- and twentieth-century theorists and critics responsible for generating a formalist approach to art, followed by an evaluation of the writings of various later twentieth-century critics who have subscribed to this method of critical analysis.

[423 Ceramics] Fall. 4 credits. Not offered 1978-79.
A. Ramage.]

[424 Numismatics] Fall. 4 credits. Not offered 1978-79.
A. Ramage.]

[431 Greek Sculpture (also Class 431)] Fall. 4 credits. Not offered 1978-79.
A. Ramage.]

[448 Mannerism and the Early Baroque Era in Italy] Spring. 4 credits. Not offered 1978-79.
E. G. Dotson.]

449 Studies in Italian Renaissance Art Fall. 4 credits.
T 2:30-4:30. C. E. Gilbert.
Topic for 1978: the age of Michelangelo and Titian.

[452 Studies in English Art] Fall. 4 credits. Not offered 1978-79.
A. S. Roe.]

[456 Literature and the Arts in Sixteenth-Century France (also Frnch 456)] 4 credits. Not offered 1978-79. Next offered fall 1979.
E. G. Dotson and E. P. Morris.]

[458 Classic and Romantic Art] Spring. 4 credits. Not offered 1978-79.
E. G. Dotson.]

[464 Studies in Modern Art] Fall. 4 credits. Not offered 1978-79. J. V. Falkenheim.]

476 Seminar on American Art: 1840-1940 Spring. 4 credits.
M 2:30-4:30. T. W. Leavitt.
An exploration of aspects of American painting represented in the collection of the Johnson Museum. Works will be examined in many different contexts.

482 Ceramic Art of Asia Spring. 4 credits.
T 2:30-4:30. S. J. O'Connor.
The Johnson Museum's collection of Asian ceramics will provide a principal resource for study. Lectures, reports, and discussions.

[483 Chinese Art of the T'ang Dynasty] Spring. 4 credits. Not offered 1978-79.
M. W. Young.]

486 Studies in Chinese Painting Fall. 4 credits. Prerequisites: 385, or a course in Chinese literature or Chinese history, or consent of instructor.
M 2:30-4:25. M. W. Young.
Topic for 1978: poetry and painting. A detailed investigation of the relationship between poetry and painting in China, with particular emphasis on the theoretical basis for each mode of expression. Lectures, readings, discussions. Final paper expected.

[488 Traditional Arts in Southeast Asia] Spring. 4 credits. Not offered 1978-79.
S. J. O'Connor.]

493 Honors Work Fall or spring. 4 credits. S-U grades only. Intended for senior art history majors who have been admitted to the honors program.
Hours to be arranged. Staff.
Basic methods of art historical research will be discussed and individual readings assigned, leading to the selection of an appropriate thesis topic.

494 Honors Work Fall or spring. 4 credits. Prerequisite: 493.
Hours to be arranged. Staff.
The student, under faculty direction, will prepare a senior thesis.

531 Problems in Medieval Art and Architecture Spring. 4 credits.
Th 3:35-5:30. R. G. Calkins.
Topic to be announced.

[540 Seminar in Renaissance Art] Spring. 4 credits. Not offered 1978-79.
C. E. Gilbert.]

564 Problems in Modern Art Spring. 4 credits.
W 2:30-4:30. R. C. Hobbs.
Selected topics in international art of the last thirty years.

565 Problems in Modern Art and Architecture Spring. 4 credits. Limited to 15 students. Prerequisite: permission of instructor.
M 2:30-4:30. T. M. Brown.
Topic for 1979: "Modernism" in nineteenth and twentieth-century culture.

580 Problems in Asian Art Fall. 4 credits.
T 2:30-4:30. S. J. O'Connor.
Topic for 1978: studies in the art of Thailand, focused on the collection of the Johnson Museum.

591-592 Supervised Reading 591, fall; 592, spring. 4 credits, but may be taken more than once. For graduate students only.

[595 Methodology Seminar] Spring. 4 credits. Not offered 1978-79.]

[596 Problems of Art Criticism] Spring. 4 credits. Not offered 1978-79.]

See also:

Early Celtic Art and Mythology (Society for the Humanities 413)

Mathematics

C. Earle, chairman; I. Bernstein, L. Billera, J. Bramble, K. Brown, S. Chase, M. Cohen, R. Dennis, E. Dynkin, A. Edmonds, R. Farrell, M. Finster, M. Fisher, W. Fuchs, S. Gelbart, L. Gross, R. Hamilton, D. Henderson, J. Hubbard, P. Kahn, H. Kesten, J. Kiefer, A. Knapp, D. Kubert, S. Lichtenbaum, G. Livesay, O. McBryan, M. Morley, A. Nerode, L. Payne, R. Platek, A. Rosenberg, O. Rothaus, A. Schatz, S. Sen, R. Shore, A. Sommese, F. Spitzer, R. Strichartz, M. Sweedler, L. Wahlbin, H. Wang, J. West, A. Zitronenbaum

Much time may be saved by a careful reading of this announcement.

Members of the department are available to discuss with students the appropriate courses for their levels of ability and interest, and students are urged to avail themselves of this help.

Students wishing to take any of the courses numbered 300 or above are invited to confer, before registering, with the instructor concerned.

Subject matter of courses indicated by the second digit: 0, general; 1, 2, analysis; 3, 4, algebra; 5, 6, topology and geometry; 7, probability and statistics; 8, logic; 9, other. The level of a course is indicated by the first digit of the course number: roughly, 1, 2, indicate underclass courses; 3, 4, upperclass courses; 5, 6, graduate courses.

Mid-term grades, when required, will be S or U only, except in special circumstances. In all 600-level courses, final grades will be S-U only, with the exception of 690. In courses with numbers below 600, students will receive letter grades, with the exception of nonmathematics majors who have requested an S-U grade.

Advanced Placement

Secondary school students are strongly urged to take one of the two advanced placement examinations of the College Entrance Examination Board in their senior year. In addition, there will be a placement examination in mathematics offered at Cornell just before the beginning of classes in the fall which some students should take. It is most important that anyone with any knowledge of calculus carefully read the brochure, *Advanced Placement of Freshmen*.

Major Options

Questions concerning the major in mathematics should be brought to a department representative. The general description of the options available follows.

Option I

This option is appropriate for students who contemplate a Ph.D. in pure mathematics or applied mathematics. Prerequisite: 221–222, and, if neither 122 nor 293 has been taken, also 217. Requirements: (a) 411–412, (b) 431–432, (c) at least twelve additional credits of mathematics courses numbered 300 or above, other than 311, 331, 332, 370; Computer Science 621, 622 may be included in these twelve credits, (d) one course from outside mathematics with serious mathematical content and dealing with scientific matters, or Math 305.

The department strongly recommends that all prospective Option I majors take Physics 112 and 213 or 207–208 in their freshman year. Students should also seriously consider the offerings in differential equations, probability and statistics, and numerical analysis.

Option II

This option is appropriate for those mainly interested in the application of mathematics and/or computer science. It does not prepare a student for work at the Ph.D. level in the theoretical side of mathematics, not even in the theoretical side of such areas as statistics and numerical analysis, unless 411–412 is taken. Students who plan to continue in mathematical economics, mathematical biology, or other applied areas should discuss their program with their adviser. Prerequisites: (a) 221–222, and, if neither 122 nor 293 has been taken, also 217; (b) Physics 207–208 or 112 and 213. Requirements: (a) 421, 422; (b) 431, and either 332 or 432; (c) Computer Science 211 (with Computer Science 100 as prerequisite) (d) an approved eight credit sequence in statistics, numerical analysis (in the Department of Computer Science), or differential equations; (e) at least eight additional credits of courses numbered 300 or above in mathematics, computer science, or a physical science not including Mathematics 331, 370, or Computer Science 100.

An alternate version with emphasis on computer science. Prerequisites: (a) 221–222, and, if neither 122 nor 293 has been taken, also 217; (b) Computer Science 100. Requirements: (a) 421–422 or 411 plus one additional course approved by the mathematics department; (b) 431 and either 332 or 432; (c) Computer Science 314, 410, and one of the following: 321–322, and 481 or 414; 481–482, and 321 or 414; 611–612, and 321 or 481 or 414.

Alternate version with emphasis on operations research. Prerequisites: (a) 221–222, and, if neither 122 nor 293 has been taken, also 217; (b) Computer Science 100. Requirements: (a) 421–422 or 411 plus one additional course approved by the mathematics department; (b) 431 and either 332 or 432; (c) two of OR&IE 435, OR&IE 634, OR&IE 431, OR&IE 432, OR&IE 630; (d) OR&IE 320 and Math 471; (e) OR&IE

321 or OR&IE 361 or OR&IE 561. (Operations research courses are offered by the College of Engineering.)

Option III

This option is for students who wish to major in mathematics but do not intend to become professional mathematicians. It does not prepare a student for graduate work in mathematics. It is appropriate for premedical and prelaw students and for students who want to become teachers of secondary mathematics, but Cornell University no longer grants certification. Students interested in teacher training can get information from Professor D. Henderson. Prerequisites: (a) 222 or (a') 214–215–216 and either 331 or 332. If neither 122 nor 293 has been taken, 217 is required. (b) Physics 101–102, or 207–208. Mathematics requirements: (a) 311, and 421 or 418; (b) 331, if 221 has not been taken; 332; (c) 451; (d) Computer Science 100; (e) 403 or 370 or 471, and eight additional credits of mathematics courses numbered above 300. It is recommended that 421 or 418, as required under (a) be completed in the junior year.

The Honors Program

Honors in mathematics will be awarded on the basis of a high level of performance in departmental courses. Further requirements, if any, will be announced during the year.

Distribution Requirement

The distribution requirement is satisfied in mathematics by any six credits, not including more than one course from 105, 107, 403. Computer Science 100 may be used for three of these credits. The mathematics distribution requirement is also satisfied by a score of 3 on the CEEB-BC examination. However, Mathematics 109 or Orientation 115, College of Agriculture and Life Sciences, may not be used.

General Courses

Students wanting a general introductory mathematics course are advised to take 107–108 (see description below).

401 Honors Seminar Fall, 4 credits. Prerequisite: permission of instructor. Students will discuss selected topics under the guidance of one or more members of the staff.

403 History of Mathematics Spring, 4 credits. Prerequisite: one term of calculus and consent of the instructor.
Lec, M W F 9:05.
Topics in mathematics from antiquity to the present.

690 Supervised Reading and Research
Variable credit up to six hours each term.

Basic Sequences

College algebra and trigonometry are taught in Mathematics 109 and also in Orientation 5 and 115, offered by the College of Agriculture and Life Science. Mathematics 109 is designed to prepare students for Mathematics 108 or 111.

There are two sequences in elementary calculus and several special purpose sequences. The two elementary calculus sequences have 111 in common, for which, however, 191 or 193 may be substituted. The upper sequence continues with 122, 221, and 222, while the standard sequence continues with 112 and the package of one-credit courses 214–215–216–217. Students who desire to take advanced courses in theoretical mathematics should take the upper sequence, which is prerequisite to most of them. However, the honors sequence 295–296 is a reasonable substitute for the

sequence 221–222. A student whose performance in 112 has been exceptional may be admitted into 221 but, if neither 122 nor 293 is taken, 217 is a prerequisite for a major in mathematics. A student in the standard sequence who wants the linear algebra material of 221 may obtain it in 331.

The special purpose sequences are 105–106, 107–108, and 191 or 193–192–293–294. The latter is primarily for engineers and is also recommended for physics majors. Note that there are honors versions of 293 and 294, namely, 295 and 296, respectively. Mathematics 107–108 is intended primarily for students in the more descriptive areas of the social sciences, and will normally be terminal. 107–108 does not fulfill the mathematics requirement for biology majors. Mathematics 107 treats finite mathematics, and 108 gives an introduction to calculus; 108 may be taken without 107, and is preferable to 111 for students desiring only one semester of calculus. Mathematics 105–106 is similar to 107–108 but it presents mathematics from the point of view of the biologist.

Students who want a second semester of mathematics after Orientation 115 are advised to take 107 or 105, or, if they need a calculus course, 111. However, they cannot receive credit for both Orientation 115 and 108. Students interested in starting with two semesters of calculus should take Mathematics 111–112 or 111–122. Students who want two semesters of calculus can also follow 106 with 112 or 122; or 108 with 112 if they have done exceptionally well in 108. In exceptional circumstances they may follow 106 with 214–217, providing they make up some missing material on their own. Students wishing to switch between sequences may take 105 and 111, or 107 and 111.

Students cannot receive credit for both 105 and 107, nor for both 108 and Orientation 115. Nor can they receive credit for more than one of 106, 108, 111, 191, 193. Nor can they receive credit for more than one of 112, 122, 192, 194. Nor can they receive credit for more than one of 214–216, 293, 295. Nor can they receive credit for both 221 and 214 or 216. Nor can they receive credit for both 216 and 192. Nor can they receive credit for both 217 and any one of 122, 293, 295. Nor can they receive credit for more than one of 221, 293, 295, 331.

103 Mathematics for Architects (also Arch 221)
Fall, 3 credits.

Lec, T 10:10; 2 rec, to be arranged.
Rudiments of calculus and introduction to vectors and matrices.

105 Finite Mathematics for Biologists (also Engineering T & AM 105) Fall, 3 credits.
Prerequisite: three years of high school mathematics including trigonometry.

Preliminary examinations will be held 7:30 p.m. on Oct. 5, Nov. 2, Nov. 30.
Models, analytic geometry, difference equations, elementary linear algebra, probability. Examples from biology will be used throughout the course.

106 Calculus for Biologists (also Engineering T & AM 106) Spring, 3 credits. Prerequisite: 105 or three years of high school mathematics, including trigonometry and analytic geometry.

Preliminary examinations will be held 7:30 p.m. on Feb. 22, March 29, April 26.
Introduction to differential and integral calculus, partial derivatives, elementary differential equations. Examples from biology will be used throughout the course.

107 Finite Mathematics Fall, 3 credits. This course cannot be used toward fulfillment of the mathematics requirement for biology majors.
Prerequisite: three years of high school mathematics.
Preliminary examinations will be held 7:30 p.m. on Oct. 5, Nov. 2, Nov. 30. Lec, T Th 12:20 and 2 hours to be arranged.

Functions, enumeration, permutations and combinations, probability, vectors and matrices, Markov chains.

108 Introduction to Calculus Spring. 3 credits. See *Basic Sequences* section for the intent of this course. This course does not normally provide adequate preparation for any higher course in mathematics; nor can it be used towards fulfillment of the mathematics requirement for biology majors. Prerequisite: three years of high school mathematics including trigonometry and analytic geometry of the line and circle. Math 107 is desirable, but not mandatory.

Preliminary examinations will be held 7:30 p.m. on Feb. 22, March 29, April 26. Lec, T Th 12:20 and 2 hours to be arranged.

Behavior of functions, introduction to differential and integral calculus, elementary differential equations.

109 Precalculus Mathematics Fall. 3 transcript credits only; cannot be used for graduation. M W F 11:15.

This course is designed to prepare students for Mathematics 111 or 108. Topics include a review of algebra, trigonometry, logarithms, and exponentials.

111 Calculus Fall or spring. 3 credits.

Prerequisite: 109 or three years of high school mathematics including trigonometry.

Preliminary examinations will be held 7:30 p.m. on Oct. 5, Oct. 31, Nov. 28 in the fall, and on Feb. 20, March 27, April 24 in the spring. Lec: fall, T Th 11:15 or 12:20 or M W 12:20 and 2 hours to be arranged; spring, T Th 11:15 and 2 hours to be arranged.

Plane analytic geometry, differentiation and integration of algebraic and trigonometric functions, applications of differentiation, logarithmic, and exponential functions.

112 Calculus Fall or spring. 3 credits.

Prerequisites: 106, 111 with a grade of C or better, or exceptional performance in 108. (Those who do extremely well in 111 should take 122 instead of 112, unless they plan to continue with 214–217.)

Preliminary examinations will be held 7:30 p.m. on Oct. 5, Nov. 2, Nov. 30 in the fall, and on Feb. 22, March 29, April 26 in the spring. Lec: fall, T Th 11:15 and 2 hours to be arranged; spring, T Th 11:15 or 12:20 or M W 12:20 and 2 hours to be arranged.

Applications of integration, techniques of integration, partial derivatives and extremal problems, multiple integrals.

122 Calculus Fall or spring. 4 credits.

Prerequisite: performance at a high level in 111 or permission of the department. (Students planning to continue with 214–217 are advised to take 112 instead of this course.)

Lec: fall, M W F 10:10, 11:15, or 12:20; spring, M W F 9:05 or 10:10.

Differentiation and integration of elementary transcendental functions, the techniques of integration, applications, polar coordinates, infinite series, and complex numbers. The approach is more theoretical than in 112.

191–193 Calculus for Engineers Fall. 4 credits.

Prerequisite: three years of high school mathematics, including trigonometry. 193 is a course parallel to 191 for students who have had a substantial amount of calculus in high school, but who did not place out of 191. Although the same topics will be covered in 193 as in 191, some may be treated in greater depth in 193. 193 is offered in the fall only.

Preliminary examinations will be held 7:30 p.m. on Oct. 5, Oct. 31, Nov. 28. Lec, 191, M W F 9:05 and 2 hours to be arranged; 193, M W F 9:05 or 11:15 and 2 hours to be arranged.

Plane analytic geometry, differential and integral calculus and applications.

192 Calculus for Engineers Fall or spring.

4 credits. Prerequisite: 191 or 193.

Preliminary examinations will be held 7:30 p.m. on Oct. 5, Nov. 2, Nov. 30 in the fall, and on Feb. 22, March 29, April 26 in the spring. Lec, fall: M W F 11:15 and 2 hours to be arranged; spring: M W F 9:05 or 11:15 and 2 hours to be arranged.

Transcendental functions, technique of integration and multiple integrals, vector calculus, analytic geometry in space, partial differentiation, applications.

[201 Mathematics for Social Scientists Fall.

4 credits. Not offered 1978–79.]

214–215–216–217 Fall or spring. 1 credit each.

Prerequisite: 112 or 122. These courses are taught as a unified package in the expected order 217, 214, 215, 216 for three or four weeks each. Students may register for any subset of these courses in accordance with their interests and needs. However, no credit can be received for 216 if 192 or 194 is taken nor can credit be received for 214 or 216 if 221 is taken, nor can credit be received for 217 if any one of 122, 293, or 295 is taken. If in doubt as to choices, students should consult with their adviser and the course instructor. Preliminary exams will be given some evenings at 7:30 p.m. All students should attend the first lecture of the semester to learn the order in which these courses are taught, the dates for each course, the examination dates, and the structure of the whole.

Lec, T Th 11:15, F 8, and 2 hours to be arranged.

214 Introduction to Differential Equations

Prerequisite: 217 or equivalent material from 122 or 293.

Simple first- and second-order equations with applications.

215 Systems of Ordinary and Partial Differential Equations

Prerequisite: 214 and 217 or equivalent material from 122 or 293. Introduction to numerical methods of solution, systems of differential equations, elementary partial differential equations, and boundary value problems. Applications.

216 Vector Analysis Vectors, matrices, vector

valued functions. Line integrals.

217 Infinite Series and Complex Numbers

221 Calculus Fall or spring. 4 credits.

Prerequisite: grade of B or better in 122 or permission of instructor.

Fall, M W F 9:05, 10:10, or 11:15; spring, M W F 10:10 or 11:15.

Linear algebra and differential equations. Topics include vector algebra, linear transformations, matrices, linear differential equations.

222 Calculus Fall or spring. 4 credits.

Prerequisite: 221.

Fall, M W F 11:15 or 12:20; spring, M W F 9:05, 10:10, or 11:15.

Vector differential calculus, calculus of functions of several variables, multiple integrals.

293–295 Engineering Mathematics Fall or

spring. 4 credits. Prerequisite: 192 or 194. In exceptional circumstances 192 and 293 or 295 may be taken concurrently. 295 is an honors section that includes more theoretical material than 293.

Preliminary examinations will be held 7:30 p.m. on Oct. 5, Nov. 2, Nov. 30 in the fall, and on Feb. 20, March 27, April 24 in the spring. Lec, fall, 293 M W F 10:10, 12:20 and 1 hour to be arranged; 295, M W F 12:20 and 1 hour to be arranged.

Linear algebra, matrix theory, first-order differential equations, infinite series, complex numbers, linear transformations, applications. Problems for programming and running on the automatic computer will be assigned, and students are expected to have a knowledge of computer

programming equivalent to that taught in Engineering DBS 105. For more details about 295, see engineering course descriptions for theoretical and applied mechanics.

294–296 Engineering Mathematics Fall or

spring. 294, 3 credits; 296, 4 credits. Prerequisite: 293 or 295. 296 is an honors section and it requires the consent of the instructor to enter 296 from 293.

Preliminary examinations will be held 7:30 p.m. on Oct. 5, Oct. 31, Nov. 28 in the fall, and on Feb. 20, March 27, April 24 in the spring. Lec: 294 fall, M W 12:20 and 1 hour to be arranged; lec: 294 spring, M W 10:10 or 12:20 and 1 hour to be arranged; 296, M W F 12:20 and 1 hour to be arranged.

Vector space and eigenvalues, linear differential equations, differential vector calculus, Fourier series, and boundary value problems. For more details about 296 see engineering course descriptions for theoretical and applied mechanics.

Applied Mathematics and Differential Equations

305 Mathematics in the Real World Spring.

3 credits. Prerequisite: 222 or 294 or permission of instructor.

This course is the same as Engineering OR&IE 431.

421 Applicable Mathematics Fall or spring.

4 credits. Prerequisites: high level of performance in 294, or 217 and 222, or 214–217 and 331. Graduate students who need mathematics extensively in their work and who have had a solid advanced calculus course and complex variables course as undergraduates should take 515–516. With less preparation they should take 421–422–423. Students who have not had infinite series, some linear algebra, and some ordinary differential equations should take 214–217, 331, and then 421–422–423.

T W Th F 12:20.

Theorems of Stokes, Green, Gauss, etc. Sequences and infinite series. Fourier series and orthogonal functions. Ordinary differential equations. Solution of partial differential equations by separation of variables.

422 Applicable Mathematics Spring. 4 credits.

Prerequisite: 421.

T W Th F 12:20.

Complex variables. Generalized functions. Fourier transforms, Laplace transforms, Partial differential equations.

423 Applicable Mathematics Fall. 4 credits.

Prerequisite: 421; however, students who have not taken 422 should talk to the instructor before taking this course.

T W Th F 12:20.

Linear operators and integral equations. Calculus of variations. Application to eigenvalue problems. Green's function, and treatment of special problems of mathematical physics.

427 Introduction to Ordinary Differential

Equations Fall. 4 credits. Prerequisite: 222 or 294, or permission of instructor.

M W F 9:05.

Covers the basic existence, uniqueness, and stability theory together with methods of solution and methods of approximation. Topics include singular points, series solutions, Sturm-Liouville theory, transform methods, approximation methods, and application to physical problems.

428 Introduction to Partial Differential

Equations Spring. 4 credits. Prerequisite: 222 or 294 or permission of instructor.

M W F 9:05.

First order quasilinear equations, classification of second-order equations, characteristics. Laplace, heat, and wave equations with emphasis on

maximum principles, existence, uniqueness, stability. Fourier series methods, approximation methods.

Analysis

311 Elementary Analysis Fall. 4 credits. Prerequisites: 214–217. The material of 311 is similar to that of 411 below, but is taught at a more elementary level and at a slower pace. A student may not receive credit for both 311 and 411 or 413. M W F 12:20.

A careful study of the topology of the real line. Continuous functions of one real variable. Differentiation and integration of such functions.

411–412 Introduction to Analysis 411, fall; 412, spring. 4 credits each term. Prerequisite: 222. Students needing measure theory and Lebesgue integration for advanced probability courses should take 413–414, or arrange to audit the first few weeks of Math 521.

T Th 8:40–9:55.
An introduction to the theory of functions of real variables, stressing rigorous logical development of the subject rather than technique of applications. Topics include metric spaces, the real number system, continuous and differentiable functions, integration, convergence and approximation theorems. Fourier series, calculus in several variables and differential forms.

413–414 Introduction to Analysis 413, fall; 414, spring. 4 credits each. Prerequisite: 222.

T Th 8:40–9:55.
Honors version of 411–412. Course will also cover parts of measure theory and Lebesgue integration.

418 Introduction to the Theory of Functions of One Complex Variable Spring. 4 credits. May not be offered 1978–79. Prerequisite: 222 or 294 or 214–217.

M W F 9:05.
A rigorous introduction to complex variable theory. Intended mainly for undergraduates and for graduate students outside mathematics. Complex numbers. Differential and integral calculus for functions of a complex variable including Cauchy's theorem and the calculus of residues. Elements of conformal mapping.

Algebra

331 Linear Algebra Fall. 4 credits. Prerequisite: one year of calculus. A student may not receive credit for both 331 and any one of 221, 293, 295.

M W F 10:10.
Vectors, matrices, and linear transformations, affine and Euclidean spaces, transformation of matrices, and eigenvalues.

332 Algebra and Number Theory Spring. 4 credits. Prerequisite: one year of calculus. 332 will not serve as prerequisite for courses numbered 500 and above.

M W F 10:10.
Commutative rings with unity, fields, and finite groups. Motivations and examples are derived mostly from arithmetical problems on the integers or congruence classes of integers.

431–433 Introduction to Algebra Fall. 4 credits. Prerequisite: 221 or 331. 433 is an honors section which will be more theoretical and rigorous than 431 and will include additional material such as multilinear and exterior algebra.

M W F 10:10.
An introduction to linear algebra, including the study of vector spaces, linear transformation, matrices, and systems of linear equations; quadratic forms and inner product spaces; canonical forms for various classes of matrices and linear transformations; determinants.

432–434 Introduction to Algebra Spring. 4 credits. Prerequisite: 431 or 433. 434 is an honors section that will be more theoretical and rigorous than 432 and will include additional material, such as the structure of finitely generated modules over a principal ideal domain with applications to canonical forms of matrices.

M W F 10:10.
An introduction to various topics in abstract algebra, including groups, rings, fields, factorization of polynomials and integers, congruences, and the structure of finitely generated abelian groups.

Geometry and Topology

451–452 Classical Geometries 451, fall; 452, spring. 4 credits each term. Prerequisite: 221 or 331 or permission of instructor. 452 may not be offered 1978–79.

M W F 11:15.
Foundations of geometry. Various geometric topics, including Euclidean geometry, non-Euclidean geometry, projective geometry.

453–454 Introduction to Topology and Geometry 453, fall; 454, spring. 4 credits each term. Prerequisites: 411 and 221, or permission of instructor.

M W F 12:20.
453: basic point set topology, connectedness, compactness, metric spaces, fundamental group. Application of these concepts to surfaces such as the torus, the Klein bottle, the Moebius band. 454: intrinsic definition of tangent vectors and differential forms in \mathbb{R}^n . Metric properties of surfaces in \mathbb{R}^3 . Smooth manifolds and introduction to Riemannian geometry.

Probability and Statistics

370 Elementary Statistics Spring. 4 credits. Prerequisites: 112, 122 or 192; or 106 or 108 with permission of instructor. A terminal course for students who will take no further work in this area; 370 does not prepare for 472.

Preliminary examinations will be held 7:30 p.m. on Feb. 20, March 27, April 24.

Topics in probability that are essential to an understanding of statistics; introduction to the principles underlying modern statistical inference and the rationale underlying choice of statistical methods in various situations.

471 Basic Probability Fall. 4 credits. Prerequisite: 221. Can serve as a terminal course in basic probability but is intended primarily for those who will continue with 472.

Preliminary examinations will be held 7:30 p.m. on Oct. 5, Nov. 2, Nov. 30.
Topics covered include combinatorics, 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 571.

472 Statistics Spring. 4 credits. Prerequisite: 471 and knowledge of linear algebra such as taught in 221.

Preliminary examinations will be held 7:30 p.m. on Feb. 20, March 27, April 24.

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.

473 Further Topics in Statistics Fall. 4 credits. Prerequisite: 472 or 574. (For corresponding subject matter taught in more detail, see description of 573 and 675.)

T Th 8:40–9:55.

More detailed discussion of some of the topics not covered at length in 472. Design and analysis of experiments. Multivariate analysis. Nonparametric inference; robustness. Sequential analysis.

Mathematical Logic

381 Elementary Mathematical Logic Spring. 4 credits. Prerequisite: 122.

M W F 11:15.
Propositional and predicate logic. Completeness and incompleteness theorems. Set theory.

Graduate Courses

Students interested in taking graduate courses in mathematics should consult the department for further course details, times, and possible changes in courses as described below.

511–512 Real and Complex Analysis
First term: set-theoretic preliminaries, abstract integration. Borel measures, Lebesgue measures. L^p spaces, Hilbert spaces, Banach spaces, product spaces, differentiation. Second term: Fourier transforms. Complex variables, harmonic functions, Schwarz lemma, approximation by rational functions.

515–516 Mathematical Methods in Physics 515, fall; 516, spring. 4 credits each. Intended for graduate students in physics or related fields who have had a strong advanced calculus course and at least two years of general physics. A knowledge of the elements of finite dimensional vector space theory, complex variables, separation of variables in partial differential equations, and Fourier series will be assumed. The course overlaps with parts of 421–422–423. Undergraduates will be admitted only with permission of instructor. First term prerequisite to the second.

T W Th F 12:20.
Topics designed to give a working knowledge of the principal mathematical methods used in advanced physics. A brief discussion of some basic notions: metric space, vector space, linearity, continuity, integration. Generalized functions (Schwartz distributions). Fourier series and Fourier integrals. Saddle point method. Linear operators. Differential operators and integral operators, the equations and eigenvalue problems connected with them and the special functions arising from them. Elements of group theory. The rotation group and its representations.

[517–518 Ordinary Differential Equations Not offered 1978–79; next offered in 1979–80.]

519–520 Partial Differential Equations
Classification of partial differential equations. Questions of existence, uniqueness, and continuity of the solutions of typical boundary-value problems. Equations of Laplace and Poisson, principles of maximum and mean, wave equation, heat equation.

521 Elementary Functional Analysis
Elementary set theory and topology, Banach and Hilbert spaces, measure and integration. Graduate students in mathematics should take 613 for functional analysis.

522 Applied Functional Analysis
Spectral theorem for bounded operators, spectral theory for unbounded operators in Hilbert space, compact operators, distributions. Applications.

[527 Analysis of Numerical Methods for Partial Differential Equations Not offered 1978–79.]

531–532 Algebra
First term: finite groups, field extensions, Galois theory, rings and algebras, tensor algebra. Second term: Wedderburn structure theorem, Brauer group, group cohomology, Ext, Dedekind domain, primary decomposition, Hilbert basis theorem, local rings. Additional topics selected by instructor.

537 Elementary Number Theory Not offered 1978-79.]

549 Lie Groups and Differential Geometry

551 Introductory Algebraic Topology

Fundamental group and covering spaces. Homology and cohomology theories for complexes and spaces.

552 Differentiable Manifolds Not offered 1978-79.]

561 Geometric Topology Not offered 1978-79.]

571-572 Probability Theory Prerequisites: a knowledge of Lebesgue integration theory, at least on the real line. Students can learn this material by taking parts of 413-414 or 521. Properties and examples of probability spaces. Sample space, random variables, and distribution functions. Expectation and moments. Independence, Borel-Cantelli lemma, zero-one law. Convergence of random variables, probability measures and characteristic functions. Law of large numbers. Selected limit theorems for sums of independent random variables. Markov chains, recurrent events. Ergodic and renewal theorems. Martingale theory. Brownian motion and processes with independent increments.

571-574 Probability and Statistics

First term: Same as first term of 571-572. Second term: topics include an introduction to the theory of point estimation, consistency, efficiency, sufficiency, and the method of maximum likelihood; the classical tests of hypotheses and their power; the theory of confidence intervals; the basic concepts of statistical decision theory; the fundamentals of sequential analysis. Intended to furnish a rigorous introduction to mathematical statistics, the course is prerequisite to all advanced courses in statistics.

573 Experimental Design Not offered 1978-79.]

575 Sequential Analysis, Multiple Decision Problems

Properties of sequential statistical procedures as obtained from random walk considerations. The sequential probability ratio test and its optimum properties. Sequential estimation. Two-stage procedures. Multiple decision problems and their treatment by one-, two-, and many-stage procedures.

581 Logic

Basic topics in mathematical logic including: propositional and predicate calculus; formal number theory and recursive functions; completeness and incompleteness theorems.

611-612 Seminar in Analysis

613 Functional Analysis

Topological vector spaces. Banach and Hilbert spaces, Banach algebras. Additional topics to be selected by instructor.

615 Fourier Analysis Not offered 1978-79.]

622 Riemann Surfaces

623 Several Complex Variables Not offered 1978-79.]

627 Seminar in Partial Differential Equations

631-632 Seminar in Algebra

635 Theory of Rings Not offered in 1978-79.]

637 Algebraic Number Theory

The study of rings of integers in algebraic number fields. Topics include localizations, completions, the different and the discriminant, class groups, unit groups, and cyclotomic fields.

639 Lie Algebras

640 Homological Algebra

651 Seminar in Topology

653-654 Algebraic Topology

Duality theory in manifolds, applications, cohomology operations, spectral sequences, homotopy theory, general cohomology theories, categories and functors.

657-658 Advanced Topology

Selection of advanced topics from modern algebraic, differential, and geometric topology. Course content varies from year to year.

667 Algebraic Geometry Not offered 1978-79.]

661-662 Seminar in Geometry Not offered 1978-79.]

670 Topics in Statistics

A course taught occasionally to cover special topics in theoretical statistics not treated in other listed courses. Typical of the subjects that will be treated are time series analysis, and classification and cluster analysis.

671-672 Seminar in Probability and Statistics

674 Multivariate Analysis

Multivariate distribution and optimality theory for more complex settings.

675-676 Statistical Decision Theory Not offered 1978-79.]

677-678 Stochastic Processes

681-682 Seminar in Logic

683 Model Theory Not offered 1978-79.]

684 Recursion Theory

Theory of effectively computable functions. Classification of recursively enumerable sets. Degrees of recursive unsolvability. Applications to logic. Hierarchies. Recursive functions of ordinals and higher type objects. Generalized recursion theory.

687 Set Theory

Models of set theory. Theorems of Gödel and Cohen, recent independence results.

690 Supervised Reading and Research

Modern Languages, Literatures, and Linguistics

The Department of Modern Languages and Linguistics (R. L. Leed, chairman) offers courses in linguistics, and elementary, intermediate, and advanced language courses. (Literature departments also offer some language courses.) For course listings, see the separate language headings in this section.

S-U options may be chosen for all courses offered by the department except for German 101-102 and Burmese, Thai, and Vietnamese.

The Department of German Literature

(S. L. Gilman, chairman) offers courses in Germanic literatures (listed under German below).

The Department of Romance Studies (Alain

Seznec, chairman) offers courses in French literature, Italian literature, and Spanish literature (listed under French, Italian, and Spanish below). In addition, the department's program seeks to

encourage study of the interactions of the Romance literatures among themselves and with other literatures, both in its course offerings and in opportunities for independent study. Each term, one course will be offered in English which emphasizes comparative and methodological questions (for 1978-79 see Romance Studies 359, p. 101).

The Department of Russian Literature (Stephen Lottridge, chairman) offers courses in Russian literature (listed under Russian below).

Courses Listed Elsewhere

Courses in Swahili are offered by the Africana Studies and Research Center (see p. 127). Courses in Greek and Latin are offered by the Department of Classics (see p. 62). Courses in Akkadian, Arabic, Aramaic, and Hebrew are offered by the Department of Near Eastern Studies (see p. 109). Courses in Chinese and Japanese literature are offered by the Department of Asian Studies (see p. 54).

Further Information

For information about placement in language classes, advanced placement, definition of qualification, and other details about foreign language requirements, consult the *Arts College Guide*, available at 142 Goldwin Smith Hall.

Arabic

See listings under Near Eastern Studies.

Burmese

R. B. Jones.

101-102 Elementary Course 101, fall; 102, spring, 6 credits each term. Prerequisite for 102 is 101 or equivalent.

Hours to be arranged. A semi-intensive course for beginners or for those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing.

201-202 Burmese Reading 201, fall; 202, spring, 3 credits each term. Prerequisites: for 201, qualification in Burmese; for 202, Burmese 201.

Hours to be arranged.

203-204 Composition and Conversation 203, fall; 204, spring, 3 credits each term. Prerequisites: for 203, qualification in Burmese; for 204, Burmese 203.

Hours to be arranged.

301-302 Advanced Burmese Reading 301, fall; 302, spring, 4 credits each term. Prerequisites: for 301, Burmese 202 or permission of instructor; for 302, Burmese 301 or permission of instructor.

Hours to be arranged. Selected readings in Burmese writings in various fields.

Cambodian

F. E. Huffman

101-102 Elementary Course 101, fall; 102, spring, 6 credits each term. Prerequisite for 102 is 101 or equivalent.

Lec, T Th 9:05; drill, M-F 8. A semi-intensive course for beginners or for those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing.

201-202 Cambodian Reading 201, fall; 202, spring, 3 credits each term. Prerequisites: for 201, qualification in Cambodian; for 202, Cambodian 201.

203-204 Composition and Conversation 203, fall; 204, spring. 3 credits each term. Prerequisites: for 203, qualification in Cambodian; for 204, Cambodian 203.

301-302 Advanced Cambodian 301, fall; 302, spring. 4 credits each term. Prerequisites: for 301, Cambodian 201-202 or the equivalent; for 302, Cambodian 301.

401-402 Directed Individual Study 401, fall; 402, spring. For advanced students. 4 credits each term. Prerequisite: permission of instructor.

404 Structure of Cambodian Spring-only. 4 credits. Prerequisite: Ling 101-102 or the equivalent.

Cebuano (Bisayan)

J. U. Wolff

101-102 Basic Course 101, fall; 102, spring. 6 credits each term. Prerequisite for 102 is 101 or equivalent. Offered according to demand. A semi-intensive course for beginners.

Chinese

N. C. Bodman, S. L. Fessler, E. M. Gunn, C. Lin, J. McCoy, T. L. Mei, P. S. Ni, P. Wang

For a major involving Chinese studies see Asian Studies.

Languages and Linguistics

101-102 Elementary Course 101, fall; 102, spring. 6 credits each term. Prerequisite for 102 is 101 or equivalent.

Lec. M W F 9:05; drill, M-F 8, 2:30.
A semi-intensive course for beginners or for those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing.

111-112 Cantonese Basic Course 111, fall; 112, spring. 6 credits each term. Prerequisite: permission of instructor.

Lec. T Th 11:15; drill, M-F 10:10.
Conversation in standard Cantonese and readings in modern expository Chinese with Cantonese pronunciation.

201-202 Intermediate Chinese I 201, fall; 202, spring. 4 credits each term. Prerequisite: qualification in Chinese.
M-F 9:05.

203-204 Chinese Conversation 203, fall; 204, spring. 1 credit each term. S-U grades only. Prerequisite: Chin 101-102. Two class hours. May be repeated for credit.
Hours to be arranged. Staff.

211-212 Intermediate Cantonese I 211, fall; 212, spring. 4 credits each term. Prerequisite: Cantonese 112 or permission of instructor.
Hours to be arranged.

213-214 Introduction to Classical Chinese 213, fall; 214, spring. 3 credits each term. Prerequisite: qualification in Chinese or permission of instructor. This course may be taken concurrently with Chinese 101-102, 201-202, or 301-302.
M W F 11:15. E. M. Gunn, T. L. Mei.

301 Intermediate Chinese II Fall. 4 credits. Prerequisite: Chin 202 or equivalent.
M W F 11:15.
Readings and drill in modern expository Chinese.

302 Intermediate Chinese III Spring. 4 credits. Prerequisite: Chin 301.
M W F 11:15.
Readings in modern Chinese with social science and humanities content.

303-304 Chinese Conversation—Intermediate 303, fall; 304, spring. 1 credit each term. S-U grades only. Prerequisite: Chinese 201-202. May be repeated for credit.
Guided conversation and oral composition and translation. Corrective pronunciation drill.

[311-312 Intermediate Cantonese II 311, fall; 312, spring. 4 credits each term. Prerequisite: Cantonese 212 or permission of instructor. Not offered 1978-79.]

401-402 History of the Chinese Language 401, fall; 402, spring. 4 credits each term. Prerequisite: permission of instructor.
Hours to be arranged. N. C. Bodman.

403 Linguistic Structure of Chinese: Phonology and Morphology Fall term on student demand. 4 credits. Prerequisite: permission of instructor.
Hours to be arranged. N. C. Bodman.

404 Linguistic Structure of Chinese: Syntax Spring term on student demand. 4 credits. Prerequisite: Chin 403.
T 2:30-4:25. J. McCoy.

405 Chinese Dialects Fall term on student demand. 4 credits. Prerequisite: permission of instructor.
N. C. Bodman. Hours to be arranged.

411-412 Readings in Modern Chinese Literature 411, fall; 412, spring. 4 credits each term. Prerequisite: Chin 302.
M W F 1:25. Staff.

607 Chinese Dialect Seminar Fall or spring on student demand. 4 credits. Prerequisite: Chin 405 and permission of instructor.
N. C. Bodman, J. McCoy.
Analysis and/or field techniques in a dialect area.

Sino-Tibetan Linguistics (see Linguistics 662)

FALCON

161-162 Intensive Mandarin Course 161, fall (parallel to first 16 credits of instruction in regular program); 162, spring (parallel to second 16 credits of instruction in regular program). Prerequisite: permission of instructor.
J. McCoy and staff.

Literature in Chinese

313 Chinese Philosophical Texts Fall. 4 credits. Prerequisite: Chin 214.
T. L. Mei.

314 Classical Narrative Texts Spring. 4 credits. Prerequisite: Chin 214.
Time to be arranged. E. M. Gunn.
Readings in literary Chinese fiction drawn from *Ch'uan-ch'i* tales and historical biographies.

[420 T'ang and Sung Poetry Fall. 4 credits. Prerequisite: permission of instructor. T. L. Mei. Not offered 1978-79.]

421-422 Directed Study 421, fall; 422, spring. 2-4 credits each term. Prerequisite: permission of instructor.
Staff.

424 Readings in Literary Criticism Spring. 4 credits. Prerequisite: permission of instructor.

430 Readings in Folk Literature Fall or spring on student demand. 4 credits. Prerequisite: permission of instructor.
J. McCoy.

For complete descriptions of courses numbered 600 or above consult the appropriate instructor.

603 Seminar in Chinese Poetry and Poetics Fall. 4 credits. Prerequisite: permission of instructor.
T. L. Mei.

605 Seminar in Chinese Fiction Fall. 4 credits. Prerequisite: permission of instructor.
E. M. Gunn.

609 Seminar in Chinese Folk Literature Fall or spring on student demand. 4 credits. Prerequisite: permission of instructor.
J. McCoy.

621-622 Advanced Directed Reading 621, fall; 622, spring. Credit to be arranged. Prerequisite: permission of instructor.
E. M. Gunn, J. McCoy, T. L. Mei.

Dutch

F. C. van Coetssem

131-132 Reading Course 131, fall; 132, spring. 3 credits each term. Prerequisite: permission of instructor.
Hours to be arranged.

Seminar in Dutch Linguistics (German 740)

English as a Second Language

M. A. Martin

Placement by examination prior to registration. For date, place, and time of examination, consult Department of Modern Languages and Linguistics, 203 or 323-B Morrill Hall. All courses must be taken for credit.

102 English as a Second Language Fall. 6 credits. Prerequisite: placement by the instructor.
M-F 9:05.

Intermediate spoken and written English with emphasis on speaking, understanding, and reading.

103 English as a Second Language Spring. 3 credits. Prerequisite: Engl 102 or placement by the instructor.
M W F 2:30.

Designed for those who have completed English 102 and who require or desire further practice. Emphasis is on developing control of written as well as spoken language.

211-212 English as a Second Language 211, fall; 212, spring. 3 credits each term. Prerequisite: placement by the instructor.
M W F 11:15 or 2:30.

Advanced reading and writing with emphasis on improving vocabulary and control of college-level written English.

213 English for Non-native Speakers Spring. 3 credits. Prerequisite: Engl 212 or placement by the instructor.
T Th 10:10.

Designed for those whose writing fluency is sufficient for them to carry on regular academic work, but who feel the need for refining and developing their ability to express themselves clearly and effectively. As much as possible, individual attention will be given to students in two class hours and a weekly interview.

French

J. Béreaud, A. M. Colby-Hall, I. Daly, N. Furman, D. I. Grossvogel, J. Harari, J. Herschensohn, S. Huffman, R. Klein, P. Lewis, S. A. Littauer, M. Marion, E. P. Morris, J. S. Noblitt, A. Seznec, L. R. Waugh

French Major

The French major is designed to give students proficiency in the oral and written language, to acquaint them with French literature and culture, and to develop skills in literary and linguistic analysis.

While prospective majors should try to plan their programs as far ahead as possible (and we have therefore listed course offerings for a three year span), no student will be refused admission merely because of a late start. It is even possible for a student to begin French at Cornell and become a major.

The major is comprised of a core, required of all majors, and of two options which attempt to reflect the variety of student interests, yet maintain the focus for a coherent and substantial program of studies.

The Core:

A. All majors are expected to acquire a sound degree of competence in language. This competence is demonstrated by the successful completion of French 312, or by the passing of a special examination to be taken no later than the end of the junior year. A typical program will involve two semesters of language at the 200 level (to be taken no later than the end of the sophomore year) and two semesters of language at the 300 level (311–312). Students may bypass any part of the sequence through placement examinations.

B. In addition, all majors are expected to take French 201 and French 202. At least one of these should be successfully completed no later than the end of the sophomore year.

The Options:

The following groups intentionally overlap in part; yet each is intended to emphasize different aspects of French culture.

I. The literature option:

1. The successful completion of six additional courses in French literature or civilization at the 300 level or above. These courses will include at least one from each of the three major periods of French literature (Medieval-Renaissance; seventeenth century-eighteenth century; and nineteenth century-twentieth century).

2. The successful completion of a two-course sequence in one of the following: a) French literature; b) French linguistics; c) French history, culture, music, or history of art or architecture, d) courses in linguistic theory, history of language, psycholinguistics, or philosophy of language.

II. The linguistic option:

1. The successful completion of six courses in French and general linguistics (in addition to Linguistics 101–102). These courses will include at least one course in the history of French and one course in the structure of French.

2. The successful completion of two courses (preferably a sequence) in one of the following: a) French literature and civilization, b) psycholinguistics, c) philosophy of language, d) anthropological linguistics.

Whatever option a student chooses, he or she is encouraged to organize a program of study that will enrich the major with a variety of related courses in history, archeology, Classics, comparative literature, English and American literature, anthropology, music, history of art, philosophy, government, linguistics, and other literature and languages.

French majors may study in France for a semester or a year during their junior year under any of the

several study-abroad plans which are recognized by the Departments of Romance Studies and Modern Languages and Linguistics, and which allow for the transfer of credit. The director of undergraduate studies has information about such plans.

Students wishing to major in French should consult the director of undergraduate studies (in 1978–79, Professor Jacques Béreaud), who will admit them to the major. After their admission, students will choose an adviser from among the French faculty. Students interested in the linguistics option should consult Professor Waugh.

Honors Program

The purpose of the honors program is to encourage well-qualified students to do independent work in French, outside the structure of courses. The preparation of the senior honors essay, generally involving three terms, provides a unique learning opportunity, since it allows for wide reading, careful outlining, and extensive rewriting to a degree not practically possible in the case of course papers. At each stage of their work, the students will have regular weekly meetings with faculty tutors.

No special seminars or courses are required of honors students. The junior tutorial (ordinarily, two terms; exceptionally, one) will be devoted to intensive study of selected problems or authors, and to the choice of a topic for the honors essay. The senior tutorial is devoted to the writing of that essay. Honors students may be released from one or two courses in either the junior or senior year to have adequate time for honors work. (Credit is obtained by enrolling in French 419–420.) They will take an informal oral examination at the end of the senior year.

Honors students are selected on the basis of their work in French language and literature courses in the freshman and sophomore years. Students interested should consult P. Lewis for details no later than the spring term of the sophomore year, and earlier if possible. Honors work in French linguistics will be supervised by L. Waugh.

Distribution Requirement

The distribution requirement in the humanities in French is satisfied by French 200, 201, 202, 222, or any 300-level literature course.

Of the courses listed below, those dealing with literature, together with language courses 200, 211–212, and 311–312, are staffed and administered by the Department of Romance Studies, and inquiries about them should be addressed to that department, 278 Goldwin Smith Hall. The courses dealing with linguistics and the other language courses are offered by the Department of Modern Languages and Linguistics, 203 Morrill Hall.

Languages and Linguistics

121–122 Elementary Course 121, fall; 122, spring. 4 credits each term. Prerequisite for 122 is 121 or equivalent.

Lec, Th 9:05, 11:15 or 1:25; drill, M T W F 8, 9:05, 10:10, 11:15, 12:20, 1:25 or 2:30. Staff.

A course for beginners or those who have been placed in the course by examination (see p. 46). The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing. The four recitation hours are devoted to language practice in small groups and the lecture to grammar explanation, reading, cultural information, and testing in larger groups. This course satisfies the qualification portion of the language requirement (see p. 46) in three semesters, although students who obtain a CEEB score of 560 after two semesters (121–122) are thereby qualified and may enter the 200-level sequence.

123 Continuing French Fall or spring. 4 credits. Open only to students who have previously studied French and have a CEEB achievement score between 450 and 559.

Lec, T 9:05 or 12:20; drill, M W Th F 9:05, 10:10, 11:15, 1:25, or 2:30. Staff.

An all-skills course designed as the final course in the sequence. A review of grammar is included in addition to reading, writing, and conversation.

200 Intermediate Course Fall or spring. 3 credits. Prerequisite: qualification in French; (maximum allowable CEEB score 629).

Fall: M W F 9:05, 11:15, 12:20, 1:25, or T Th 8:40–9:55; spring: M W F 9:05, 11:15, 12:20, or T Th 8:40–9:55. Department of Romance Studies staff.

Extended readings and discussions of modern texts selected for their cultural and humanistic value. A brief review of grammar is included.

203 Intermediate Composition and Conversation Fall or spring. 3 credits.

Prerequisite: qualification in French.

Lec, T 11:15, 1:25, W 1:25, Th 11:15; drill, M W F 9:05, 10:10, 11:15, 12:20, 1:25 or 2:30.

Weekly grammar review in addition to composition and conversation.

204 Intermediate Composition and Conversation Fall or spring. 3 credits.

Prerequisite: Fr 203 or equivalent. Enrollment limited.

Lec, W 1:25, T 10:10, or T 2:30; drill, M W F 8, 9:05, 10:10, 11:15, 12:20, 1:25.

211–212 Intermediate French 211, fall; 212, spring. 3 credits each term. Prerequisite for 211: qualification; prerequisite for 212: 211, 203, or placement by advanced standing examination.

Offered by the Department of Romance Studies.

Fall: M W F 10:10, 11:15; spring: M W F 11:15, 12:20. N. Furman and staff.

Designed to improve reading, writing, and speaking skills, this course includes a review of grammar while placing special emphasis on vocabulary expansion, composition, and the development of reading competence. Students will write short essays in French; readings will focus on modern literature and culture.

311–312 Advanced Composition and Conversation 311, fall; 312, spring. 4 credits each term.

Prerequisite: 212 or 204 or placement by special examination. Offered by Department of Romance Studies.

M W F 10:10, 1:25. J. Béreaud and staff.

All skills course. Reading and analysis of contemporary texts. Detailed study of present-day syntax in French 311. Weekly translations or essays in French.

[401 History of the French Language Fall.

4 credits. Prerequisites: qualification in French and Ling 101. Not offered 1978–79.]

407 Applied Linguistics: French Fall. 4 credits.

Prerequisite: qualification in French.

M W F 3:35. J. S. Noblitt.

Survey of French phonetics, grammar, and pedagogical techniques.

408 Linguistic Structure of French Spring.

4 credits. Prerequisites: qualification in French and Ling 101, or permission of instructor.

M W F 3:35. J. Herschensohn.

A descriptive analysis of present-day French, with emphasis on its phonology, morphology, and syntax.

410 Semantic Structure of French Fall or

spring, alternate years. 4 credits. Prerequisite: permission of instructor. Open to undergraduate and graduate students.

Hours to be arranged. L. R. Waugh.

424 Composition and Style Spring. 4 credits.
Prerequisite: Fr 312 or placement by special examination by the Department of Romance Studies.
M W F 12:20. J. Béreaud.

Written work will include review of some areas of advanced grammar, the theory and practice of translation, and pastiches of certain French authors. The oral work will aim at enabling students to deliver a short and correct communication in the foreign language. Weekly papers, *explications de texte*, and exposés on cultural problems.

[602 Linguistic Structure of Old and Middle French] Spring. Offered in alternate years. 4 credits. Prerequisite: Fr 408 or permission of instructor. Not offered 1978-79.]

604 Contemporary Theories of French Grammar Fall 4 credits. Prerequisite: permission of instructor. Hours to be arranged. L. R. Waugh.

700 Seminar in French Linguistics Spring. 4 credits. Offered according to demand. Hours to be arranged. L. R. Waugh.
Topic: current theories of French phonology.

Literature

105-106 Contemporary French Literature 105, fall; 106, spring. 3 credits. Freshman Seminar. M W F 9:05 or T Th 8:40-9:55. Staff.
Readings and class discussion in English.

201 Introduction to French Literature Fall or spring. 3 credits. Prerequisite: qualification. French 201 serves as a prerequisite for all 300-level courses in French literature and is required of all majors. The course is divided into small sections of three types: those conducted in French; those that use more French as the term progresses; those conducted in English. The reading in each section will be in French and will be the same; students will be given the option to write their principal papers in English. Students will have relative freedom during the first two weeks of the course to change from one section to another.

Fall: M W F 9:05, 10:10, 11:15, 12:20, or T Th 10:10-11:25. (Tentatively, the sections primarily conducted in English will be M W F 9:05 and 12:20; the sections using both French and English will be M W F 9:05, 10:10, 11:15 and T Th 10:10-11:25; the sections primarily conducted in French will be M W F 10:10 and 11:15.) Spring: M W F 11:15 or T Th 10:10-11:25. D. Grossvogel, P. Lewis, and staff.

A first introduction to the work of five or six major French authors from the nineteenth and twentieth centuries, the course stresses literary analysis and the development of reading skills. The course will also consider the larger historical framework in which French literature can be seen as a whole, having its peculiar features and specific tendencies, and will raise more general questions of cultural anthropology, linguistics, sociology, and aesthetics. Readings will be chosen from the works of such authors as Baudelaire, Flaubert, Mallarmé, Rimbaud, Proust, Sartre, Malraux, Beckett, and Ionesco.

202 Studies in French Literature Fall or spring. 3 credits. Prerequisite: Fr 201 or a score of 650 on the written portion of the CEEB exam (students with scores in the 560-649 range, see French 200). Required of all majors, but not limited to them.

Fall: T Th 10:10-11:25; spring: M W F 10:10, 11:15, or T Th 10:10-11:25. J. Harari and staff.
Study of the classic literature of seventeenth-century France and its immediate forebears (Montaigne) and successors. Authors such as Montaigne, Corneille, Racine, Molière, Voltaire, and Rousseau will be read.

[222 French Civilization] Not offered 1978-79.]

[309 Mystery and the Nature of Fiction (also Comparative Literature 309)] D. Grossvogel. Not offered 1978-79. Next offered fall 1979.]

[322 French Civilization] J. Béreaud. Not offered 1978-79. Next offered fall 1979.]

347 Masterpieces of Medieval Literature Fall. 4 credits.
M W F 12:20. A. Colby-Hall.

An overview of medieval French literature. Readings will include: the *Chanson de Roland*, an Arthurian romance by Chrétien de Troyes, one or two plays, a selection of lyric poetry, and the *Testament* of Villon. All works except the *Testament* will be read in modern French translations. Conducted in French.

[350 Pléiade to Montaigne] E. Morris. Not offered 1978-79. Next offered spring 1980.]

[361 From Tragedy to Tragicomedy: Variations on the Tragic in Seventeenth- and Eighteenth-Century Drama] P. Lewis. Not offered 1978-79. Next offered fall 1979.]

[368 The Baroque in France] A. Seznec. Not offered 1978-79. Next offered spring 1980.]

369 French Classicism Fall. 4 credits.
T Th 12:20-1:35. P. Lewis.

A survey of French classicism, its theory and literary practice, beginning with the emergence of a classical esthetics from the baroque and continuing to the end of the seventeenth century. Major emphasis on reading and interpreting representative works by the principal figures of the classical movement at its apogee: La Fontaine, Boileau, Molière, Racine, Madame de Lafayette, La Rochefoucauld, La Bruyère, and Bossuet. Individual students may also elect to do work on letter-writers, historians, critics, and precursors of the enlightenment. Conducted in French.

375 The Eighteenth-Century Novel Fall. 4 credits.

M W F 11:15. Staff.
Ideological content and narrative patterns: the novel from Montesquieu to Rousseau.

380 An Introduction to French Romanticism (also Comparative Literature 380) Spring. 4 credits.

M W F 10:10. R. Klein.
This preliminary attempt to define certain features of French Romanticism will focus on the love and seduction of idealized women by artist-heroes whose romantic adventures are emblematic of the difficult accommodation between art and the world, between fiction and reality. Readings will include works of Chateaubriand, Balzac, Stendhal, Vigny, Musset, Nerval, and Baudelaire. Conducted in French.

386 The Novel in the Nineteenth Century Spring. 4 credits.

M W F 11:15. N. Furman.
Readings will include novels by Stendhal, Balzac, Flaubert, and Zola. Conducted in French.

390 Camus: Novels, Plays, Essays (also Comparative Literature 390) Spring. 3 credits; 4 credits if taking extra French component.
T Th 10:10-11:25. D. Grossvogel.

[394 Marx in France] R. Klein. Not offered 1978-79. Next offered spring 1980.]

419-420 Special Topics in French Literature 419, fall; 420, spring. 2-4 credits each term. Prerequisite: permission of instructor.

Staff.
Guided independent study of specific topics.

429-430 Honors Work in French May be taken without credit or for four credits with consent of the adviser. Open to juniors and seniors. See the director of the honors program.
P. Lewis.

447-448 Medieval Literature 447, fall; 448, spring. 4 credits each term. Also offered 1979-80. Prerequisite: Fr 201 or consent of the instructor. First term not prerequisite to the second. Additional hour to be arranged for students entering in the spring without previous training in Old French.

Fall: M W F 9:05; spring: W 1:25-3:25. A. Colby-Hall.

The first term deals with the epic and the theatre; the second with the romance and the lyric. Facility in reading Old French and appreciation of these four major genres are the primary goals of this course.

452 Theatre in Sixteenth-Century France Spring. 4 credits.

T Th 12:20-1:35. E. Morris.
Popular and courtly entertainments; the growth of learned and literary forms. Continuing medieval practices: farce, *sotie*, and *mystère*. Street theater, theatrical guilds, Italian professionals, students and scholars, lords and ladies dancing. Theatrical sites, designs, and music. Royal entries and pageants. Scoffing and subversion; ecclesiastical and political repressions. Theory of ancient comedy and tragedy and their imitation in practice: Jodelle, Rémy Belleau, Garnier. The looser forms: tragicomedy, ballet, pastoral.

[456 Literature and the Arts in Sixteenth-Century France] E. Dotson, E. Morris. Not offered 1978-79. Next offered fall 1979.]

[461 Molière] A. Seznec. Not offered 1978-79. Next offered fall 1979.]

[479 Literature of Ethnology in the Eighteenth Century] J. Harari. Not offered 1978-79. Next offered fall 1979.]

[480 Travel Literature and the Exotic] J. Harari. Not offered 1978-79. Next offered spring 1980.]

[490 French Film and Literature in the Twentieth Century] Spring. 4 credits.
T Th 2:30-3:45. D. Grossvogel.

497 Poetry in France Since Baudelaire Fall. 4 credits.

M W 1:25-2:40. D. Grossvogel.
Baudelaire, Breton, Char, Claudel, Eluard, Laforgue, Lautréamont, Mallarmé, Perse, Rimbaud, Valéry, and others.

[637 Old French Dialectology] A. Colby-Hall. Not offered 1978-79. Next offered fall 1979.]

639-640 Special Topics in French Literature 639, fall; 640, spring. 4 credits each term. To be taken by all new graduate students.
Staff.

648 Medieval Seminar: Le Roman de la Rose Spring. 4 credits.
M 1:25-3:25. A. Colby-Hall.

[664 Types of Critical Performance: The Example of Racinian Criticism] P. Lewis. Not offered 1978-79. Next offered spring 1980.]

669 Seventeenth-Century Seminar: Illusion and Representation Spring. 4 credits.
W 3:30-5:30. P. Lewis.

The course will have two foci: (1) a comparison of the problematics of literary representation in two decades, the 1630s and the 1660s; (2) a testing of methods of description and interpretation developed by literary semiotics on three levels: the process of enunciation, the structures of narration, and the modes of description. Readings will include works of drama, poetry, and narrative from each of the mentioned decades and a modest selection of articles describing or illustrating the work of literary semiotics. Conducted in French.

[685 **Mallarmé** R. Klein. Not offered 1978-79. Next offered fall 1979.]

689 Bohemians and Dandies Fall. 4 credits. T 2:30-4:30. N. Furman.

The counter culture of the nineteenth century will be studied in the works of such writers as Bertrand, Gautier, Nerval, Villiers de L'Isle-Adam, Huysmans, Vallès, and Jarry.

[696 **Memory, Creation, and the Novel: Reading Proust through Bergson** D. Grossvogel. Not offered 1978-79. Next offered spring 1980.]

Germanic Studies

E. Augsberger, A. J. Berger, V. T. Bjarnar, E. A. Blackall, H. Deinert, I. Ezergailis, S. L. Gilman, A. Groos, W. Harbert, P. Hohendahl, J. Jasanoff, I. Kovary, H. L. Kufner, P. W. Nutting, J. P. Stern (Professor-at-Large), G. Valk, F. C. van Coetsem

German Major

Students majoring in German are encouraged to design their program in a manner that will allow for diversity in their course of study. It should enable them to become acquainted with an adequate selection of major works, authors, and movements of German literature and to develop their skill in literary analysis.

Students majoring in German will normally proceed through German 201, 202, 203, 204. Students who, because of previous training, are qualified to enroll in 300- or 400-level courses will be permitted to do so. For details, students may consult the major advisers, H. Deinert in the Department of German Literature, or H. L. Kufner in the Department of Modern Languages and Linguistics. Students majoring in German are expected to complete successfully a minimum of six 300- and 400-level courses in addition to German 303-304. These courses should be a representative selection of subjects in German literature and/or Germanic linguistics. The attention of students majoring in German is called to the courses offered by the Department of Comparative Literature, many of which complement the course offerings in German.

Students majoring in German are expected to become competent in the German language. This competence is normally demonstrated by the successful completion of German 304. Placement of German majors who have done no work in German at Cornell will be determined by the level of preparation they have obtained elsewhere. For information please consult the major advisers, H. Deinert or H. L. Kufner. All German majors, particularly those who have had no German prior to coming to Cornell, are encouraged to spend at least part of their junior year abroad. Students have the opportunity to enroll, for credit, in a Cornell-sponsored Summer Language Program in Germany. Information is available upon request in the Office of the Summer Session, 105 Day Hall and in the departmental offices.

The German Area Studies Major

The major in German area studies is intended for students who are interested in subject matter related to German-speaking countries, but not necessarily or not exclusively in German literature or linguistics. Students will select appropriate courses offered by such departments as History, Government, Economics, Music, and Theatre Arts. These students will select a committee of two or more faculty members to help them design a program and supervise their progress. One committee member must be from the German faculty of either the Department of Modern Languages and Linguistics or the Department of German Literature. The other member(s) should represent the student's main area of interest.

The student majoring in German area studies is expected to become competent in the German language. Such competence is normally demonstrated by successful completion of German 304. A minimum of six area courses above the 200 level is required for the major.

The Honors Program

The honors program in German is open to superior students who wish to work independently in an area of their own choice. Students are free to select any member of the Field of Germanic Studies to assist them in designing their honors program, to supervise their work, and to help them select a suitable topic for an honors essay. The independent study courses 451, 452 may form part of the program.

Freshman Seminar Requirement

The following courses will satisfy the Freshman Seminar requirement: German 108, 109, 151, 211, and 312. For details, please consult the instructors.

Distribution Requirement

The distribution requirement in the humanities is satisfied in German by any two German literature courses at the 200 level and above.

Languages and Linguistics

121-122 Elementary Course 121, fall; 122, spring. 4 credits each term. Prerequisite for 122 is 121 or equivalent.

Lec, T 9:05, 11:15, 2:30; drill, M W Th F 8, 9:05, 10:10, 11:15, 12:20, 1:25, 2:30. Staff.

A course for beginners or those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing. The four recitation hours are devoted to language practice in small groups and the lecture to grammar explanation, reading, cultural information, and testing in larger groups. This course satisfies the qualification portion of the language requirement in three semesters, although students who obtain a CEEB score of 560 after two semesters (121-122) are thereby qualified and may enter the 200-level sequence.

123 Continuing German Fall or spring. 4 credits. Open only to students who have previously studied German and have a CEEB score between 450 and 559.

Lec, M 2:30; drill, T-F 9:05, 10:10, 11:15, 12:20. H. L. Kufner and staff.

An all-skills course designed to prepare students for study at the 200 level. Automatic qualification upon successful completion of this course.

203 Intermediate Composition and Conversation Fall or spring. 3 credits.

Prerequisite: qualification in German.
Fall: M W F 9:05, 10:10, 11:15, 12:20; spring: M W F 10:10. E. Augsberger, G. Valk.

204 Intermediate Composition and Conversation Spring. 3 credits. Prerequisite: German 203 or permission of instructor.

M W F 9:05, 10:10, 11:15. E. Augsberger, G. Valk.

303-304 Advanced Composition and Conversation 303, fall; 304, spring. 4 credits each term. Prerequisites: for Ger 303, Ger 204 or equivalent; for 304, 303 or equivalent.

M W F 1:25. E. Augsberger, G. Valk.
Emphasis is placed on increasing the student's oral and written command of German. Detailed study of present-day syntax and different levels of style.

305-306 Directed Individual Study 305, fall; 306, spring. Subject to the needs of students and to the limitations of staff time. 3 credits.

M W F 1:25. E. Augsberger, G. Valk.

A practical course on an advanced level, emphasizing the fine points of usage in spoken and written German.

[400 Stilistische Uebungen Spring. 4 credits. Prerequisite: 304 or equivalent. Not offered 1978-79.]

401 Introduction to Germanic Linguistics Fall. 4 credits. Prerequisite: Ling 101. Offered in alternate years.

Hours to be arranged. F. van Coetsem.

[402 History of the German Language Spring. 4 credits. Prerequisite: Ger 204 and Ling 101 or permission of instructor. Offered in alternate years. Not offered 1978-1979.]

[407 Applied Linguistics: German Fall. 4 credits. M W F 11:15. H. L. Kufner. Not offered 1978-79.]

408 Linguistic Structure of German Spring. 4 credits. Prerequisites: Ger 204 and Ling 101, or permission of instructor.

M W F 11:15. H. L. Kufner.

For complete descriptions of courses numbered 600 or above, consult the appropriate instructor.

[602 Gothic Fall only. 4 credits. Offered in alternate years. Prerequisite: Ling 101. Hours to be arranged. F. van Coetsem. Not offered 1978-79.]

603-604 Old Saxon, Old High German, Old Low Franconian, Old Frisian 603, fall; 604, spring. 4 credits each term. Offered in alternate years. Prerequisite: Ling 102.

Hours to be arranged. F. van Coetsem, fall; J. Jasanoff, spring.

609-610 Old Norse 609, fall; 610, spring. 4 credits each term.

Hours to be arranged. V. Bjarnar.

631-632 Elementary Reading I 631, fall; 632, spring. 3 credits each term. Prerequisite for 632 is 631 or equivalent.

M W F 4:30. Staff.

Open exclusively to graduate students. The primary aim of this course is to develop skill in reading, although some attention will be devoted to the spoken language, especially to listening comprehension.

710 Seminar in Germanic Linguistics Fall or spring, subject to the needs of students and to the limitations of staff time. 4 credits.

Hours to be arranged. Staff.

720 Seminar in Comparative Germanic Linguistics Fall or spring, subject to the needs of students and to the limitations of staff time. 4 credits.

Hours to be arranged. Staff.

720 Seminar in Comparative Germanic Linguistics Fall or spring, subject to the needs of students and to the limitations of staff time. 4 credits.

Hours to be arranged. Staff.

730 Seminar in German Linguistics Fall or spring, subject to the needs of students and to the limitations of staff time. 4 credits.

Hours to be arranged.

740 Seminar in Dutch Linguistics Fall or spring, subject to the needs of students and to the limitations of staff time. 4 credits.

Hours to be arranged. F. C. van Coetsem.
Selected topics including the history, structure, and dialects of modern Dutch.

Literature

Freshman Seminars

108 Women and Writing (also Women's Studies 108) Fall or spring. 3 credits.

M W F 12:20, T Th 8:30-10, T Th 12:20-1:35.
I. Ezerzgalis and staff.

A critical reading of texts about women (Schiller, *Intrigue and Love*; Kleist, *The Marquise of O.*) and works of Droste-Hülshoff, Virginia Woolf, Ilse Aichinger, Christa Wolf, Doris Lessing, and other modern women writers. All readings in English.

109 Folktale and Folk Poetry Fall or spring. 3 credits.

M W F 10:10, T Th 8:30-10. A. J. Berger and staff.
The study of folktales, ballads, myths, and other forms of primitive literature. Readings in the Grimm brothers, H. C. Andersen, Old Icelandic mythological texts, saints' lives, Child ballads, and selected secondary literature. All readings in English.

151 Literature and German Literature Fall or spring. 3 credits.

M W F 12:20. Staff.
The techniques and methods of literary study will be taught, using great works of German literature in English translation.

German Literature

201 Introduction to the Study of German Literature I Fall. 3 or 4 credits. Prerequisite: qualification in German. To be taught in German.

M W F 12:20, T Th 12:20-1:35. H. Deinert and staff.
The course focuses on the transition from language learning to the study of literature. Texts will be taken from twentieth-century German literature.

202 Introduction to the Study of German Literature II Spring. 3 or 4 credits. Prerequisite: qualification in German. To be taught in German.

M W F 12:20, T Th 12:20-1:35. H. Deinert and staff.
The course focuses on the transition from language learning to the study of literature. Texts will be taken from eighteenth- and nineteenth-century German literature.

211 Intensive Workshop in Germanic Studies for Freshmen I Fall. 6 credits. Intended for entering freshmen with extensive training in the German language (CEEB score of 680 or higher).

Conducted in German. Satisfies both language and distribution requirements. Can also be used to fulfill the Freshman Seminar requirement.
T Th 2:30-4:30. H. Deinert.

Not intended as a survey but rather as a rigorous seminar designed to familiarize the student with literary forms and the tools of critical analysis. The course will provide an intensive introduction to the study of German literature through the discussion of exemplary prose works, dramas, and poems from the eighteenth century to the present.

212 Intensive Workshop in Germanic Studies for Freshmen II Spring. 4 credits. Conducted in German. Can be used to satisfy the Freshman Seminar requirement.

T Th 2:30-4. H. Deinert.
Designed primarily as a sequel to 211. Emphasis on modern German literature since 1900 (Thomas Mann, Hesse, Kafka, Grass, Handke, Brecht, Dürrenmatt, Weiss, Rilke, Trakl, Benn, Celan). Supplementary reading from philosophy, psychology, sociology, and political theory.

The 300-level courses listed below will be offered in a three year cycle.

[359 Nineteenth-Century Drama Not offered 1978-79.]

[360 The German Novelle Not offered 1978-79.]

[361 Modern German Literature I: Twentieth-Century Drama Not offered 1978-79.]

[362 Modern German Literature II: Twentieth-Century Prose Not offered 1978-79.]

363 Modern German Literature III: Contemporary Literature Fall. 4 credits.

Prerequisite: 201, 202, or permission of instructor.
T Th 12:20-1:35. P. W. Nutting.
The course will concentrate on the period after 1945 and treat the major authors in both East and West Germany, in Austria, and in Switzerland. The course will be conducted in German.

[365 Lyrical Poetry Not offered 1978-79.]

[354 Schiller Not offered 1978-79.]

[355 The Age of Goethe Not offered 1978-79.]

356 Major Works of Goethe Fall. 4 credits.

Prerequisite: German 201, 202, or permission of instructor.
W 2:30-4:30. H. Deinert.
Faust Part I and the final act of Part II; *Torquato Tasso*; selections from *Werther*, *Wilhelm Meister*, *Wahlverwandtschaften*; *Novelle*; a representative selection of lyrical poetry. The course will be conducted in German.

357 Romantic Literature Spring. 4 credits.

Prerequisite: German 201, 202, or permission of instructor.
T Th 12:20-1:35. Staff.
The course will treat a representative selection of drama, prose, and lyrical poetry from Kleist to Heine. The course will be conducted in German.

Courses in English Translation

[313 Thomas Mann Not offered 1978-79.]

[314 Nietzsche, the Man and the Artist Not offered 1978-79.]

[350 Yiddish Literature in English Translation Not offered 1978-79.]

[413 Topics in German Literature I: The Modern German Novel in English Translation Not offered 1978-79.]

[414 The Modern Scandinavian Novel Not offered 1978-79.]

[416 Don Juan and Faust Not offered 1978-79.]

[424 Old Icelandic Sagas in English Translation Not offered 1978-79.]

451-452 Independent Study 451, fall; 452, spring. Variable credit: 1 to 4 hours each term.

To be arranged. Staff
Extensive reading of texts in addition to regular course work, under the direction of a member of the department.

Advanced Courses

405-406 Introduction to Medieval German Literature 405, fall; 406, spring. 4 credits each term. Intended for students with no previous knowledge of Middle High German.

M W F 10:10. A. Groos.
The course will provide a survey of the court epic, the heroic epic, and Minnesang.

[417-418 The Great Moments of German Literature Not offered 1978-79.]

[421 Germanic Mythology Not offered 1978-79.]

427 Baroque Literature Fall. 4 credits.
T 1:25. P. Hohendahl.
A survey.

438 Twentieth-Century German Literature Spring. 4 credits.

T 1:25. Staff.
A survey of the first half of the century.

Seminars

For complete descriptions of courses numbered 600 or above consult the appropriate instructor.

611 Seminar in Old Icelandic Literature I Fall. 4 credits. Prerequisite: Ger 610 or permission of instructor.

W 12:20. A. J. Berger.
Topic to be announced.

612 Seminar in Old Icelandic Literature II Spring. 4 credits. Prerequisite: Ger 610 or permission of instructor.

W 12:20. A. J. Berger.
Topic to be announced.

623 Seminar in Middle High German Literature I Fall. 4 credits. Prerequisite: Ger 405-406 or permission of instructor.

To be arranged. A. Groos.
Topic to be announced.

[624 Seminar in Medieval German Literature II Spring. 4 credits.

To be arranged. A. Groos.

[625 The Northern Renaissance and Reformation Not offered 1978-79.]

[629 German Literature, 1700 to 1770 Not offered 1978-79.]

[631 From Wilhelm Meister to Buddenbrooks Not offered 1978-79.]

[632 Goethe's Poetry Not offered 1978-79.]

633 Hölderlin Fall. 4 credits.

T Th 3:35. J. P. Stern.
An intensive four-week session devoted mainly to Hölderlin's lyrical poetry.

634 Major Poets of the Romantic Era Fall. 4 credits.

To be arranged. I. Ezerzgalis.
Intended as a continuation of 633. The course will concentrate on representative selections of Romantic poetry from Novalis to Heine.

[635 The Backgrounds of German Realism Not offered 1978-79.]

[636 Nineteenth-Century Drama Not offered 1978-79.]

[637 Seminar in Realism: The Novel Not offered 1978-79.]

638 Twentieth-Century German Literature Spring. 4 credits.

To be arranged. S. L. Gilman.
Topic: Literature of the Holocaust. Intended as a tutorial for students who wish to read the German titles discussed in Comparative Literature 323 in the original.

[639 Contemporary Lyrical Poetry Not offered 1978-79.]

641 The Postwar German Novel Not offered 1978-79.]

[650 Graduate Seminar in Medieval Literature Not offered 1978-79.]

[682 Seminar on Richard Wagner (also Music 682)] Not offered 1978–79.]

699 Colloquium on the Teaching of Literature
Fall or spring. Variable credit: 1 to 4 credits a term. Open to teaching assistants in the Department of German Literature. Composed of all faculty members and assistants teaching undergraduate courses.
To be arranged. Staff.

753–754 Seminar in German Literature 753, fall; 754, spring. Variable credit: 1 to 4 credits each term. Permission of the instructor required.
To be arranged. Staff.

See also:

Introduction to Psychopathological Texts (Comparative Literature 311)

Literature of the Holocaust (Comparative Literature 323)

The Bildungsroman in Modern Literature (Comparative Literature 477)

Towards Thomas Mann (Comparative Literature 487)

Towards a Theory of the Humanities: Jürgen Habermas (Comparative Literature 496)

Hermeneutics (Comparative Literature 699)

Survey of German History 1648–1890 (History 357)

Survey of German History 1890–Present (History 358)

Seminar on German History (History 456)

Seminar in European Fascism (History 457)

Modern Greek

See listings under Classics.

Modern Hebrew

See listings under Near Eastern Studies.

Hindi-Urdu

J. W. Gair, G. B. Kelley

101–102 Hindi-Urdu Elementary Course 101, fall; 102, spring. 6 credits each term. Prerequisite for 102 is 101 or equivalent.
Hours to be arranged.

A semi-intensive course for beginners. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing.

201–202 Hindi Reading 201, fall; 202, spring. 3 credits each term. Prerequisites: for 201, qualification in Hindi; for 202, Hindi 201 or permission of instructor.
Hours to be arranged.

203–204 Composition and Conversation 203, fall; 204, spring. 3 credits each term. Prerequisites: for 203, qualification in Hindi; for 204, Hindi 203 or permission of instructor.
Hours to be arranged.

301–302 Readings in Hindi Literature 301, fall; 302, spring. 4 credits each term. Prerequisites: for 301, Hindi 202; for 302, Hindi 301 or equivalent.
Hours to be arranged.

303–304 Advanced Composition and Conversation 303, fall; 304, spring. 4 credits each term. Prerequisites: for 303, Hindi 204 or equivalent; for 304, 303 or equivalent.
Hours to be arranged.

305–306 Advanced Hindi Readings 305, fall; 306, spring. 4 credits each term. Prerequisites: for 305, Hindi 202 or equivalent; for 306, Hindi 305 or equivalent.
Hours to be arranged.

Intended for those who wish to do readings in history, government, economics, etc., instead of literature.

[401 History of Hindi Fall or spring. 4 credits. Prerequisite: Hindi 101–102 or equivalent, or Ling 102. Not offered 1978–79.]

For complete descriptions of courses numbered 600 and above, consult the appropriate instructor.

700 Seminar in Hindi Linguistics Fall or spring. 3 credits. Prerequisite: permission of instructor.
Hours to be arranged. J. W. Gair, G. B. Kelley.

Indonesian

J. U. Wolff

101–102 Elementary Course 101, fall; 102, spring. 6 credits each term. Prerequisite for 102 is Indo 101.

M–F 8, plus 2 more hours to be arranged. A semi-intensive course for beginners.

201–202 Indonesian Reading 201, fall; 202, spring. 3 credits each term. Prerequisites: for 201, qualification in Indonesian; for 202, Indo 201, or permission of instructor.
Hours to be arranged.

203–204 Composition and Conversation 203, fall; 204, spring. 3 credits each term. Prerequisites: for 203, qualification in Indonesian; for 204, Indo 203 or permission of instructor.
Hours to be arranged.

300 Linguistic Structure of Indonesian Fall or spring. 4 credits. Prerequisites: Indo 101–102 or the equivalent, and Ling 101.
Hours to be arranged.

301–302 Readings in Indonesian and Malay 301, fall; 302, spring. 4 credits each term. Prerequisites: for 301, Indo 201–202 or the equivalent; for 302, Indo 301.
Hours to be arranged.

303–304 Advanced Indonesian Conversation and Composition 303, fall; 304, spring. 4 credits each term. Prerequisites: for 303, Indo 204; for 304, Indo 303 or equivalent.
Hours to be arranged.

401–402 Advanced Readings in Indonesian and Malay Literature 401, fall; 402, spring. 4 credits each term. Prerequisites: for 401, Indo 302 or equivalent; for 402, Indo 401 or equivalent.
Hours to be arranged.

Intensive Course

161–162 Intensive Course 161, fall; 162, spring. 16 credits each term. Prerequisite: permission of instructor.

M–F, 6 hours per day. J. U. Wolff and staff.

See also:

Malayo-Polynesian Linguistics (Linguistics 655–656)

Italian

A. Grossvogel, G. Mazzotta, C. Rosén

Italian Major

Students who wish to major in Italian should choose a faculty member to serve as major adviser; the general plan and the details of the student's course of studies will be worked out in consultation. Italian majors are encouraged to take courses in related subjects such as history, art history, music, philosophy, anthropology, Classics, linguistics, and other modern languages and literatures. While, theoretically, a Cornell major occupies only the junior and senior years, as a matter of practical fact it is wise for the student to seek faculty advice on the major as early as possible.

Students who elect to major in Italian ordinarily should have completed Italian Literature 201–202 and Italian Language 203–204 by the end of their sophomore year. Exemptions can be made on the basis of an examination. Students majoring in Italian are expected to become conversant with a fair portion of the masterworks of Italian literature, to acquaint themselves with the outlines of Italian literary history, and to develop some skill in literary analysis. To this end students will be expected to complete successfully twenty-four credits of Italian literature courses at the 300 level or higher, with papers to be written in Italian or English. One or more courses offered by the Department of Comparative Literature may be counted toward the required twenty-four credits if students obtain the prior approval of their major adviser.

Students majoring in Italian also will be expected to acquire competence in the handling of the language. That competence may be demonstrated by passing an oral and written examination to be arranged with the adviser.

Italian majors may study in Italy, generally during their junior year, under any one of those study-abroad plans, organized by American universities, that allow the transfer of grades and credit, such as the Syracuse Semester in Italy in Florence.

Distribution Requirement

The distribution requirement in the humanities is satisfied in Italian by Italian 201–202.

Courses dealing with literature are staffed and administered by the Department of Romance Studies, and inquiries in regard to them ought to be addressed to that department, 278 Goldwin Smith Hall.

The courses dealing with language and linguistics are offered and administered by the Department of Modern Languages and Linguistics, 203 Morrill Hall.

Languages and Linguistics

121–122 Elementary Course 121, fall; 122, spring. 4 credits each term. Prerequisite for 122 is Italian 121 or equivalent.

Lec, T 10:10; drill, M W Th F, 8 or 12:20. C. Rosen and staff.

A course for beginners or for those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing. The four recitation hours are devoted to language practice in small groups and the lecture to grammar explanation, reading, cultural information, and testing in larger groups. This course satisfies the qualification portion of the language requirement in three semesters, although students who obtain a CEEB score of 560 after two semesters (121–122) are thereby qualified and may enter the 200-level sequence.

123 Continuing Italian Fall. 4 credits. Open only to students who have previously studied Italian and have a CEEB achievement score between 450 and 559.

Lec. Th 2:30; drill M T W F 2:30. C. Rosen and staff.

203–204 Composition and Conversation 203, fall; 204, spring. 3 credits each term. Prerequisites: for 203, qualification in Italian; for 204, Ital 203 or equivalent.

M W F 9:05.

These courses consist of guided conversation, composition, reading, pronunciation, and grammar review, with special attention to the development of accurate and idiomatic expression in the language. (Please note that students placed in the 200 level also have the option of taking courses in introductory literature; see separate listings under 200, 201, and 202 for descriptions of these courses, any of which may be taken concurrently with the 203–204 language courses described above. The introductory literature courses are offered by the respective literature departments and the 203–204 language courses by the Department of Modern Languages and Linguistics.)

300 Advanced Composition and Conversation Spring. 2 credits. Prerequisite: Ital 204.

Hours to be arranged. C. Rosen.

Cultural orientation; varieties of style. Material for conversation will be prepared by students according to their individual interests.

[402 History of Italian Language Fall. 4 credits. Offered in alternate years. Prerequisites:

qualification in Italian and Ling 101 or permission of instructor. Not offered 1978–79.]

403 Structure of Italian Fall. 4 credits. Offered in alternate years. Prerequisites: Ling 102 and qualification in any Romance language.

Hours to be arranged. C. Rosen.

Descriptive overview of Italian grammar. Introduction to topic-content analysis. Conducted in English.

[432 Italian Dialectology Spring. 4 credits. Offered in alternate years. Not offered 1978–79.]

For complete descriptions of courses numbered 700 and above, consult the graduate faculty representative.

[700 Seminar in Italian Linguistics Offered according to demand. 4 credits. Not offered in 1978–79.]

Literature

201 Introduction to Modern Italian Literature

Fall. 3 credits. Fulfills distribution requirements. Required of all majors in Italian. Graduate students may take the course on a S-U basis in fulfillment of area examination requirements.

M W F 10:10. Staff.

Classes will meet twice a week with the first class meeting devoted to literature from the seventeenth century to the present and the second meeting to the reading in Italian of contemporary texts. For those who lack reading ability in Italian, prerequisite is a knowledge of another Romance language and consent of the instructor. Part of the second meeting will focus on language instruction.

202 Introduction to Modern Italian Literature

Spring. 3 credits.
M W F 10:10. Staff.
The course will study medieval doctrines and will focus on some critical questions (politics, history, language, exile, etc.) that *The Divine Comedy* poses.

[322 Italian Civilization Spring. 4 credits. A. Grossvogel. Not offered 1978–79. Next offered fall 1979.]

[327–328 Dante: La Divina Commedia (also Italian 527–528) G. Mazzotta. Not offered 1978–79.]

[334 Dante in Translation (also Comparative Literature 344) G. Mazzotta. Not offered 1978–79.]

[335 Boccaccio G. Mazzotta. Not offered 1978–79.]

359–360 The Italian Renaissance 359, fall; 360, spring. 4 credits.

Hours to be arranged. W. Stephens.
An exploration of the basic problems and traditions of the Italian Renaissance. Taught in English.

[366 Seventeenth-Century Prose A. Grossvogel. Not offered 1978–79. Next offered spring 1980.]

370 Eighteenth-Century Thought Spring. 4 credits.

T Th 10:10–11:25. A. Grossvogel.
Vico's *Scienza Nuova* and its impact on nineteenth-century Italian writers will be the main topic of the course. Works of other thinkers of the eighteenth century will also be read, such as Beccaria's *Dei delitti e delle pene*, Genovesi's *Discorso sul vero fine delle lettere e delle scienze*, Muratori's *Della perfetta poesia*, and selections from Giannone's *Triregno* and from the Verri brothers' contributions to *Il Caffè*.

381 Verga, Svevo, and Pirandello Fall. 4 credits.

T Th 10:10–11:25. A. Grossvogel.
An examination of the narrative and dramatic productions of the authors and of their relationship as contemporaries.

387 Nineteenth-Century Poetry: Leopardi Spring. 4 credits.

T Th 12:20–1:35. A. Grossvogel.
Giacomo Leopardi, a modern poet between the classicists and the romantics. A close reading of the *Canti* against the background of his literary ideology as expressed in *Operette morali*, *Pensieri*, *Zibaldone*, *Epistolario*, and *Paralipomeni della Batracomiomachia*.

[390 Contemporary Narrative in Italy A. Grossvogel. Not offered 1978–79.]

[395 Twentieth-Century Prose A. Grossvogel. Not offered 1978–79. Next offered fall 1979.]

419–420 Special Topics in Italian Literature

419, fall; 420, spring. 2–4 credits each term. Prerequisite: permission of the instructor.
Staff.
Guided independent study of specific topics.

[437 Petrarch: Canzoniere G. Mazzotta. Not offered 1978–79. Next offered fall 1979.]

[472 Eighteenth-Century Theater A. Grossvogel. Not offered 1978–79.]

486 The Nineteenth-Century Novel Fall. 4 credits.

W 2:30–4:30. A. Grossvogel.
A study of the shift from the historical to the psychological novel in Italy between the first and the second romantic generation. Detailed reading and analysis of Manzoni's *I Promessi sposi* will be stressed. Other works to be considered will be Foscolo's *Ultime lettere di Jacopo Ortis*, Grossi's *Marco Visconti*, Tommaseo's *Fede e bellezza*, Ruffini's *Il dottor Antonio*, Rovani's *Cento anni*, and Nievo's *Confessioni di un italiano*.

[498 Contemporary Poetry A. Grossvogel. Not offered 1978–79. Next offered spring 1980.]

[499 Futurism in Italy and Europe (also Comparative Literature 499) A. Grossvogel. Not offered 1978–79.]

[527–528 Special Topics in The Divine Comedy G. Mazzotta. Not offered 1978–79.]

559–560 The Italian Renaissance 559, fall; 560, spring. 4 credits.

Hours to be arranged. W. Stephens.
An exploration of the basic problems and traditions of the Italian Renaissance. Taught in Italian.

[590 Contemporary Narrative in Italy (also Italian 390) A. Grossvogel. Not offered 1978–79.]

639–640 Special Topics in Italian Literature 639, fall; 640, spring. 4 credits each term. Staff.

Japanese

K. Brazell, B. deBary, M. Hamada, E. H. Jorden, R. Sukle

For a major involving Japanese studies, see Asian studies.

Languages and Linguistics

101–102 Elementary Course 101, fall; 102, spring. 6 credits each term. Prerequisite for 102 is Jap 101 or equivalent.

Lec. M W F 10:10; drill, M–F 9:05 or 12:20.

E. H. Jorden and staff.
A semi-intensive course for beginners or for those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing.

123–124 Accelerated Introductory Japanese 123, fall; 124, spring. 6 credits per term.

Prerequisites: for 123, permission of instructor; for 124, Jap 123 or equivalent.

Lec. M W F 10:10 (with Jap 101–102); drill, M W F 12:20. E. H. Jorden and staff.

Accelerated training in listening, speaking, reading, and writing for students who have already acquired a limited facility in Japanese through residence in Japan or brief formal study, but who require additional training to qualify for admission to second-year Japanese courses.

201–202 Intermediate Japanese I 201, fall; 202, spring. 4 credits each term. Prerequisites: for 201, Jap 102 or equivalent; for 202, Jap 201 or equivalent.

M–F 10:10. E. H. Jorden and staff.
Reading of elementary texts with emphasis on expository style.

203–204 Japanese Conversation 203, fall; 204, spring. 2 credits each term. Prerequisites: for 203, Jap 102 or equivalent; for 204, Jap 203 or equivalent.

M W F 1:25. E. H. Jorden and staff.
Training in listening and speaking for students who have already acquired a basic oral proficiency.

301–302 Intermediate Japanese II 301, fall; 302, spring. 4 credits each term. Prerequisites: for 301, Jap 202 or equivalent; for 302, Jap 301 or equivalent.

M W F 2:30. Staff.
Reading of selected modern texts with emphasis on expository style.

303–304 Communicative Competence—Intermediate 303, fall; 304, spring. 3 credits each term. Prerequisites: for 303, Jap 204 or equivalent; for 304, Jap 303 or equivalent.

Hours to be arranged. E. H. Jorden and staff.
Drill in the use of spoken Japanese within the constraints set by a sampling of Japanese social settings. May be repeated for credit.

401-402 Advanced Japanese 401, fall; 402, spring. 4 credits each term. Prerequisites: for 401, Jap 302 or equivalent; for 402, Jap 401 or equivalent.

Hours to be arranged. Staff.
Reading of selected modern texts with emphasis on expository style.

404 Linguistic Structure of Japanese Spring. 4 credits. Prerequisites: Jap 102 or permission of instructor, and Ling 101.

T 2:30-4:25. E. H. Jordan.

407-408 Oral Narration and Public Speaking 407, fall; 408, spring. 2 credits each term.

Prerequisite: Jap 304 or permission of instructor.

Hours to be arranged. E. H. Jordan and staff.
Instruction in storytelling, lecturing, and speechmaking, with emphasis on both the construction of the discourse and Japanese patterns of oral delivery.

421-422 Directed Readings 421, fall; 422, spring. Credit to be arranged. Prerequisite: permission of instructor. Topics will be selected on the basis of student needs.

Hours to be arranged. Staff.

FALCON

161-162 Intensive Japanese 161, fall; 162, spring. 16 credits each term. Prerequisite: permission of instructor.

Six hours a day, M-F. E. H. Jordan and staff.

Literature in Japanese

305-306 Introduction to Literary Japanese 305, fall; 306, spring. 4 credits each term.

Prerequisites: for 305, Jap 302 or FALCON 162 or equivalent; for 306, Jap 305 or equivalent.

T Th 1:25-2:15 plus one hour to be arranged.

B. deBarry.

405-406 Intermediate Literary Japanese 405, fall; 406, spring. 4 credits each term. Prerequisites: for 405, Jap 306 or 402 or equivalent; for 406, Jap 405 or equivalent.

T Th 1:25-2:15 plus one hour to be arranged.

K. Brazell.

421-422 Directed Readings 421, fall; 422, spring. Credit to be arranged. Prerequisite: for 421, Jap 402 or equivalent; for 422, Jap 421 or equivalent.

Hours to be arranged. Staff.

Topics will be selected on the basis of student needs.

For complete descriptions of courses numbered 600 or above consult the appropriate instructor.

611 Seminar in Modern Literature Fall. 2 to 4 credits. Prerequisite: permission of instructor.

Hours to be arranged. B. deBarry.

612 Seminar in Classical Literature Spring. 2 to 4 credits. Prerequisite: permission of instructor.

Time to be arranged. K. Brazell.

621-622 Advanced Directed Readings 621, fall; 622, spring. Credit to be arranged. Prerequisite: permission of the instructor.

Hours to be arranged. Staff.

See courses listed under Department of Asian Studies for Japanese literature courses in translation.

Javanese

J. U. Wolff

131-132 Elementary Course 131, fall; 132, spring. 3 credits each term. Prerequisites: for 131, qualification in Indonesian; for 132, Javanese 131 or equivalent.

Hours to be arranged.

An elementary language course for those who have had no previous experience in the language.

133-134 Intermediate Course 133, fall; 134, spring. 3 credits each term. Prerequisites: for 133, Javanese 132 or equivalent; for 134, Javanese 133 or equivalent.

Hours to be arranged.

Old Javanese (see Linguistics 651-652)

Linguistics

L. H. Babby, N. C. Bodman, J. S. Bowers, E. W. Browne, J. W. Gair, J. E. Grimes, W. Harbert, J. Herschensohn, C. F. Hockett, F. E. Huffman, J. Jasanoff, R. B. Jones, Jr., E. H. Jordan, G. B. Kelley, L. D. King, W. H. Klemme, H. L. Kufner, R. L. Leed, S. McConnell-Ginet, J. McCoy, G. M. Messing, J. S. Noblitt, C. Rosen, D. F. Solá, M. Suñer, F. C. van Coetsem, L. R. Waugh, J. U. Wolff

Linguistics Major

The major in linguistics has three prerequisites: (1) Linguistics 101-102; (2) qualification in two languages, one from the familiar European group (Latin, Greek, French, Italian, Portuguese, Spanish, German, Russian) and one from the other languages offered at Cornell, with six credits beyond qualification in one or the other of these two; (3) a two-semester sequence in a related discipline (e.g. the literature of the language in which six credits beyond qualification was offered as a prerequisite, anthropology, computer science, mathematics, philosophy, psychology, or sociology.)

Completion of the major requires: (1) Linguistics 303, 304, 311; (2) a course in historical linguistics, either a course in historical method such as Linguistics 404 or the history of a specific language or family; (3) a minimum of eight additional credits in linguistics chosen in consultation with the adviser. Prospective majors should see J. W. Gair.

(For other relevant courses see anthropology, psychology, human development and family studies, computer science, and philosophy.)

The Honors Program

Applications for honors should be made during the junior year. Candidates for admission must have a 3.0 average overall and should have a 3.2 average in linguistics courses.

In addition to the regular requirements of the major, the candidate for honors will complete an honors thesis and take a final oral examination in defense of it. The thesis is usually written during the senior year, but may be begun in the second term of the junior year when the student's program so warrants. The oral examination will be conducted by the honors committee consisting of the thesis adviser and at least one other faculty member in linguistics. Members of other departments may serve as additional members if the topic makes this advisable. Linguistics 493 and/or 494 may be taken in conjunction with thesis research and writing, but are not required.

Distribution Requirement

Linguistics 101-102, or the combination Linguistics 111-112 or 101 and any other course for which Linguistics 101 is a prerequisite, satisfies the distribution requirement in the social sciences.

Related Courses

A number of other departments offer courses that are relevant for linguists. The following list is suggestive, not exhaustive: Anthropology 108, 109, 201, 202, 426; Psychology 124, 215, 309, 416, 425; Human

Development and Family Studies 333, 431, 631, 633; Philosophy 332, 382, 437, 633; Computer Science 100, 102, 211, 314, 410, 600.

101-102 The Theory and Practice of Linguistics 101, fall; 102, spring. 4 credits each term.

M W F 9:05. H. L. Kufner.

An introductory course designed primarily for those who intend to major in a language or in general linguistics. (See Ling 111-112 for a course designed for nonmajors.)

111-112 Themes in Linguistics 111, fall; 112, spring. 4 credits each term. Ling 111 (or, with permission of instructor, 101) is prerequisite to 112. Intended primarily for nonmajors; no prerequisite. (See Ling 101-102 for a course designed for majors in language or linguistics.)

M W F 10:10. S. McConnell-Ginet.

The study of language with emphasis on the biological, psychological, social, and cultural context. Basic linguistic concepts are introduced and the relation of linguistics to other disciplines is explored. Topics include communicative systems in other species, biological base of human language capacity, language and thought, language as a cultural artifact, regional dialects, black English, social mobility and language use, linguistic change, functions of language, language development in the child, second-language learning, and other aspects of language.

201-202 Phonetics 201, fall; 202, spring. 3 credits each term. 201 prerequisite for 202.

T Th 12:20-1:35. Fall: articulatory phonetics.

C. F. Hockett. Spring: acoustic phonetics.

J. E. Grimes.

Practical, experimental, and theoretical aspects of phonetics.

244 Sex Roles and Linguistic Behavior (also Women's Studies 244) Spring. 4 credits.

Prerequisite: Ling 101, Psych 215, or permission of instructor.

M W F 1:25. S. McConnell-Ginet.

A study of sexual differentiation in language and its significance for sex stereotyping, sexual stratification, socialization, and personal interactions. Different approaches to the study of language in the social context are introduced, drawing on work in linguistics, anthropology, psychology, sociology, and philosophy. Conversational styles, politeness, linguistic change, intonation, taboos, and address are among the topics considered.

302 Multilingual Societies and Cultural Policy Spring. 4 credits.

T Th 2:30-4. D. F. Solá.

An interdisciplinary course on the linguistic, cultural, and political components of cultural policy in multilingual societies with attention to theory and method in bilingual-bicultural education.

303 Phonology Fall. 4 credits. Prerequisite: Ling 101.

T Th 2:30-3:45. L. R. Waugh.

A general survey of neo-Bloomfieldian and Jakobsonian phonology.

304 Morphology Spring. 4 credits. Prerequisite: Ling 303 or permission of instructor.

T Th 2:30-3:45. L. R. Waugh.

A general survey of generative phonology and neo-Bloomfieldian, Jakobsonian, and generative morphology.

306 Functional Syntax Fall. 4 credits.

Prerequisite: Ling 102 or permission of instructor.

M W F 10:10. D. F. Solá.

A general survey of function oriented syntactic theory and method.

[308 Dialectology Spring. 4 credits. Offered in alternate years. Not offered 1978-79.]

311-312 The Structure of English 311, fall; 312, spring. 4 credits each term. Prerequisites: for 311, Ling 102 or permission of instructor; for 312, 311 or permission of instructor.

M W F 11:15. S. McConnell-Ginet.

The first term is an overview of the structure of English, concentrating on the facts of the language as dealt with in various descriptions and treatments, drawing upon whatever theoretical approaches are relevant. The second term deals with special problems of English structure and semantics in a more detailed and advanced fashion.

318 Style and Language Spring. 4 credits.

Prerequisite: Ling 101 or permission of instructor.

T Th 8:30-9:45. G. M. Messing.

Through lectures and informal discussion this course will cover some of the many areas where linguistics impinges on style, such as sound symbolism, stylistic statistics, metrics, grammaticality and deviation, speech registers, ambiguity, context parameters.

325 Teaching English as a Second Language

Spring. 4 credits. Prerequisites: Ling 102 (may be taken concurrently); 311 or equivalent as determined by instructor.

T Th 2:30-4. Staff.

The course deals with problems associated with the teaching of English to non-native speakers. Emphasis may be varied to suit the needs of students from year to year.

341 India as a Linguistic Area Fall. 4 credits.

Offered in alternate years. Prerequisite: Ling 102 or consent of instructor.

T Th 2:30-3:45. J. W. Gair.

A general introduction to the linguistic situation in South Asia, emphasizing some of the particularly interesting linguistic and sociolinguistic problems that it poses. Topics covered include languages and language families of the region; language varieties and their social and other correlates; language loyalty and problem of language policy, official language, and standardization; cross-language influence and convergence and the linguistic area concept.

401 Language Typology Spring. 4 credits.

Prerequisite: Ling 304.

T Th 2:30-3:45. C. F. Hockett.

An examination in depth of several languages of different structures.

[402 Contrastive Analysis Spring. 4 credits.

Prerequisite: permission of instructor. H. L. Kufner. Not offered 1978-79.]

403 Applied Linguistics and Second Language Acquisition Spring. 4 credits. Prerequisite:

structure of a language at 400 level.

T Th 2:30-3:45. J. S. Noblitt.

Examination of the theoretical bases of applied linguistics including current language-teaching methodologies.

404 Comparative Methodology Fall. 4 credits.

Prerequisite: Ling 303.

T Th 2:30-3:45. R. B. Jones.

Readings, problems, and discussion of the reconstruction of protolanguages, including questions of subgrouping and evaluation of results.

405-406 Sociolinguistics 405, fall; 406, spring. 4 credits each term. Prerequisites: 101-2 or 111-2 or consent of instructor. Ling 405 is not prerequisite to 406.

Hours to be arranged. J. U. Wolff.

Fall: The cultural patterning of speech behavior; speech acts in social context; the ethnography of communication; verbal art; language and politics; sociolinguistics and grammatical theory. Spring: Speech variation and its social meanings; social patterning of speech behavior; language change and its motivation; pidgins and creoles and processes affecting them.

410 Historical Linguistics: Methods and Approaches Spring. 4 credits. Prerequisite: Ling 102 or permission of instructor.

Hours to be arranged. W. Harbert.

General introduction to historical linguistics including methods and approaches, issues, and applications.

411-412 Transformational Grammar: Syntax and Semantics 411, fall; 412, spring. 4 credits

each term. Prerequisite: Ling 102; first term is prerequisite to the second.

T Th 10:10-11:25. J. Bowers.

Fall: Introduction to the theory of syntax within a generative-transformational framework. Spring: advanced course on syntax and the relation of syntax to semantics.

[413-414 Generative Phonology 413, fall; 414, spring. 4 credits each term. Given in alternate years.

Prerequisites: for 413, Ling 102; for 414, Ling 413. J. S. Bowers. Not offered 1978-79.]

[415-416 Social Functions of Language 415,

fall; 416, spring. 4 credits each term. Prerequisites: Ling 101 or 111, or consent of instructor.

G. B. Kelley. Not offered 1978-79.]

417 History of the English Language Fall.

4 credits. Prerequisite: consent of the instructor.

Hours to be arranged. G. B. Kelley.

A survey of Old and Middle English dialects; development of modern English; external history; the English language in America.

[440 Dravidian Structures Fall or spring

according to demand. 4 credits. Prerequisite: Ling 102. G. B. Kelley. Not offered 1978-79.]

[442 Indo-Aryan Structures Fall or spring

according to demand. 4 credits. Prerequisite: Ling 102. J. W. Gair. Not offered 1978-79.]

493 Honors Thesis Research Fall. 4 credits.

Staff.

May be taken before or after Ling 494 or may be taken independently.

494 Honors Thesis Research Spring. 4 credits.

Staff.

May be taken as a continuation of or before Ling 493.

For complete information on courses numbered 600 or above, consult the appropriate instructor.

600 Field Methods Fall or spring; 4 credits.

Prerequisites: Ling 101 or 201.

Hours to be arranged. F. E. Huffman.

601-602 Proseminar: Introduction to Graduate Study 601, fall; 602, spring. 4 credits each term.

M W F 11:15. J. W. Gair.

A survey of the major subareas of linguistics. Emphasis is on basic concepts, current issues and their background, and methodology, with discussions and data-oriented problems based on extensive readings. Required of entering graduate students majoring in general linguistics. Open to those minoring in linguistics or majoring or minoring in the linguistics of specific languages by consent of the instructor.

603 History of Linguistics Fall. 4 credits.

T Th 12:20-1:35. G. M. Messing.

Study of the history of linguistics from early Greek and Sanskrit grammarians to the modern period.

[605-606 Linguistic Data Processing 605, fall;

606, spring. 2 credits each term. Prerequisites: for 605, Ling 102 and permission of instructor; for 606, Ling 605. J. E. Grimes. Not offered 1978-79.]

607 Schools of Linguistics Spring. 4 credits.

Prerequisites: Ling 102 and permission of instructor.

W 2:30-4:30. J. E. Grimes.

Investigation of the major current points of view.

608 Discourse Analysis Spring. 4 credits.

Prerequisite: permission of instructor.

W 2:30-4:30. J. E. Grimes.

Linguistic theory applied to relationships beyond the sentence.

610 Topics in Transformational Grammar Fall

or spring. 3 credits. Prerequisite: permission of instructor.

Hours to be arranged. J. S. Bowers.

621-622 Hittite 621, fall; 622, spring. 4 credits

each term. Prerequisite: for 621, consent of instructor, for 622, Ling 621.

Hours to be arranged. J. Jasanoff.

Reading and analysis of Hittite texts with historical perspective.

631-632 Comparative Indo-European

Linguistics 631, fall; 632, spring. 4 credits each term. Prerequisites: for 631, permission of instructor;

for 632, 631 or permission of instructor.

M W F 2:30. J. Jasanoff.

640 Elementary Pali Either term according to

demand. 3 credits.

Hours to be arranged. J. W. Gair.

[641-642 Elementary Sanskrit 641, fall; 642,

spring. 3 credits each term. First term is prerequisite to the second. Not offered 1978-79.]

644 Comparative Indo-Aryan Spring. 4 credits.

Prerequisites: Ling 102 and a basic course in Indo-Aryan language, or permission of instructor.

Hours to be arranged. J. W. Gair.

[646 Comparative Dravidian Spring. 4 credits.

Prerequisites: Ling 102 and a basic course in a Dravidian language, or permission of instructor.

G. B. Kelley. Not offered 1978-79.]

651-652 Old Javanese Fall or spring according

to demand. 4 credits each term.

Hours to be arranged. J. U. Wolff.

653-654 Seminar in Southeast Asian

Linguistics 653, fall; 654, spring. 4 credits.

Prerequisites: Ling 303 or permission of instructor. 653 not a prerequisite for 654.

Hours to be arranged. R. B. Jones, Jr.

655-656 Malayo-Polynesian Linguistics 655,

fall; 656, spring. 4 credits each term. Prerequisites:

Ling 102 and permission of instructor; first term is prerequisite to the second.

Hours to be arranged. J. U. Wolff.

657-658 Seminar in Austro-Asiatic Linguistics

657, fall; 658, spring. 4 credits each term.

Prerequisites: Ling 102 and permission of instructor.

Hours to be arranged. F. E. Huffman.

662 Sino-Tibetan Linguistics Spring term on

student demand. 4 credits. Prerequisites: Ling 102 or Chin 401-402, and permission of instructor.

Hours to be arranged. N. C. Bodman.

[671-672 Comparative Slavic Linguistics 671,

fall; 672, spring. 4 credits each term. Offered in

alternate years. Prerequisite: permission of instructor. First term is a prerequisite of the second.

E. W. Browne. Not offered 1978-79.]

700 Seminar Fall or spring. Credit to be

arranged. Prerequisite: permission of instructor.

Hours to be arranged. Staff.

701-702 Directed Research

751 Thai Dialectology Fall, 4 credits.
Prerequisites: Ling 303 and permission of instructor.
Hours to be arranged. R. B. Jones.

752 Comparative Thai Spring, 4 credits.
Prerequisites: Ling 404 or equivalent and permission of instructor.
Hours to be arranged. R. B. Jones, Jr.

753 Tibeto-Burman Linguistics Fall, 4 credits.
Prerequisites: Ling 404 or equivalent and permission of instructor.
Hours to be arranged. R. B. Jones.

Pali

See **Linguistics 640**.

Polish

131-132 Elementary Course 131, fall; 132, spring, 3 credits each term. First term or equivalent is a prerequisite to the second.
Staff.

[133-134 Elementary Course II 133, fall; 134, spring, 3 credits each term. First term or equivalent is a prerequisite to the second. Not offered 1978-79.]

Portuguese

L. D. King

121-122 Elementary Course 121, fall; 122, spring, 4 credits each term.
Lec, F 12:20; rec, M-Th 12:20. L. D. King and staff.

A course for beginners or those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing. Qualification upon completion of 122 by special examination.

203-204 Intermediate Composition and Conversation 203, fall; 204, spring, 3 credits each term. Prerequisites: for 203, qualification in Portuguese; for 204, Port 203 or permission of instructor.
M W F 10:10. Staff.

Conversational grammar review with special attention to pronunciation and the development of accurate and idiomatic oral expression. Includes readings in contemporary Portuguese and Brazilian prose and writing practice.

[303-304 Advanced Composition and Conversation 303, fall; 304, spring, 4 credits each term. Prerequisites: for 303, Port 204 or equivalent; for 304, Port 303 or equivalent. Not offered 1978-79.]

305-306 Readings in Luso-Brazilian Culture 305, fall; 306, spring, 4 credits each term.
Prerequisites: Port 204 or equivalent or consent of instructor. Offered in 1978-79 and alternate years.
M W F 12:20. Staff.
Topic for fall: O Brasil e Portugal do século XIX.
Topic for spring: O século XX.

700 Seminar in Portuguese Linguistics Fall or spring according to demand. Variable credit.
L. D. King.

Quechua

D. F. Solá

131-132 Elementary Course 131, fall; 132, spring, 3 credits each term. Prerequisite: qualification in Spanish.
M W 11:15, plus required lab hours.
A beginning conversation course in the Cuzco dialect of Quechua.

133-134 Intermediate Course 133, fall; 134, spring, 3 credits each term. Prerequisites: for 133, Quechua 131-132 or equivalent; for 134, Quechua 133 or equivalent.

Hours to be arranged.
An intermediate conversation and reading course.
Study of the Huarochiri manuscript.

700 Seminar in Quechua Linguistics Fall or spring. Credit to be arranged. Prerequisite: permission of instructor.
Hours to be arranged.

Romance Studies

Languages and Linguistics

321-322 History of the Romance Languages 321, fall; 322, spring, 4 credits each term. Offered in alternate years. First term is prerequisite to the second.
Hours to be arranged. J. Herschensohn.

[323-324 Comparative Romance Linguistics 323, fall; 324, spring, 4 credits each term. Offered in alternate years. First term is prerequisite to the second. C. Rosen. Not offered 1978-79.]

620 Areal Topics in Romance Linguistics Fall or spring, 4 credits. May be repeated for credit.
Hours to be arranged. J. S. Noblitt.
Topic for spring 1979: Old Provençal.

621 Problems and Methods in Romance Linguistics Spring, 4 credits.
Hours to be arranged. C. Rosen.
Topic for 1978-79: Synchronic Syntax. Outstanding features of the modern Romance languages in the light of current theories of grammar.

[622 Romance Dialectology Spring, 4 credits. Offered every third year. Not offered 1978-79.]

Literature

359 Being, God, and Mind: The Key Concepts of European Thought from Plato to Vico (also Comparative Literature 359) Fall, 4 credits.
M W F 12:20. C. Morón-Arroyo.

A study of the origins of scientific language: body/soul, matter/form, act/potentiality, being. A study of the ideological background of Western literatures: the conception of human personality and the presentation of character, the conception of reality and the sense of literary structures. A study of the fusion of Greek thought and the Bible and its reflection on the development of the ideas of freedom and equality in Western thought.

628 Political Anthropology: Les Sciences de l'Homme (also Comparative Literature 628 and Anthropology 628) Spring, 4 credits.
W 2:30-4:25; additional hour to be arranged.
R. Klein, J. Siegel.

The Heideggerian critique of science and of humanism, with the correlative analysis of technology and its institutions will serve as the basis for considering the conceptual status of the social sciences—what the French call *les sciences de l'homme*. The course will also consider the influence of the Heideggerian problematic on more recent philosophical and theoretical writing.

Romanian

131-132 Elementary Course 131, fall; 132, spring. Offered according to demand, 3 credits. First term or equivalent is prerequisite to the second.
Hours to be arranged. S. Huffman.
An elementary language course for those who have had no previous experience in the language.

133-134 Elementary Course II 133, fall; 134, spring. Offered according to demand, 3 credits. First term or equivalent is prerequisite to the second.
Hours to be arranged. S. Huffman.

Russian

L. H. Babby, E. W. Browne, P. J. Carden, G. Gibian, R. L. Leed, A. Nahkimovsky, V. Ripp, M. Senderovich, S. Senderovich

Russian Major

Russian majors study Russian language, literature, and linguistics with emphasis placed in accordance with their specific interests. It is desirable, although not necessary, for prospective majors to complete Russian 101-102, 201-202, 203-204 as freshmen and sophomores since these courses are prerequisites to most of the junior and senior courses that count toward the major. Students may be admitted to the major upon satisfactory completion of Russian 102 or the equivalent. Students who elect to major in Russian should consult with both P. J. Carden and R. L. Leed as soon as possible. For a major in Russian, students will be required to complete: (1) Russian 301-302 or 303-304 or the equivalent; (2) eighteen credits from 300- and 400-level literature and linguistics courses of which twelve credits must be in literature in the original.

The Honors Program

Students taking honors in Russian undertake individual reading and research, write an honors essay, and take a comprehensive examination at the end of the senior year.

Major in Russian and Soviet Studies

Interested students see Special Programs and Interdisciplinary Studies after departmental listings.

Distribution Requirement

The distribution requirement in the humanities is satisfied in Russian by any two Russian literature courses at the 200 level and above.

Languages and Linguistics

101-102 Elementary Courses 101, fall; 102, spring, 6 credits each term. Prerequisite for 102 in Russian 101 or equivalent.

Lec, M W 2:30 or T Th 11:15; drill, M-F 8, 9:05, 10:10, 12:20, or 1:25.

A semi-intensive course for beginners or for those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing. The five recitation hours are devoted to language practice in small groups and the two lectures to grammar explanation, reading, cultural information, and testing in larger groups. This course is recommended for those who wish to obtain qualification within two semesters or who wish to enter the 200-level sequence the following fall semester.

123 Continuing Russian Fall, 4 credits. Open only to students who have previously studied Russian and have a CEEB achievement score between 450 and 559.
T W Th F 3:35. Staff.

A pre-qualification course designed to prepare students for study at the 200 level. Passing this course is equivalent to qualification.

203-204 Composition and Conversation 203, fall; 204, spring, 3 credits each term. Prerequisite: qualification in Russian. First term or equivalent is prerequisite to the second.

Lec, Th 1:25; drill, M W F 11:15, 1:25, or 3:35.
A. Nahkimovsky and staff.

These courses consist of guided conversation, composition, reading, pronunciation, and grammar review, with special attention to the development of accurate and idiomatic expression in the language. (Please note that students placed in the 200 level also have the option of taking courses in introductory literature; see separate listings under 200, 201, and 202 for descriptions of these courses, any of which may be taken concurrently with the 203–204 language courses described above. The introductory literature courses are offered by the respective literature departments and the 203–204 language courses by the Department of Modern Languages and Linguistics.)

301–302 Advanced Russian Morphology and Syntax 301, fall; 302, spring. 4 credits each term. Prerequisite: Rus 204 or equivalent; first term is prerequisite to the second.

Hours to be arranged. L. H. Babby.
This course is intended to increase the student's active command of Russian syntactic constructions.

303–304 Advanced Composition and Conversation 303, fall; 304, spring. 4 credits each term. Prerequisites: for 303, Rus 204 or equivalent; for 304, Rus 303 or equivalent.

M W F 12:20. A. Nakhimovsky.

305–306 Directed Individual Study 205, fall; 306, spring. 2 credits. Prerequisite: Russian 303–304 or equivalent; first term is prerequisite to the second.

Hours to be arranged. Staff.
This is a practical language course on an advanced level and is designed to improve oral control of colloquial Russian.

401–402 History of the Russian Language 401, fall; 402, spring. 4 credits each term. Offered in alternate years. Prerequisite for 401 is qualification in Russian. First term or equivalent is prerequisite to the second.

Hours to be arranged. L. H. Babby.

403–404 Linguistic Structure of Russian 403, fall; 404, spring. 4 credits each term. Offered in alternate years. Prerequisite: qualification in Russian; Ling 101–102 recommended; first term or equivalent is prerequisite to the second.

T Th 3:30–5. L. H. Babby.
A synchronic study and analysis of Russian linguistic structure. The fall semester will deal primarily with phonology and morphology and the spring semester with syntax.

[601 Old Church Slavic Fall. 4 credits. This course is a prerequisite to 602. Not offered 1978–79.]

[602 Old Russian Spring. 4 credits. Prerequisite: 601. Not offered 1978–79.]

[Comparative Slavic Linguistics (Linguistics 671–672) Not offered 1978–79.]

700 Seminar in Slavic Linguistics According to demand. Variable credit.
Staff.

Literature

107 Freshman Seminar: Two Years in Russia—1846 and 1929 Spring. 3 credits.

T Th 2:30–3:45. G. Gibian.
Interdisciplinary study of two brief periods of Russian history and literature. Music, painting, and other arts will also be considered. By concentrating on the years 1846 and 1929 and on the ways in which these years reflect characteristic features of Russian culture, the course gives the student a more concrete understanding than is possible in a survey. Students will inquire into moments in the lives and careers of such diverse men as, in 1929,

Mayakovsky, Pasternak, Trotsky, Stalin, Nabokov, Prokofiev, Shostakovich; and, in 1846, Tolstoy, Dostoevsky, Turgenev, and others.

201–202 Readings in Russian Literature 201, fall; 202, spring. 3 credits each term. Prerequisite: qualification in Russian. Open to freshmen.

M W F 10:10. M. Senderovich.
Completion of this series is the prerequisite for all 300- and 400-level literature courses where the reading is done in Russian. Close reading of selected texts with attention to their stylistic features and their significance in Russian literary history.

207 Themes from Russian Culture, 1800–1860 Fall. 4 credits.

Lec. M 9:05, P. Carden; Sec 1, W 9:05 plus one hour to be arranged, P. Carden; Sec 2, W F 9:05, staff; Sec 3, W F 9:05, staff; Sec 4, W F 12:20, staff. (Sections 2–4 are restricted to freshmen.)

Discussion of a number of fundamental themes from Russian culture as they are reflected in the work of major Russian writers. Readings from Pushkin, Lermontov, Gogol, Turgenev, early Dostoevsky, and Tolstoy in translation. May be taken as a Freshman Seminar.

208 Themes from Russian Culture, 1860–Present Spring. 4 credits.

Lec. M 9:05, P. Carden; Sec 1, W 9:05 plus one hour to be arranged, P. Carden; Sec 2, W F 9:05, staff; Sec 3, W F 9:05, staff; Sec 4, W F 12:20, staff. (Sections 2–4 are restricted to freshmen.)

The development of Russian culture into the twentieth century. Readings from Tolstoy, Dostoevsky, Chekhov, Babel, and others. May be taken as a Freshman Seminar.

[210 Images of Women in Russian Literature Fall. 3 credits. Not offered 1978–79.]

[312 Background of Russian Culture Spring. 4 credits. Not offered 1978–79.]

314 Intellectual Background of Russian Literature, 1750–1860 Spring. 4 credits.

T Th 11:15 plus one hour to be arranged. V. Ripp.
A survey of the key figures influencing the development of the literary tradition, including an attempt to define the nature of the connection between literary and nonliterary writing, from Romanticism to the Revolutionary period.

331 Russian Poetry Fall. 4 credits. Prerequisite: Rus 202 or the equivalent and permission of instructor.

M W F 2:30. S. Senderovich.
A survey of Russian poetry with primary emphasis on analysis of individual poems by major poets. This course counts toward the fulfillment of twelve credits of literature in the original.

[332 Russian Theatre and Drama Fall. 4 credits. Conducted in English. Not offered 1978–79.]

335 Gogol Fall. 4 credits. Prerequisites: Rus 202 or the equivalent and permission of instructor.

M W 1:25 plus one hour to be arranged.
M. Senderovich.
Selected works of Gogol read closely and viewed in relation to his life and to the literature of his time. Readings are in Russian. This course counts toward the fulfillment of twelve credits of literature in the original.

[336 Society and Literature Fall. 4 credits. Not offered 1978–79.]

350 Tolstoy and the Disciplines (also College Scholar 350) Spring. 4 credits.

M 2:30–4:25 plus one hour to be arranged.
P. Carden, A. Stulglova.
The seminar will discuss the nature of the individual disciplines and the proper modes of their critical

examination using Tolstoy's inquiries ("What is history?", "What is art?", etc.) as a point of departure. Using Tolstoy's artistic works, diaries, and letters, we will discuss "career" as the integration of knowledge into the individual's process of self-formation. In translation, with a special section for readers of Russian which can count toward the fulfillment of twelve credits of literature in the original. Course includes a section on research techniques: one hour a week training in use of library and research techniques geared to the materials of the seminar.

[367 The Russian Novel in Translation Fall. 4 credits. Not offered 1978–79.]

368 Soviet Literature in Translation Fall. 4 credits.

T Th 2:30 plus one hour to be arranged. G. Gibian.
Selected works of Russian literature, 1917 to date, examined primarily as works of art, with some attention to their social, political, and historical importance. Mayakovsky, Babel, Pasternak, Solzhenitsyn, and others.

369 Dostoevsky Fall. 4 credits.

T Th 1:25 plus one hour to be arranged. V. Ripp.
Readings of Dostoevsky's major works from *Poor Folk* to *The Brothers Karamazov*. Consideration of such problems as Dostoevsky's conception of good and evil, structure of his novels, and his importance for modern European literature. Readings in translation.

[370 Revolution and the Individual in Russian Literature—Nineteenth and Twentieth Centuries Fall. 4 credits. Not offered 1978–79.]

373 Chekhov and the Short Story Spring. 4 credits.

M W F 1:25. M. Senderovich.
Chekhov's stories: their formal and thematic properties and their importance for the subsequent definition of the form, with some attention to the theory of the short story. Stories by various other Russian and Western writers will also be read. In translation, with a special section for readers of Russian which can count toward the fulfillment of twelve credits of literature in the original.

[374 Liberal Imagination in Imperial Russia: Turgenev Spring. 4 credits. Not offered 1978–79.]

[380 Solzhenitsyn and Siniavsky Fall. Variable credit. Not offered 1978–79.]

[382 Nabokov Spring. 4 credits. Not offered 1978–79.]

393 Honors Essay Tutorial Fall or spring. 4 credits.

431 Russian Prose Fiction Spring. 4 credits. Prerequisites: Rus 202 or the equivalent and permission of instructor.

T Th 1:25 plus one hour to be arranged. V. Ripp.
An examination of selected shorter works with the aim of establishing the varying roles a narrator can assume, his rhetorical strategies, and the effect on the reader. Authors to be read include Nabokov, Chekhov, Babel, and Gogol.

432 Pushkin Spring. 4 credits. Prerequisites: Rus 202 or the equivalent and permission of the instructor.

M W F 11:15. S. Senderovich.

492 Supervised Reading in Russian Literature Fall or spring. 2–4 credits. By initiation of the department.

[499 The Modern Arts in Russia Spring. 4 credits. Not offered 1978–79.]

611 Supervised Reading and Research Fall or spring. 2–4 credits. Prerequisite: consent of the department.

617 Russian Stylistics Fall. 4 credits. Conducted in Russian.

MWF 11:15. A. Nakhimovsky.
Russian in the eighteenth and nineteenth centuries: the succession of literary style and the making of the language.

618 Russian Stylistics Spring. 4 credits. Conducted in Russian.

MWF 12:20. S. Senderovich.
Introduction to the diversity of styles of modern Russian and training in stylistically coherent writing.

[620 Studies in Russian Poetry Spring. 4 credits. Not offered 1978–79.]

621 Russian Literature from the Beginnings to 1700 Fall. 4 credits.

W 3:35–5:30.
A study of the themes and forms that are characteristic of medieval Russian literature.

[622 Eighteenth-Century Literature Fall. 4 credits. Conducted in Russian. Not offered 1978–79.]

[623 Early Nineteenth-Century Literature Fall. 4 credits. Prerequisite: Russian 622 or consent of the instructor. Conducted in Russian. Not offered 1978–79.]

[624 Russian Romanticism Spring. 4 credits. Not offered 1978–79.]

[628 Topics in Soviet Literature Fall. 4 credits. Not offered 1978–79.]

671 Seminar in Nineteenth-Century Russian Literature Fall. 4 credits.

Th 3:35–5:30. P. Carden.
Topic: Tolstoy's *Voyna i mir*. An intensive study of the text of Tolstoy's novel using his drafts and other materials. Open to advanced undergraduates.

672 Seminar in Twentieth-Century Russian Literature Spring. 4 credits.

Th 3:35–5:30. G. Gibian.
Topic: Mayakovsky: poetry, drama, film.

701 Proseminar: Problems of Literary Criticism Fall. 4 credits.

T 3:35–5:30. V. Ripp.
An examination of such issues as influence, intention, evaluation, with reference to methods of various twentieth-century schools, including Formalism, Marxism, and Structuralism. Conducted in English, and intended primarily for students in the department but open to all who are qualified.

See also:

Ideas and Art in Great Political Novels
(Comparative Literature 388)

Sanskrit

See **Linguistics 641–642**

Serbo-Croatian

[131–132 Elementary Course 131, fall; 132, spring. 3 credits each term. First term or equivalent is prerequisite to the second.]

[133–134 Elementary Course II 133, fall; 134, spring. 3 credits each term. First term or equivalent is prerequisite to the second. E. W. Browne. Not offered 1978–1979.]

Sinhala (Sinhalese)

J. W. Gair

101–102 Elementary Course 101, fall; 102, spring. 6 credits each term. First term or equivalent is prerequisite to the second.

Hours to be arranged.
A semi-intensive course for beginners. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing.

201–202 Sinhala Reading 201, fall; 202, spring. 3 credits each term. Prerequisites: for 201, qualification in Sinhala; for 202, Sinhala 201 or equivalent.

Hours to be arranged.

203–204 Composition and Conversation 203, fall; 204, spring. 3 credits each term. Prerequisites: for 203, Sinhala 202 or permission of instructor; for 204, Sinhala 203 or equivalent.

Hours to be arranged.

See also **Linguistics 341, 442, 631, 640, 641, 644.**

Spanish

U. J. De Winter, L. D. King, W. Klemme, J. W. Kronik, C. Morón-Arroyo, M. Randel, E. Rudat, E. M. Santi, M. Suñer, J. Tittler, M. Van Antwerp-Hill

Spanish Major

The Spanish major is designed to give students proficiency in the oral and written language, to acquaint them with Hispanic culture, and to develop their skill in literary and linguistic analysis. Satisfactory completion of the major should enable students to meet language and literature requirements for teaching, to continue with graduate work in Spanish, or to satisfy standards for acceptance into the training programs of the government, social agencies, and business concerns. A Spanish major combined with another discipline may also allow a student to undertake preprofessional training for graduate study in law or medicine.

Students interested in a Spanish major are encouraged to seek faculty advice as early as possible. For acceptance into the major, students should consult with the director of undergraduate studies in Spanish, M. Van Antwerp-Hill (269 Goldwin Smith) who will admit them to the major, and choose an adviser from the Spanish faculty or either the Department of Romance Studies or the Department of Modern Languages and Linguistics. Spanish majors will then work out a plan of study in consultation with their advisers. Previous training and interests, as well as vocational goals, will be taken into account when the student's program of courses is determined.

Spanish 201 and 204 (or equivalent) are prerequisite to entering the major in Spanish. All majors will normally include the following core courses in their programs:

1. two literature courses of the 315–316–317 series
2. 303 and 312 (or equivalent)

Spanish majors have great flexibility in devising their programs of study and areas of concentration. Some typical options of the major are:

1. Spanish literature, for which the program of study normally includes at least 24 credits of Spanish literature beyond the core courses.
2. Spanish linguistics, for which the program normally includes 401, 407, 408, and at least 12 additional credits in general or Spanish linguistics. (Linguistics 101+102 are recommended before entering this program.) Students interested in including linguistics in their programs should consult with the

coordinator of Spanish for the Department of Modern Languages and Linguistics (M. Suñer).

3. A combination of literature and linguistics.
4. Any of the above options with certain courses in other disciplines counted towards the major.

Whichever option a student chooses, he or she is encouraged to enrich the major program by including a variety of courses from related fields or, by combining Spanish with related fields such as history, philosophy, sociology, anthropology, art, music, Classics, English, comparative literature, and other foreign languages and literatures.

Spanish majors are encouraged to spend all or part of the junior year in a Spanish-speaking country on one of the study-abroad programs organized by American universities that allow the transfer of grades and credits.

The J. G. White Prizes and Scholarships are available annually to students who achieve excellence in Spanish.

The Honors Program

The honors program in Spanish is open to superior students who wish to undertake guided independent reading and research in an area of their choice. Students in the senior year select a member of the Spanish faculty from either the Department of Romance Studies or the Department of Modern Languages and Linguistics to supervise their work and direct the writing of the honors essay (see Spanish 429–430).

Distribution Requirement

The distribution requirement in the humanities is satisfied in Spanish by any two of the following courses: 201, 315, 316, 317, or any 300-level literature course.

For the social sciences the distribution requirement may be satisfied by Linguistics 101 and any one Spanish linguistics course for which Ling 101 is prerequisite.

Of the courses listed below, those dealing with literature as well as Spanish 212 and 312 are staffed and administered by the Department of Romance Studies (278 Goldwin Smith Hall).

The courses dealing with language and linguistics (except those language courses listed above) are offered by the Department of Modern Languages and Linguistics (203 Morrill Hall).

Languages and Linguistics

[111–112 Basic Course Not offered 1978–79.]

121–122 Elementary Course 121, fall; 122, spring. 4 credits each term. Prerequisite for 122 is 121. Special sections of this course are available for students with qualification in another language.

Fall and spring: lec, Th 12:20, Th 2:30, F 9:05, or F 11:15; drill M–Th 8, 9:05, 10:10, 11:15, 12:20, 1:25, 2:30, 3:35. W. H. Klemme and staff. Evening prelims: fall (121), October 3 and November 7; spring (122), February 27 and April 10.

A course for beginners or those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing. The four recitation hours are devoted to language practice in small groups and the lecture to grammar explanation, reading, cultural information, and testing in larger groups. This course satisfies the qualification portion of the language requirement in three semesters, although students who obtain a QEEB score of 560 after two semesters (121–122) are thereby qualified and may enter the 200-level sequence.

123 Continuing Spanish Fall or spring. 4 credits. Open only to students who have previously studied Spanish and have a CEEB achievement score between 450 and 559.

Fall: lec, Th 1:25 or F 10:10; drill, M–Th 9:05, 10:10, 11:15, 12:20, 1:25. Spring: lec, Th 1:25; drill, 9:05, 10:10, 12:20. Evening prelims: fall, October 3 and November 7. L. D. King and staff. An all-skills course designed to prepare students for study at the 200 level. Automatic qualification upon completion of the course.

203 Intermediate Composition and Conversation Fall or spring. 3 credits.

Prerequisite: qualification in Spanish.
Fall: M W F 8, 9:05, 10:10, 11:15, 12:20, 1:25. Spring: M W F 9:05, 10:10, 12:20, 1:25. Evening prelims: fall, October 17; spring, March 6. Conversational grammar review with special attention to the development of accurate and idiomatic oral expression. Includes readings in contemporary Spanish prose and practice in writing.

204 Intermediate Composition and Conversation Spring. 3 credits. Prerequisite: Span 203 or equivalent.

M W F 9:05, 11:15, 12:20 or 1:25. Staff. Practice in conversation with emphasis on improving the students' oral and written command of Spanish. Includes treatment of specific problems in grammar, expository writing, and readings in contemporary prose.

212 Intermediate Reading and Composition

Fall or spring. 3 credits. Prerequisite: qualification in Spanish.

M W F 10:10. E. M. Santi, M. Van Antwerp-Hill. Designed to improve reading and writing skills; this course focuses on vocabulary expansion, grammar review, composition, and the development of reading competence. This course is recommended for future Spanish majors. Conducted in Spanish.

303 Advanced Composition and Conversation

Fall. 4 credits. Prerequisites: Span 204 or equivalent.

M W F 10:10, M. Suñer and staff. Advanced course in grammar, composition, and conversation. Special attention to the fundamental aspects of language styles through the analysis of contemporary spoken and written Spanish. Frequent oral and written reports in Spanish.

[304 Advanced Composition and Conversation

Spring. 4 credits. Prerequisites: Span 303 or equivalent. Not offered 1978–79.]

310 Advanced Conversation and Pronunciation

Spring. 2 credits. Prerequisites: Span 204 or equivalent.

M W F 9:05. W. H. Klemme. The goal of the course is to perfect the students' command of spoken Spanish by the practical application of Spanish phonetics to pronunciation and patterns of intonation. Oral activities include formally prepared individual and group presentations and conversation practice based on topics of general interest.

[312 Advanced Composition Prerequisite: Span

201 or 204 or 212 or equivalent. Not offered 1978–79. Next offered 1979–80.]

[401–402 History of the Spanish Language

401, fall; 402, spring. 4 credits each term. Prerequisites: qualification in Spanish and Ling 101 or permission of instructor. Not offered 1978–79.]

407 Applied Linguistics: Spanish Fall. 4 credits.

Prerequisites: qualification in Spanish and Ling 101 or permission of instructor.
M W F 2:30. W. H. Klemme. Designed to equip the teacher of Spanish with the ability to apply current linguistic theory to the second-language learning situation.

408 The Grammatical Structure of Spanish

Spring. 4 credits. Prerequisites: qualification in Spanish and Ling 101 or permission of instructor.

M W F 2:30. M. Suñer. Descriptive analysis of the morphological and syntactical structure of present-day standard Spanish. A survey of current attitudes, methods, materials, and techniques.

[601 Hispanic Dialectology Spring. 4 credits.

Hours to be arranged. M. Suñer. Not offered in 1978–79.]

602 Linguistic Structures of Ibero-Romance

Fall or spring. 4 credits. Offered according to demand.

Hours to be arranged.]

[603 Contemporary Theories of Spanish

Phonology Fall. 4 credits. M. Suñer. Not offered in 1978–79.]

604 Contemporary Theories of Spanish

Grammar Fall or spring. 4 credits. Offered according to demand.

Hours to be arranged. M. Suñer.

The Comparative Study of the Romance Languages (see Romance Linguistics 321–322, 323–324, 620, 621, 622)

700 Seminar in Hispanic Linguistics

According to demand. Variable credit. Hours to be arranged.

Literature

105 Spanish Rogues and Heroes Fall. 3 credits.

Freshman Seminar.
T Th 8:40–9:55. M. Randel.

Readings in English from works which present the *picaro*, Don Quijote, and Don Juan. Papers and class discussion will explore the roots of these types in Spanish literature and society and the nature of their universality.

106 Literature As Game in Modern Spanish-American Fiction

Spring. 3 credits. Freshman Seminar.

T Th 12:20–1:35. J. Kronik. Discussion of novels and short stories by Borges, Cortázar, García Márquez, and others in which the writers experiment and play with language, with the forms of fiction itself, and with the reader. Readings in English translation.

108 Classics of Spanish Thought and Letters

Spring. 3 credits. Freshman Seminar.

T Th 8:40–9:55. U. J. De Winter. Readings and discussion (in English) of selected works focusing on art, literature, culture, and education; included among these Spanish writers are Ortega y Gasset and Unamuno.

201 Introduction to Hispanic Literature Fall or

spring. 3 credits. Prerequisite: qualification in Spanish or permission of instructor.

Fall: M W F 9:05, 12:20, 1:25 or T Th 10:10–11:25; spring: M W F 12:20, 1:25, or T Th 12:20–1:35. J. Tittler and staff.

An intermediate reading course in which texts from Spain and Spanish America are read and analyzed. The course is designed to increase reading and speaking facility in Spanish and to develop critical and analytical skills in the appreciation of literary texts. Conducted mainly in Spanish. (The literature course that normally follows 201 is 315, 316, or 317.)

313 Spanish Civilization Spring. 4 credits.

Prerequisite: Span 201 or 4 years of entrance Spanish or permission of instructor.

M W F 11:15. M. Van Antwerp-Hill. A study of the major periods of Spanish political and intellectual history. Readings in both Spanish and English. Conducted in Spanish.

315 Readings in Sixteenth- and Seventeenth-Century Hispanic Literature Fall. 4 credits.

Prerequisite: Span 201 or 4 years of entrance Spanish or permission of instructor. (This course is not prerequisite to Span 316 or 317.)

T Th 12:20–1:35. M. Van Antwerp-Hill.

Reading and discussion of representative texts of the period from both Spain and her colonies in the New World.

316 Readings in Modern Spanish Literature

Fall. 4 credits. Prerequisite: Span 201 or 4 years of entrance Spanish or permission of instructor.

T Th 10:10–11:25. J. Kronik.

Reading and discussion of representative texts from Spain from the romantic period to the present: Zorrilla, Galdós, Unamuno, García Lorca, Cela, and others.

317 Readings in Modern Spanish-American Literature

Spring. 4 credits. Prerequisite: Span 201 or 4 years of entrance Spanish or permission of instructor.

M W F 10:10 or T Th 10:10–11:25. E. M. Santi and J. Tittler.

Reading and discussion of representative texts of the nineteenth and twentieth centuries from Spanish America: Darío, Neruda, Borges, Paz, Cortázar, García Márquez, and others.

[323 Latin American Civilization Not offered

1978–79. Next offered 1979–80.]

Note: The prerequisite for the following courses, unless otherwise indicated, is Spanish 315 or 316 or 317 or permission of instructor.

332 The Modern Drama in Spanish America

Spring. 4 credits.
T Th 2:30–3:45. J. Kronik.

A study of significant plays from several Spanish-American countries, with emphasis on the current scene and a retrospective view to playwrights such as Florencio Sánchez, Villaurrutia, Usigli. Consideration will be given to the tensions between the expression of a Spanish American social identity and the influence of general currents such as the absurd.

[334 The Spanish American Short Story Not

offered 1978–79.]

336 Popular Culture in Contemporary Spanish-American Prose Fiction Fall. 4 credits.

M W F 9:05. J. Tittler.

An inquiry into the nature of popular culture, its relationship to mass media, and its role in current fiction. Readings include works by Cabrera Infante (O), Fuentes (*La muerte de Artemio Cruz*), Cortázar (*Libro de Manuel*), Puig (*Boquitas pintadas*), Sarduy (*Cobra*), Vargas Llosa (*Pantaleón y las visitadoras*), Borges and Bioy Casares (*Crónicas de Bustos Domecq*), and García Márquez (*Cien años de soledad*).

340 Women in Hispanic Literatures (also

Women's Studies 340) Spring. 4 credits.
M W F 12:20. E. Rudat.

Works of representative woman writers in Spain and Spanish America will be studied within the context of the image of woman in the Hispanic literatures. The readings will include novels by María de Zayas y Sotomayor, Fernán Caballero, Emilia Pardo Bazán, Ana María Matute, Carmen Martín Gaité, and Beatriz Guido; a selection of poetry by Sor Juana Inés de la Cruz, Gertrudis Gómez de Avellaneda, Rosalía Castro, Juana de Ibarbourou, Gabriela Mistral, and Gloria Fuertes. The course is taught in English and several of the texts are available in English translation. However, a rudimentary reading knowledge of Spanish is required.

351 Spanish Drama of the Golden Age Fall.

4 credits.
T Th 10:10–11:25. M. Van Antwerp-Hill.

A study of selected Spanish dramatists of the seventeenth century with readings of representative plays of the period. Special emphasis upon the idea of the theater as dramatic poetry.

[356 Spanish Lyric Poetry of the Golden Age]
Not offered 1978–79.]

368 The Birth of the Novel in Spain: Toward Don Quijote (also Comparative Literature 368)

Spring. 4 credits.
T 10:10–11:25. M. Randel.

A study of pastoral, picaresque, and Moorish tales, as well as the epistolary and dialogued fiction which paved the way for Cervantes' synthesis. Works read will include *La Diana* of Montemayor, *Lazarillo de Tormes*, *El Abencerraje* y *la hermosa Jarifa*, and Guevara's *Epistolas familiares*. Reading knowledge of Spanish recommended.

[386 The Nineteenth-Century Spanish Novel]
Not offered 1978–79.]

387 The Ideology of Independence and Romanticism in Spanish-American Literature

Fall. 4 credits.
M W F 11:25. E. Rudat.

The intellectual genesis of the movement toward autonomy will be studied as a phenomenon that can be considered parallel to the evolution toward romanticism. The characteristics peculiar to Spanish American romanticism will be defined and commented upon. The readings will include poetry by Andrés Bello, Olmedo, Heredia, and Echeverría; examples of *literatura gauchesca*, such as *Martin Fierro* by José Hernández; prose works by Sarmiento and Ricardo Palma; examples of *literatura indigenista*; a selection of relevant ideological prose, and the romantic novel *Maria* by Jorge Isaacs. Conducted in Spanish.

[389 The Generation of 1898] Not offered 1978–79.]

391 The Post-Civil War Drama in Spain Fall. 4 credits.

T Th 2:30–3:45. J. Kronik.

A study of the contemporary Spanish theater as an expression of social, political, and esthetic protest. Readings from Buero Vallejo and Sastre to Arrabal, with a preliminary discussion of Garcia Lorca and Valle-Inclán.

[395 The Post-Civil War Novel in Spain] Not offered 1978–79.]

398 Modern Hispanic Poetry Spring. 4 credits.

T Th 12:20–1:35. E. M. Santí.

A study of the major trends in Hispanic poetry from *modernismo* to the present. Authors include Darío, Jiménez, Machado, Huidobro, Lorca, Guillén, Neruda, Vallejo, Aleixandre, and Paz.

419–420 Special Topics in Hispanic Literature

419, fall; 420, spring. 4 credits each term.

Prerequisite: permission of instructor.

Staff.
Guided independent study of specific topics. For undergraduates interested in special problems not covered in courses.

429–430 Honors Work in Hispanic Literature

429, fall; 430, spring. 4 credits each term.

Prerequisite: senior standing and permission of instructor.

440 Medieval Literature from the Origins Through 1300 Fall. 4 credits.

M W 2:30–3:45. C. Morón-Arroyo.

A study of the basic bibliographical and linguistic tools for research in medieval culture; the early stages of Castilian language, and classical works of

medieval literature: *Mío Cid*, *Razón de amor*, *Berceo*. Emphasis on concepts such as courtly and Platonic love, and the European context of Spanish literature.

441 Medieval Literature 1300–1508 Spring. 4 credits.

M 1:25–3:25. C. Morón-Arroyo.

From Don Juan Manuel through *Amadis de Gaula*, including *Libro de buen amor*, the humanism and cultural conflicts of the fifteenth century: woman, conversos, Inquisition, and *La Celestina*.

[466 Cervantes] Not offered 1978–79.]

479 Colonial Spanish American Literature: Sor Juana, Ruiz de Alarcón, Inca Garcilaso Fall. 4 credits.

W 4–6. E. M. Santí.

An inquiry into the nature of Colonial writing through the works of Sor Juana Inés de la Cruz (poetry), Juan Ruiz de Alarcón (theatre) and Inca Garcilaso (historical prose). Our aim will be to uncover the rhetorical and ideological strategies which subvert the hierarchies dominating these texts.

[480 Romanticism in Spain] Not offered 1978–79.]

[481 Eighteenth- and Nineteenth-Century Spanish Drama] Not offered 1978–79.]

496 Resonances of the Quijote in the Modern Hispanic Novel Spring. 4 credits.

W 2:30–4:30. J. Tittler.

A study of the *Quijote* as the symbolic elaboration of a theory of the novel, and an investigation of that theory's application by leading twentieth-century authors. Readings include works by Lukács (*The Theory of the Novel*), Unamuno (*Niebla*), Cela (*La familia de Pascual Duarte*), Sender (*Crónica del alba*), Puig (*El beso de la mujer araña*), Cabrera Infante (*Tres tristes tigres*), Carpentier (*Los pasos perdidos*), Ortiz (*Juyungo*). Students should be acquainted with Cervantes' *Don Quijote de la Mancha* before taking the course.

[629 Principles of Esthetics and Literary Criticism] Not offered 1978–79.]

639–640 Special Topics in Hispanic Literature

639, fall; 640, spring. 4 credits each term. To be taken by all new graduate students.

Staff.

Tagalog

J. U. Wolff

101–102 Elementary Course 101, fall; 102, spring. According to demand. 6 credits each term. Prerequisite: permission of instructor; first term or equivalent is prerequisite to the second.

Hours to be arranged.

A semi-intensive course for beginners.

201–202 Tagalog Reading 201, fall; 202, spring. 3 credits each term. Prerequisite for 201 is Tagalog 102 or equivalent; first term or equivalent is prerequisite to the second.

Hours to be arranged.

300 Linguistic Structure of Tagalog Fall or spring. 4 credits. Prerequisite: Ling 101.

Hours to be arranged. J. U. Wolff.

Tamil

J. W. Gair

101–102 Elementary Course According to demand. 101, fall; 102, spring. 6 credits each term; first term or equivalent is prerequisite to the second.

Telugu

G. B. Kelley

[101–102 Elementary Course] 101, fall; 102, spring. 6 credits each term. First term or equivalent is prerequisite to the second. Not offered 1977–78.]

[201–202 Telugu Reading] 201, fall; 202, spring. 3 credits each term. Prerequisite: qualification in Telugu; first term or equivalent is prerequisite to the second. Not offered 1978–79.]

See also **Linguistics 341, 440, 646.**

Thai

R. B. Jones, Jr., R. Mendiones

101–102 Elementary Course 101, fall; 102, spring. 6 credits each term; first term or equivalent is prerequisite to the second.

Lec, T Th 11:15, drill, M–F 10:10.

A semi-intensive course for beginners or for those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing.

201–202 Thai Reading 201, fall; 202, spring. 3 credits each term. Prerequisites: for 201, qualification in Thai; for 202, Thai 201 or equivalent.
M W F 2:30.

203–204 Composition and Conversation 203, fall; 204, spring. 3 credits each term. Prerequisites: for 203, qualification in Thai; for 204, Thai 203.
Hours to be arranged.

301–302 Advanced Thai 301, fall; 302, spring. 4 credits each term. Prerequisite: Thai 201–202, or equivalent.

M W F 1:25.

Selected readings in Thai writings in various fields.

303–304 Thai Literature 303, fall; 304, spring. 4 credits each term. Prerequisite: Thai 301–302 or the equivalent.

Hours to be arranged.

Reading of some of the significant novels, short stories, and letters written since 1850.

401–402 Directed Individual Study 401, fall; 402, spring. 4 credits each term. For advanced students. Prerequisite: permission of instructor.

Hours to be arranged.

Ukrainian

[131–132 Elementary Course] 131, fall; 132, spring. 3 credits each term; first term is a prerequisite to the second or equivalent.
E. W. Browne. Not offered 1978–79.]

Vietnamese

F. E. Huffman

101–102 Elementary Course 101, fall; 102, spring. 6 credits each term. First term or equivalent is prerequisite to the second.

Lec, T Th 10:10; drill, M–F 11:15.

A semi-intensive course for beginners or for those who have been placed in the course by examination. The purpose of the course is to give a thorough grounding in all the language skills: listening, speaking, reading, and writing.

201–202 Vietnamese Reading 201, fall; 202, spring. 3 credits each term. Prerequisites: for 201, qualification in Vietnamese; for 202, Viet 201.

Hours to be arranged.

203-204 Composition and Conversation 203, fall; 204, spring. 3 credits each term. Prerequisites: for 203, qualification in Vietnamese; for 204, Viet 203.

Hours to be arranged.

301-302 Advanced Vietnamese 301, fall; 302, spring. 4 credits each term. Prerequisite: Viet 201-202 or the equivalent.

Hours to be arranged.

303-304 Vietnamese Literature 303, fall; 304, spring. 4 credits each term. Prerequisite: Viet 301-302 or equivalent.

Hours to be arranged.

Reading of selections from contemporary literature.

401-402 Directed Individual Study 401, fall; 402, spring. 4 credits each term. Prerequisite: permission of instructor. For advanced students.

Hours to be arranged.

Music

N. Zaslaw, chairman; W. W. Austin, M. Bilson, C. Greenspan, J. Hsu, K. Husa, M. Keller, S. Monosoff, E. Murray, R. M. Palmer, D. R. M. Paterson, D. M. Randel, T. A. Sokol, M. W. Stith, B. Troxell, J. Webster

There are two options available to the student planning to major in music. At the core of both options is a program which carries the study of music to an advanced level through the deliberate integration of performance, music theory, and music history. This core program sets standards which the Department of Music believes all serious students of music must meet, regardless of the role that music may ultimately play in their lives. Option I is designed to allow the student greater opportunity to elect courses in fields other than music. Option II is designed for the student interested in a more specialized program with a view toward graduate study and a career in music.

Option I presupposes some musical background and the satisfactory completion of Music 151-152 by the end of the sophomore year. Students must take a piano examination before admission to the major and will be expected to remedy through further study any deficiencies that may be revealed.

The requirements for the Bachelor of Arts degree with a major in music under Option I include four semester courses in music theory (251-252 and 351-352), three semester courses in music history (381-382 plus one other numbered 300 or above), and four semesters of participation in a musical organization or ensemble.

Option II presupposes considerable musical studies before entering and the satisfactory completion of Music 251-252, normally by the end of the sophomore year. Students must take a piano examination before admission to the major and will be expected to remedy through further study any deficiencies that may be revealed.

The requirements for the Bachelor of Arts degree with a major in music under Option II include three semester courses in music theory (351-352 and 451 or 453), three semester courses in music history (381-382 plus one other numbered 300 or above), and two semesters of participation in a musical organization.

In addition, the student majoring in music under Option II will concentrate in one of the following areas:

A. Theory and Composition. The student concentrating in theory and composition will elect, during the junior and senior years, four additional semester courses in this area plus Music 462 or 463. These courses may include Music 401-402.

B. Music History. The student concentrating in music history will elect, during the junior and senior years, four additional semester courses in this area plus Music 462 or 463. These courses may include Music 401-402. Two of the four may be drawn from the offerings of other departments.

C. Performance. The student who has shown exceptional promise as a performer during the freshman and sophomore years, as demonstrated in part by a solo recital, may concentrate in performance by electing, during the junior and senior years, four semesters of private instruction in his or her major instrument, plus two semesters of chamber music (Music 441-442).

Students contemplating a program in music under either option should arrange for placement examinations and auditions during the orientation period of the freshman year, or earlier if possible.

Before entering the major, each student should choose an adviser from among the department's faculty members.

The Honors Program

The honors program in music is intended to provide a special distinction to the department's ablest undergraduate majors. To become a candidate for honors in music a student must be invited by the faculty at the beginning of the second semester of the junior year. As soon as possible thereafter, the student will form a committee of three faculty members to guide and evaluate the honors work. In the senior year the candidate will enroll in Music 401-402 with the chairperson of the honors committee as instructor. Candidates will be encouraged to formulate programs that will allow them to demonstrate their total musical ability. The level of honors conferred will be based on the whole range of the independent work in this program of which a major part will culminate in an honors thesis, composition, or recital, to be presented not later than April 1, and a comprehensive examination to be held not later than May 1.

Distribution Requirement

The distribution requirement in the expressive arts is satisfied in music with any six credits in Music. A maximum of three credits in courses from Music 331 through 338 and 441 through 448 may be used to satisfy this requirement.

Facilities

A large collection of recorded music and scores is housed in the Department of Music, where listening facilities are provided in the Music Library. These facilities may be used by any member of the student body at hours to be announced each term.

Choral and instrumental ensembles are trained and directed by members of the departmental staff each term, and all students who are interested are invited to join one or more of these groups. These ensembles included the Sage Chapel Choir, the Cornell Chorus, the Cornell University Glee Club, the bands (marching band, wind ensemble, symphonic band, brass ensembles), the Cornell Symphony Orchestra, the Cornell Chamber Orchestra, the Gamelan Ensemble, the Collegium Musicum, and chamber music groups. For rehearsal hours and conditions for academic credit, see Music 331 through 338 and 441 through 448. Announcements of tryouts for all organizations will be made at the beginning of fall and spring terms.

Music Theory

141-142 Rudiments of Music Theory 141, fall; 142, spring. 3 credits each term. May not be counted toward the requirements for the major in music. Some familiarity with music is desirable. 141 with grade of B- or better is prerequisite to 142. Enrollment in 142 is limited to 50 students.

M W 9:05; disc to be arranged. D. M. Randel and staff.

An elementary, self-contained introduction to music theory, emphasizing fundamental musical techniques, theoretical concepts, and their application. 141: ear training; notation, pitch, meter; intervals, scales, triads; basic concepts of tonality; extensive listening to music in various styles; analysis of representative works of Bach, Mozart, Beethoven, and Debussy. 142: systematic introduction to counterpoint; original composition of four-part chorales or short keyboard pieces.

151-152 Elementary Theory 151, fall; 152, spring. 4 credits each term. First term or its equivalent prerequisite to the second. Students intending to major in music under Option II should enroll in Music 151-152 during their freshman year. A knowledge of the rudiments of music and some ability to perform are required for admission. Registration for this course is provisional depending upon the demonstration of adequate background and ability in proficiency tests given on the first two days of the term.

M W F 9:05, Th 2:30-4. D. R. M. Paterson.

Designed for students expecting to major in music and other qualified students. An integrated theory course required for admission to the music major. Detailed study of the fundamental elements of tonal music; rhythm, scales, intervals, triads; melodic movement, two-part counterpoint, harmonic progression in the chorale style of J. S. Bach; and introduction to analysis of small forms. Drill in aural discrimination, sight singing, keyboard harmony, and elementary figured bass; rhythmic, melodic, and harmonic dictation; and score reading.

251-252 Intermediate Theory 251, fall; 252, spring. 4 credits each term. Prerequisite: a grade of C or better in 152 or the equivalent. First term prerequisite to the second.

M W F 10:10, Th 1:25-3. J. Hsu, fall; E. Murray, spring.

Continuation of study and writing in the chorale style of J. S. Bach, concentrating on seventh chords; also study of secondary dominants, modulation, augmented sixth chords, and the Neapolitan. Introduction to writing small forms using piano textures, combined with analysis of larger forms and sonatinas. Analysis and writing of two- and three-voice chorale preludes. Ear training, keyboard harmony, and score reading.

351 Advanced Theory Fall. 4 credits each term. Prerequisite: a grade of C or better in 252 or the equivalent.

M W F 9:05. E. Murray.

Inventions, chromatic harmony, analysis of larger forms and nineteenth-century music, ear training, score reading, and advanced keyboard studies including figured bass.

352 Advanced Theory Spring. 4 credits each term. Prerequisite: a grade of C or better in 351 or the equivalent.

T 10:10-12:05; 1 additional hour to be arranged. K. Husa.

Introduction to some techniques of composers from 1900 to 1950, including expanded tonal resources, atonality, and new approaches to form and rhythm. Analysis of representative smaller works by Bartok, Hindemith, Schoenberg, Stravinsky, Webern, and some American composers. Writing assignments in various styles.

[451 Modal Counterpoint and Analysis Spring. 4 credits. Prerequisite: 352 or the equivalent with a grade of C or better. R. M. Palmer. Not offered 1978-79.]

[454 Fugue Spring. 4 credits. Prerequisite a grade of C or better in 352 or the equivalent. M 10:10-12:05; Th 12:20. R. M. Palmer. Not offered 1978-79.]

456 Orchestration Fall. 4 credits. Prerequisite: 352 or equivalent.

T 10:10–12:20. K. Husa.

A study of the instruments of the orchestra and their use in representative works from 1700 to the present. Scoring for various instrumental groups including large orchestra. Students will occasionally attend rehearsals of Cornell musical organizations and ensembles.

457 Analysis and Composition (Proseminar)

Fall. 4 credits. Prerequisite: 352 or permission of instructor.

T Th 10:10; 1 additional hour to be arranged.

R. M. Palmer.

A development of the techniques for analyzing structure and function in twentieth-century music. New methods of tonal analysis will be employed, and atonal and serial music will be studied in the wider context of twentieth-century tonality. Compositional projects will concentrate on the acquisition of fundamental techniques and the assimilation of new materials. Though most students do both, a student may concentrate on either analysis or composition.

460 Electronic Music Composition Fall.

3 credits. Enrollment limited to 10. Prerequisites: 252 and permission of instructor.

M 1:25–4:25. M. W. Stith and staff.

A study of the basic techniques of writing music by electronic means. This will involve musique concrète, tape recorder techniques such as re-recording and splicing, and the use of synthesizers. Works by electronic music composers and readings from the current literature will be studied. Students will be allotted studio time for carrying out class projects and assignments.

[462 Orchestral Conducting Spring. 2 credits.

Prerequisite: 352. Not offered 1978–79.]

[463 Choral Conducting Spring. 2 credits.

Prerequisite: 252 or permission of instructor. F 2:30–4:10. T. A. Sokol. Not offered 1978–79.]

464 Choral Style Spring. 2 credits. Prerequisite:

352 or permission of instructor.

F 2:30–4:10. T. A. Sokol.

A study of the principal forms of choral music (Mass, cantata, oratorio, madrigal, motet, etc.) with emphasis on performance style.

Music History

[101 Introduction of Music Fall. 3 credits.

D. M. Randel and staff. Not offered 1978–79.]

111–112 Freshman Seminar in Music 111, fall;

112, spring. Enrollment limited to 40.

M W F 10:10. M. Hunter and B. Kernfeld.

This course tries to teach students how better to listen to music, think about music, talk about music, and write about music. We will not confine ourselves to Western "classical" music; non-Western music and popular music will be just as appropriate for our investigations. Students do not need to have studied music to take this course. However, student performances in class will be welcome.

204 Musical Improvisation Spring. 3 credits.

Prerequisite: ability to read music well enough to follow printed music while listening.

M W F 2:30. J. Spitzer.

Study of improvised music from a variety of musical traditions, including Greek dance music, Turkish art music, American jazz, Western art-music (classical and baroque), and Chinese opera. A search for the principles behind improvisation through analysis of underlying tunes, melodic formulas, tonal structures, etc. There will be some reading, much listening, and occasional guest performances. Music majors, wishing to take this course should enroll in 304,

213 The Art of Music Fall. 3 credits.

T Th 11:15; disc to be arranged. W. W. Austin and assistants.

An exploration, chiefly through study of phonograph records, designed to speed up the continuing development of various independent tastes. Works of Bach and Beethoven provide a common focus for tracing historical continuities and changes among all the diverse styles of music that students may choose individually. Diversity is represented by live performances as well as recordings in the lectures, which are organized to survey the topics of melody, rhythm, chords, and musical forms.

[214 Opera Spring. 3 credits. Not offered

1978–79.]

218 Chopin, Chaikovsky, Musorgsky Spring.

3 credits.

T Th 11:15; disc to be arranged. W. W. Austin,

G. Gibian, and staff.

Chief works of the three composers, including symphonies, concertos, and operas, are studied through phonograph records. Piano music and chamber music are presented in live performance. The biographical, social, and intellectual contexts of the music are considered in relation to concerns of the present. Students' essays may deal with such concerns more than any technical aspect of the music, though techniques are not neglected.

219 Chopin, Chaikovsky, Musorgsky Spring.

1 credit. Seminar for students capable of reading in Russian. Open only to students concurrently enrolled in Music 218.

304 Musical Improvisation Spring. 4 credits.

Prerequisite: 152.

M W F 2:30 and an additional hour to be arranged.

J. Spitzer.

The same course as 204 except that students will have additional assignments involving transcription.

306 Women in Western Music (also Women's

Studies 306) Spring. 4 credits. Prerequisite: a course in music history or music theory, or permission of instructor.

T 2:30–4:30. J. Bowers.

A study of women's roles in Western music, particularly Western art music, from ancient times to the present.

[315 Brahms, Wagner, and the End of an Era

Fall. 4 credits. Prerequisite: any course in music or permission of instructor. D. M. Randel. Not offered 1978–79.]

[317 Music and Poetry in France: Late Middle

Ages and Renaissance (also French 617) Fall. 4 credits. D. M. Randel and E. P. Morris. Not offered 1978–79.]

[318 Baroque Instrumental Music Spring.

3 credits. Prerequisite: a course in music history or music theory, or permission of instructor. T Th 9:05. Not offered 1978–79.]

319 Music Criticism Fall. 4 credits. Prerequisite:

152 or permission of instructor.

M W F 1:25. C. Greenspan.

The history of music criticism; criticism as an aspect of the growth of a public of spectators; criticism as historical record; composer-critics (Berlioz and Schumann), author-critics (E. T. A. Hoffmann, G. B. Shaw); present-day criticism, daily-journal criticism, "thought" pieces, performance as criticism.

381 Monteverdi to Mozart Fall. 4 credits.

Prerequisite: 152 or permission of instructor.

T 11:15, Th 11:15–1:10. N. Zaslav.

The history of music from the emergence of baroque style around 1600 through the classical period at the

end of the eighteenth century. Emphasis on works of Monteverdi, Schütz, Purcell, J. S. Bach, Händel, Haydn, and Mozart.

382 Beethoven to Debussy Spring. 4 credits.

Prerequisite: 152 or permission of instructor.

M W F 2:30. C. Greenspan.

The history of musical styles from Beethoven's time through the beginning of the twentieth century. Emphasis on works of Beethoven, Schubert, Schumann, Chopin, Verdi, Wagner, Brahms, Mahler, and Debussy.

385 Schoenberg, Bartók, and Stravinsky Fall.

3 credits.

M W 11:15. W. W. Austin.

A survey of the three composers' works, of their interactions with each other, and of their connections with some of the literary, artistic, political, and religious concerns of their time.

[387 Mozart, His Life, Works, and Times (also

German 387) Fall. 4 credits. N. Zaslav, S. L. Gilman. Not offered 1978–79.]

426 Poetry and Music in the English

Renaissance (also English 426) Spring. 4 credits.

W F 12:20–1:35. E. Murray and B. Rosecrance.

A survey of English poems and their musical settings from late medieval times to the early seventeenth century, with emphasis on the interrelations of music and text. Some attention will also be given to historical background and social context. The course will consider selected medieval lyrics, the words and music of early Tudor songbooks, related European settings and texts, English madrigal composers, and the ayre. Besides anonymous settings and lyrics, settings by Fayrfax, Henry VIII, Tallis, Byrd, Gibbons, Morley, Weelkes, Wilbye, Dowland, and Campion; lyrics by Wyatt, Vaux, Surrey, Raleigh, Spenser, Sidney, Shakespeare, Campion, and Donne, will be represented. No theoretical training in music is assumed.

481 Music in Western Europe to Josquin Fall.

4 credits. Prerequisite: 381–382 or permission of instructor.

M W F 12:20. D. M. Randel.

The history of music in Western Europe from the first written monuments to the masses of Josquin Des Prez and his older contemporaries.

[482 Josquin to Monteverdi Spring. 4 credits.

Prerequisite: 381–382 or permission of instructor. M W F 11:15. Not offered 1978–79.]

Independent Study

301–302 Independent Study in Music 301, fall;

302, spring. 4 credits each term. Limited to juniors and seniors who are majoring in music. Department approval required.

Staff.

The Honors Program

401–402 Honors in Music 401, fall; 402, spring,

4 credits each term. Open only to honors candidates in their senior year.

Staff.

Musical Performance

321–322 Individual Instruction in Voice, Organ,

Harpichord, Piano, and String, Woodwind, and

Brass Instruments Prerequisite: successful

audition with instructor during registration period; 321 is not prerequisite to 322.

Without credit: basic fee for one half-hour lesson weekly during one term, \$90; fees for a practice schedule of six hours weekly during one term: \$45 for the use of a pipe organ, \$22 for a practice room with piano, \$7 for a practice room without piano. For credit: one one-hour lesson weekly (or two half-hours) and a double practice schedule earn two

credits each term, provided the student has earned, or is earning, at least three credits in courses in music history or music theory for every four credits in Music 321-322. The basic fees are then multiplied by one and one-half (lesson fee \$135; practice fees \$67, \$33, or \$10). All fees are nonrefundable once classes begin, even if registration is subsequently cancelled by the student. A student may register for this course in successive years. Members of Cornell musical organizations and ensembles will receive scholarships of one-half of their lesson fees. The Department of Music offers a limited number of additional partial scholarships for lesson fees for cases of both need and special merit. For information inquire at the department office.

321a-322a Individual Instruction in Voice

321a, fall; 322a, spring. 2 credits each term.
Time to be arranged. B. Troxell.

321b-322b Individual Instruction in Organ

321b, fall; 322b, spring. 2 credits each term.
Time to be arranged. D. R. M. Paterson.

321c-322c Individual Instruction in Piano

321c, fall; 322c, spring. 2 credits each term.
Time to be arranged. Fall, M. Bilson and staff; spring, P. Mehta and staff.

Students required to take 321c-322c in order to pass the Department of Music's piano examination may enroll without paying lesson fee.

321d-322d Individual Instruction in Harpsichord

321d, fall; 322d, spring. 2 credits each term.
Time to be arranged. Staff.

321e-322e Individual Instruction in Violin or Viola

321e, fall; 322e, spring. 2 credits each term.
Time to be arranged. Staff.

321f-322f Individual Instruction in Cello or Viola da Gamba

321f, fall; 322f, spring. 2 credits each term.
Time to be arranged. J. Hsu.

321g-322g Individual Instruction in Brass Instruments

321g, fall; 322g, spring. 2 credits each term.
Time to be arranged. M. W. Stith.

391-392 Advanced Individual Instruction

391, fall; 392, spring. 4 credits each term. Open only to juniors and seniors who are majoring under Option II with concentration in performance, and to graduate students. 391 is not prerequisite to 392.

Time to be arranged. Staff.

Musical Organizations and Ensembles

Students may participate in musical organizations and ensembles throughout the year. Consent of the instructor is required, and admission is by audition only, except in the Sage Chapel Choir. Registration is permitted in two of these courses simultaneously and students may register in successive years, but no student may earn more than six credits in these courses. Membership in these musical organizations and ensembles is also open to qualified students without credit, if desired.

331-332 Sage Chapel Choir

Fall or spring. 1 credit. No audition for admission.
M 7-8:30 p.m., Th 7-8:30 p.m., Sunday 9:30 a.m.
D. R. M. Paterson.

333-334 Cornell Chorus

Fall or spring. 1 credit. Prerequisite: permission of instructor.
T 7:15-9 p.m., Sunday 2:15-3:45 or 7:15-9 p.m.
T. A. Sokol.

335-336 Cornell Orchestra

Fall or spring. 1 credit.
Rehearsals for the Cornell Symphony Orchestra: full orchestra, W 7:30-10 p.m.; sectional rehearsals, alternate T or Th 7:30-10 p.m.
Rehearsals for the Cornell Chamber Orchestra, Th 7:30-10 p.m. (Limited to more experienced players.) E. Murray.

337-338 University Bands

1 credit.
Marching band during football season: T 7:15-9:15 p.m., Th 4:30-5:45, F 4:30-5:45, S 11:00.
Symphonic band during spring and fall terms: T 4:30-5:45, Th 7:15-9:15 p.m. Wind ensemble, spring term only: M 7:15-9:15 p.m., Th 4:30-5:45.
M. W. Stith.

339 Ear Training and Sight Singing

Fall. 1 credit. Open only to students who are participating in a University musical ensemble. Prerequisite: permission of instructor.
T 3:35. T. A. Sokol.

A practical course designed to improve the student's conception of melody and rhythm and to help sight-reading ability. Progressive class exercises in intervals, rhythms, melodies, and counterpoints.

441-442 Chamber Music Ensemble

1 credit. Prerequisite: permission of instructor.
M. Bilson and J. Hsu.
Study and performance of chamber music literature; string and wind groups, piano trios and quartets, trio sonatas, etc. Emphasis on musical problems, with some practice in sight reading.

443-444 Chamber Singers

1 credit. Prerequisite: permission of instructor.
F 4:30-6. T. A. Sokol.
Study and performance of selected vocal chamber music.

445-446 Gamelan Ensemble

1 credit. Prerequisite: permission of instructor.
Hours to be arranged. J. Lindsay.
Basic theory and performance techniques of Central Javanese gamelan.

447-448 Collegium Musicum

1 credit. Prerequisite: permission of instructor.
Hours to be arranged. J. Hsu and staff.
Study and performance of medieval, Renaissance, and baroque vocal and instrumental music, with recorders, crumhorns, sackbutts, viols, shawms, organ, harpsichord, and other early instruments.

Graduate Courses

Open to qualified undergraduates with consent of instructor.

[617 Music and Poetry in France: Late Middle Ages and Renaissance (also Music 317 and Fr 617)] Fall. 4 credits. W 2:30-4:30, additional hour to be arranged. D. M. Randel and E. P. Morris. Not offered in 1978-79.]

651 Twentieth-Century Classics

Spring. 4 credits. Prerequisite: 352 or permission of instructor.
T 10:10-12:05. R. M. Palmer.
Detailed analysis of a limited number of larger works representative of main trends in twentieth-century music. Different works are chosen each year.

652 Rhythms

Spring. 4 credits.
M 2:30-4:25. W. W. Austin.
Comparative studies of rhythmic schemes and performances in various styles. Open, with the instructor's consent, to students in languages, psychology, philosophy, dance, anthropology, etc., as well as in music.

[653 Analysis of Structure and Function in Tonal Music] Spring. 4 credits. R. M. Palmer. Not offered 1978-79.]

657-658 Composition

657, fall; 658, spring. 4 credits.
W 2:30-4:25. R. M. Palmer.

659-660 Composition

659, fall; 660, spring. 4 credits.
T 2:30-4:25. K. Husa.

681 Introduction to Bibliography and Research

Fall. 4 credits. Prerequisites: a reading knowledge of French and German, and familiarity with music theory and general music history.
M 1:25-4:25. M. A. Keller.

[682 Wagner (also German 682)]

Spring. 4 credits. W 1:25-3:25. J. Webster, E. A. Blackall. Not offered in 1978-79.]

685 Schoenberg, Bartók, and Stravinsky

Fall. 5 credits. Prerequisites: ability to play Stravinsky's *Pieces for the Five Fingers*, and reading knowledge of one relevant foreign language—French, German, Russian, or Hungarian.
M W F 11:15. W. W. Austin.

[686 Beethoven]

Spring. 4 credits. Th 1:25-4:25. J. Webster. Not offered 1978-79.]

[687 Mozart, His Life, Works, and Times (also German 757)]

Fall. 4 credits. N. Zaslav, S. L. Gilman. Not offered 1978-79.]

[688 Music of the Grand Siècle]

Spring. 4 credits. Th 2:30-4:15. N. Zaslav. Not offered 1978-79.]

[689 Haydn]

Fall. 4 credits. Prerequisites: 653 or the equivalent; and a reading knowledge of German.
T 1:30-4:30. J. Webster. Not offered 1978-79.]

[690 Ballad Opera]

Spring. 4 credits. N. Zaslav. Not offered 1978-79.]

692 Performance Practice

Spring. 4 credits.
Th 2:30-4:15. N. Zaslav.
An investigation into the way in which the music of a major composer or school was originally intended to be performed, taking into account contemporaneous writings, notation, venue, instruments, playing techniques, vocal production, tempo, articulation, ornamentation, and improvisation. In 1979 the seminar will be devoted to J. S. Bach and his circle.

697-698 Independent Study and Research

Hours and credits to be arranged. Staff.

[783-784 Seminar in Medieval Music]

783, fall; 784, spring. 4 credits each term. W 2-4:30. D. M. Randel. Not offered 1978-79.]

[785-786 History of Music Theory]

Fall. 4 credits each term. Prerequisite: a reading knowledge of French or German. J. Webster. Not offered 1978-79.]

[787-788 Debussy to Boulez]

787, fall; 788, spring. 4 credits each term. W. W. Austin. Not offered 1978-79.]

[789-790 Liturgical Chant in the West]

789, fall; 790, spring. 4 credits each term. D. M. Randel. Not offered 1978-79.]

Near Eastern Studies

D. I. Owen, chairman; J. Cohen, M. F. Collins, M. B. Schub, J. M. Weinstein

The Department of Near Eastern Studies offers Cornell undergraduates access to the history and archaeology, civilization and culture, philosophy and thought of the cultures that produced Judaism, Christianity, and Islam, and that today help define and characterize the many millions of people who live in the countries of the Middle East. The area, often called the "Cradle of Civilization," is the homeland of many of the earliest written languages, including the Semitic languages of the Bible and of the Koran, as well as other literatures of intrinsic merit and interest. These languages have exerted profound influence on the literatures of many civilizations, ancient and modern, Eastern and Western, including our own. The study of the Near East is, therefore, of seminal importance for our understanding of the emergence of Western civilization.

The department's offerings cover the historical span from the prehistory of the ancient Near East through the history of modern Israel, with primary focus on the ancient and medieval periods. Although generally restricted to the region of the Near East, courses in Jewish studies and medieval Jewish history necessarily encompass Western Europe. Studies pursued in this department will be found of lasting value to all whose career interests involve the cultures of the ancient Near East, the modern Middle East, and the field of Jewish studies. The department offers students majors in four areas: Near Eastern languages and literatures, Near Eastern and biblical civilizations, history of the Jewish people, and Hebrew language and literature.

Near Eastern Languages and Literatures

Those who major in Near Eastern languages and literatures must successfully complete (a) proficiency in Classical Hebrew and qualification in a second Semitic language; (b) an additional twenty-four credits selected from courses listed under Akkadian, Arabic (211 and above), Aramaic, Ethiopic, Hebrew (202 and above), Ugaritic, ancient Near Eastern literature, biblical literature, rabbinic literature, Arabic literature, history of ancient Near Eastern civilizations, Near Eastern and biblical archaeology; (c) and fifteen credits in related subjects listed under history of the Jewish people, general Judaic studies, modern Hebrew literature, or any courses in the humanities selected in conference with the adviser.

Near Eastern and Biblical Civilizations

Those who major in Near Eastern and biblical civilizations must successfully complete (a) qualification in Classical Hebrew or one other Semitic language; (b) an additional twenty-four credits selected from the courses listed under biblical literature, history of the Jewish people, history of ancient Near Eastern civilizations, ancient Near Eastern literature, Near Eastern and biblical archaeology, and advanced Semitic language courses; (c) and fifteen credits in related subjects. Related subjects for this purpose may be any courses in the humanities selected in conference with the adviser.

History of the Jewish People

Those who major in history of the Jewish people must successfully complete (a) proficiency in Hebrew; (b) an additional twenty-four credits in advanced courses listed under Hebrew (above 201), history of the Jewish people, history of ancient Near Eastern civilizations, Near Eastern and biblical archaeology; (c) and fifteen credits of related

subjects listed under ancient Near Eastern literature, biblical literature, rabbinic literature, modern Hebrew literature, general Judaic studies, or any courses in the humanities selected in conference with the adviser.

Hebrew Language and Literature

Those who major in Hebrew language and literature must successfully complete (a) competence in Hebrew equivalent to the completion of 301; (b) an additional twenty-four credits of advanced courses—of which 302 must be completed—listed under Classical Hebrew, ancient Near Eastern literature, biblical literature, rabbinic literature, and modern Hebrew literature; (c) and three courses in related subjects listed under history of the Jewish people, general Judaic studies, or any courses in the humanities selected in conference with the adviser.

The Honors Program

Candidates for the degree of Bachelor of Arts with honors in Near Eastern languages and literatures, Near Eastern and biblical civilizations, history of the Jewish people, and Hebrew language and literature, must fulfill the requirements of the appropriate major study, and enroll in the honors course 400 in the first semester of their senior year. For admission to the honors program, candidates must have a cumulative average of B- or better and have demonstrated superior performance in Near Eastern studies courses. After consulting with their major adviser, candidates should submit an outline of their proposed honors work to the department during the second semester of their junior year.

Distribution Requirements

The distribution requirement in humanities is satisfied in Near Eastern studies by any two courses at the 200 level or above, except language courses. However, 231-232 and 301-302, which emphasize literary aspects, will satisfy the distribution requirement.

Program of Jewish Studies

The field of Jewish studies encompasses a broad spectrum of disciplines that includes language, literature, philology, and history. The Department of Near Eastern Studies offers students the opportunity to take a wide variety of courses in Jewish studies on all levels. Furthermore, cooperating faculty in other departments periodically offer additional courses in Jewish studies whose subjects are not represented in this department. Students interested in planning a program in Jewish studies should consult with the coordinator, J. Cohen. Contributing faculty are listed with the program description, p. 133.

Study Abroad

Near Eastern studies majors may choose to study in the Near East in their junior year. There are various academic programs in Israel and Egypt that are recognized by the Department of Near Eastern studies and that allow for the transfer of credit. Archaeological field work on Cornell-sponsored projects in the Near East or recognized field schools in Israel may also qualify for course credit.

Ancient Mediterranean Studies

See p. 129.

Medieval Studies

See p. 134.

Religious Studies

See p. 136.

Hebrew

101-102 Elementary Modern Hebrew I, II 101, fall; 102, spring. 6 credits each term. Each section limited to 15. Prerequisite for 102: 101 or permission of instructor.

*Sec 1, M T W Th F 9:05; **sec 2, M T W Th F 10:10; **sec 3, M T W Th F 11:15; *sec 4, M T W Th F 1:25.

Semi-intensive course providing the fundamentals of modern Israeli Hebrew with emphasis on the development of reading, writing, listening, and speaking skills. Course conducted in small groups by native Hebrew speakers with supplementary work at the language laboratory.

*For students with no Hebrew background.

**For students with some Hebrew background.

103-104 Elementary Classical Hebrew 103, fall; 104, spring. 4 credits each term. Prerequisite for 104: 103 or permission of instructor.

M W F 11:15. M. Collins.

A thorough introduction to the grammar and syntax of biblical Hebrew. Stress is placed on noun and verb patterns, sentence types, acquisition of basic vocabulary, and fluency in reading biblical prose and poetry. This course provides the basis for the study of the historical development of the Hebrew language.

201-202 Intermediate Modern Hebrew I, II

201, fall; 202, spring. 6 credits each term. Each section limited to 15. Prerequisites: for 201, 102 or permission of instructor; for 202, 201 or permission of instructor.

Sec 1, M T W Th F 9:05; sec 2, M T W Th F 11:15. Second-year modern Israeli Hebrew. Continued development of reading, writing, listening, and speaking skills. Review of grammar; readings from contemporary Israeli prose and poetry; guided conversation and composition. Course is conducted in small groups by native Hebrew speakers with supplementary work at the language laboratory.

[301-302 Advanced Modern Hebrew I, II] 301, fall; 302, spring. 4 credits each term. Not offered 1978-79.]

303 Independent Study Fall or spring. 2-4 credits. Open to qualified students.

Arabic

111-112 Elementary Arabic 111, fall; 112, spring. 6 credits each term. Limited to 15. Prerequisite for 112; 111 or permission of instructor.

M T W Th F 12:20. M. B. Schub.

An introduction to the phonology, morphology, and syntax of classical and modern standard Arabic: a thorough background in grammar is stressed. Reading selections from the Qur'an, the classical period, and modern period are studied. Introduction to Arabic dialectology.

211-212 Intermediate Arabic 211, fall; 212, spring. 3 credits each term. Prerequisite: for 211, one year of Arabic or permission of instructor; for 212, 211 or permission of instructor.

T Th 2:30-3:45. M. B. Schub.

The grammar of classical and modern standard Arabic is stressed. Extensive reading selections from the Qur'an, the classical period and the modern period are studied. Some introductory topics in Arabic dialectology and comparative Semitic linguistics are discussed.

[311-312 Advanced Arabic] 311, fall; 312, spring. 4 credits each term. Not offered 1978-79.]

351 Independent Study Fall or spring. 2-4 credits. Open to qualified students.

M. B. Schub.

Akkadian

[323–324 **Elementary Akkadian** 323, fall; 324, spring. 4 credits each term. Not offered 1978–79.]

325. Readings in Akkadian Texts Fall or spring. 3 credits. May be repeated for credit.

Hours to be arranged. D. I. Owen.
Fall: Readings in literary texts. Spring: readings in historical texts.

Aramaic

327 Aramaic Spring. 4 credits. Prerequisite: permission of instructor.

M W F 1:25. M. Collins.
The western Aramaic of the Bible, the Qumran Scrolls, and the Targums; reading of selected texts.

Ethiopic

See below under Comparative Semitic Linguistics

Ugaritic

[328 **Ugaritic** Fall. 3 credits. Not offered 1978–79.]

Comparative Semitic Linguistics

329 Introduction to Comparative Semitic Linguistics through Ethiopic Spring. 4 credits.

Prerequisite: permission of instructor.
M W F 1:25. M. B. Schub.
Classical Ethiopic (Ge'ez) readings and grammar, studied in the light of comparative Semitic linguistics. Some knowledge of Arabic and/or Hebrew is desirable.

Ancient Near Eastern Literature

[282 **Ancient Near Eastern Literature (also C Lit 226)** Spring. 4 credits. Not offered 1978–79.]

Biblical Literature

[141 **Freshman Seminar in Biblical Literature—World in Crisis: The Response of Jewish Apocalyptic** Spring. 3 credits. Not offered 1978–79.]

231 Readings in Classical Hebrew Prose Fall. 3 credits. Prerequisite: 104 or equivalent with permission of instructor.

M W F 9:05. M. Collins.
Intensive reading of selected biblical prose texts. Emphasis on fluency in reading and interpretation of texts from various points of view: grammar, syntax, semantics, literary structure, and style.

232 Readings in Classical Hebrew Poetry

Spring. 3 credits. Prerequisite: 104 or permission of instructor.

M W F 9:05. M. Collins.
Intensive reading of selected biblical poetic texts. Emphasis on literary structure and form, poetic devices and style, fluency in reading, and linguistic analysis.

331 The Literature of Ancient Israel I Fall. 4 credits.

M W F 1:25. Staff.
The literature of ancient Israel through the sixth century B.C.E. Sources include the Torah, former prophets, pre-exilic and exilic prophets, and selections from the Hagiographa (writings). Emphasis is on literary structure and style accompanied by explanations of cultural, religious, and historical background. All readings in English translation.

[332 **The Literature of Ancient Israel II** Spring. 4 credits. Not offered 1978–79.]

Rabbinic Literature

333 The Historical Development of Rabbinic Legal Literature Spring. 4 credits.

T 2:30, Th 2:30–4:10. J. Cohen.
A survey of the most important stages in the development and recording of oral law—beginning with the period of the Second Commonwealth in Israel and ending with the close of Spanish Jewry's Golden Age—from both literary and historical perspectives. Texts to be studied (in translation) include: Midrash Halakhah, Mishnah, Talmud, and Maimonides' Code of Jewish Law. The background of each text and the entire process of the development of the halakhah with all its cultural ramifications will be discussed.

[334 **Biblical Interpretation in Rabbinic Literature** 4 credits. Not offered 1978–79.]

Medieval Hebrew Literature

[371 **The Secular Hebrew Poetry of the Andalusian Period: Moslem Spain** Spring. 4 credits. Not offered 1978–79.]

Modern Hebrew Literature

[260–261 **Modern Hebrew Literature in English Translation** 260, fall; 261, spring. 4 credits each term. Not offered 1978–79.]

[361–362 **Seminar in Modern Hebrew Literature: The National Renaissance (1881–1914)** 361, fall; 362, spring. 4 credits each term. Not offered 1978–79.]

[363–364 **Seminar in Modern Hebrew Literature: The Enlightenment (1780–1880)** 363, fall; 364, spring. 4 credits each term. Not offered 1978–79.]

[365 **Hebrew Poetry of the Twentieth Century** Fall. 4 credits. Not offered 1978–79.]

366 Seminar in Modern Hebrew Literature: The Israeli Short Story Fall. 4 credits. Prerequisite:

202 or equivalent advanced Hebrew language course, or permission of instructor. Course conducted in Hebrew.

Hours to be arranged. Staff.
An analytical study of the narrative art of Israel's contemporary writers.

367 Seminar in Modern Hebrew Literature: The Israeli Novel Spring. 4 credits. Prerequisite:

301 or equivalent advanced Hebrew language, or permission of instructor. Course conducted in Hebrew.

Hours to be arranged. Staff.
Styles, themes, and problems in the contemporary Israeli novel reflecting religious, cultural, and social issues that confront the people of Israel.

[368 **Agnon and Hazaz** Spring. 4 credits. Not offered 1978–79.]

369 Independent Study Fall or spring. 2–4 credits each term. Prerequisite: permission of instructor. Open to majors and other qualified students.

Staff.

General Judaic Studies

[240 **What is Judaism?** Fall. 3 credits. Not offered 1978–79.]

[266 **Themes in Modern Hebrew Literature: The Holocaust** Fall. 3 credits. Not offered 1978–79.]

[320 **From Spinoza to Buber** Fall. 4 credits. Not offered 1978–79.]

[321 **Nationalism and Religion in Modern Jewish History (1789–1948)** Spring. 4 credits. Not offered 1978–79.]

343 The Jewish Community Throughout History

Fall. 4 credits. Prerequisite: permission of instructor. Hours to be arranged. J. Cohen.

A seminar on the evolving dynamics of Jewish communal organization from ancient to modern times. Discussions of both primary and secondary sources will consider the various legal, political, socioeconomic, religious institutions, and beliefs which held the Jewish community together in different environments. Particular emphasis will be placed on the factors which created major changes in the Jewish community, especially during the last 200 years.

See also:

The Literature of the Holocaust (Comparative Literature 323)

[**Yiddish Literature in English Translation (German Literature 350)** Not offered 1978–79.]

Politics of the Middle East (Government 358)

Jewish Workers in Europe and America, 1789–1948 (Industrial and Labor Relations 381)

History of the Jewish People

243 The History of Ancient Israel I (to 450 B.C.E.) Fall. 4 credits.

T Th 10:10–11:25. D. I. Owen.
A detailed survey of the history of ancient Israel from the traditional origins in the early second millennium (ca. 2000 B.C.E.) through the Babylonian Exile to the arrival of Ezra and Nehemia (ca. 450 B.C.E.). Discussion of biblical and Near Eastern sources relating to the history of Israel, as well as the archaeological evidence, will form the basis of the course.

244 The History of Ancient Israel II (450 B.C.E.–429 C.E.) Spring. 4 credits.

T Th 10:10–11:25. J. Cohen.
A detailed survey of the history of Israel from Ezra and Nehemia through the fall of Masada, the Bar Kochba rebellion and the end of Jewish civil autonomy in Palestine (429 C.E.). Discussion of biblical, Near Eastern, Greco-Roman, and rabbinic sources relating to this period, as well as the archaeological evidence, will form the basis of the course.

341 The History of the Jewish People III (429–1492) Fall. 4 credits.

T Th 12:20–1:35. J. Cohen.
A general survey of the history of Israel from the end of Jewish civil autonomy in Palestine (429) to the expulsion of the Jews from Spain (1492). The course will begin with a brief survey of the Jews in the West. The discussion will deal with the status of the Jews in medieval society; their relationship with the crown, church, nobility, and burghers; their contribution to the development of the cities, capitalism, and centralized government; the persecution of the Jews in the Middle Ages, and the establishment of the Spanish Inquisition.

342 The History of the Jewish People IV (1492–1948) Spring. 4 credits.

T Th 12:20–1:35. J. Cohen.
Commencing with the virtual disappearance of the Jews from most of Western Europe and culminating with the founding of the State of Israel, this course will trace the development of the status and personality of the modern Jew. It will focus attention both on the treatment of the Jew in the gentile world around him—his gradual emancipation into European and American society, the parallel rise of anti-Semitism, and the Nazi holocaust—as well as the numerous cultural responses of the Jew to this world—the shtetl, the Enlightenment, Hasidism,

religious reform, and Zionism. Emphasis will be placed on the reading of historical documents in translation.

[344 Age of the Patriarchs Fall. 4 credits. Not offered 1978-79.]

348 Independent Study Fall or spring. 2-4 credits. Open to qualified students. May be repeated for credit.

Staff.
Directed readings on the history, culture and civilization of ancient Israel.

[442 Seminar in Jewish History: The Medieval Church and the Jews Spring. 4 credits. Not offered 1978-79.]

History of Ancient Near Eastern Civilizations

[345 The History of the Ancient Near East Fall. 4 credits. Not offered 1978-79.]

349 Independent Study Fall or spring. 2-4 credits. Open to qualified students. May be repeated for credit. Directed readings on the history, culture, and civilization of the ancient Near East.
D. I. Owen.

[385 Interconnections in the Eastern Mediterranean World in Antiquity Spring. 4 credits. Not offered 1978-79.]

See also:

Greeks and Their Eastern Neighbors (Classics 322)

Introduction to Art History of Egypt and Mesopotamia (History of Art 211)

Near Eastern and Biblical Archaeology

[249 Ancient Seafaring (also Arkeo 275) 3 credits. Not offered 1978-79.]

285 Introduction to Biblical Archaeology Spring. 3 credits.

M W F 2:30. J. M. Weinstein.
A one-semester survey of the principal archaeological developments in Palestine, from the Neolithic Period (beginning ca. 9000 B.C.E.) to the fall of Masada (73 C.E.). Includes an introduction to the development of methodology in Palestinian archaeology, the role of archaeology in reconstructing ancient Palestinian culture, and the basic bibliography of the field. Primary emphasis will be placed on the use of archaeological data for understanding some of the major problems of Israelite history and archaeology, such as the dating and cultural milieu of the Patriarchs, the origin and history of the Philistines, and the dating and geographical setting of the Exodus and Israelite Conquest. Recommended for students planning to participate in excavations in Israel.

387 Archaeology of the Ancient Near East (also Arkeo 310) Fall. 4 credits. Prerequisite: Archaeology 100 or permission of instructor.

M W F 2:30. J. M. Weinstein.
Ancient civilizations between the Indus and the Mediterranean, from the first stone tool to the palace at Persepolis; Sumerian, Assyrian, Babylonian, Israelite, Phoenician, and Persian remains in terms of indigenous developments and cross-cultural contacts.

[481 Seminar in Syro-Palestinian Archaeology: The Israelite Conquest of Canaan Fall. 4 credits. Not offered 1978-79.]

See also:

[The Archaeology of Cyprus (Classics 321) Not offered 1978-79.]

Islamic

250 Classics of Islamic Literature Spring. 3 credits. Freshman Seminar.
M W F 2:30. Staff.

A study of the culture and poetry of pre-Islamic Arabia, Muhammad and the *Koran*, and works of traditional and secular authors of the eighth to thirteenth centuries. Students will be introduced, through readings in translation, to the diversified culture of the Islamic "Golden Age," which has set the standard for subsequent intellectual and cultural developments in the Muslim World.

[253 Classical Islam Fall. 3 credits. Not offered 1978-79.]

[374 The Mystics of Islam Spring. 4 credits. Not offered 1978-79.]

[376 Topics in the Civilization of Islam Spring. 4 credits. Not offered 1978-79.]

Honors Course

400 Independent Study: Honors Fall or spring. 2-4 credits. Directed readings and conferences centered on the candidate's honors thesis. Thesis topic must be approved by the honors adviser at the end of the second term of the junior year.

See also:

New Testament Greek (Classics 202)

[Introduction to Medieval Latin (Classics 214) Not offered 1978-79.]

Introduction to Classical Archaeology (Classics 220)

[Minoan-Mycenaean Art and Archaeology (Classics 221) Not offered 1978-79.]

[Art and Archaeology of Archaic Greece (Classics 326) Not offered 1978-79.]

[Pagan and Christian at Rome (Classics 332) Not offered 1978-79.]

Problems in Minoan-Mycenaean Archaeology (Classics 629)

Philosophy

D. B. Lyons, chairman; J. G. Bennett, R. N. Boyd, G. Fine, C. A. Ginet, H. Hodes, T. H. Irwin, N. Kretzmann, R. W. Miller, S. Shoemaker, R. C. Stalnaker, N. L. Sturgeon, A. W. Wood

Students expecting to major in philosophy should begin their study of it in their freshman or sophomore year. Admission to the major is granted by the Director of Undergraduate Education of the department on the basis of a student's work during the first two years.

Eight philosophy-courses are required for the major. They must include at least one course in ancient philosophy, at least one course in the history of philosophy other than ancient philosophy, and a minimum of three courses numbered above 300, at least one of which must be numbered above 400 (with the exception of 490). Philosophy 231, while not required, is especially recommended for majors or prospective majors.

Philosophy majors must also complete at least eight credits of course work in related subjects approved by their major advisers.

Occasionally, majors may serve as teaching or research aides, working with faculty members familiar with their work.

The Honors Program

A candidate for honors in philosophy must be a philosophy major with a B- or better for all work in the College of Arts and Sciences and an average of B or better for all work in philosophy. In either or both terms of the senior year a candidate for honors enrolls in Philosophy 490 and undertakes research leading to the writing of an honors essay by the end of the final term. Prospective candidates should apply to the Department of Philosophy.

Distribution Requirements

The distribution requirement in the humanities is satisfied in philosophy by completing any two courses in philosophy, with the following exceptions: (a) Philosophy 100 if used in satisfying the Freshman Seminar requirement; (b) a combination of two courses in formal logic, such as 231, 431, 432, and 436.

Introductory Courses

100 Freshman Seminar in Philosophy Fall or spring. 3 credits. Open only to freshmen who have not taken 101. Independent sections; limited to 21 students per section.

Fall: M W F 9:05, staff; T Th 10:10, staff;
M W F 11:15, staff; M W F 1:25, N. Sturgeon;
M W F 2:30, staff; T Th 10:10, staff; T Th 12:20, staff.
Spring: M W F 9:05, staff; M W F 1:25, R. Miller; M W F 1:25, S. Shoemaker; M W F 2:30, S. Shoemaker; T Th 2:30-3:45, C. Ginet; T Th 10:10, staff; T Th 12:20, staff.

101 Introduction to Philosophy Fall or spring. 3 credits.

Fall: T Th 8:00, N. Kretzmann; spring: T Th 10:10, A. Wood.

Readings in classic works of philosophy (such as Plato, Aquinas, Descartes, Hume, Mill, Russell) concerned with central philosophical issues—foundations of knowledge, reality and illusion, the basis of morality, the existence of God.

102 Introduction to Philosophy: Problems Spring. 3 credits.

M W F 11:15. D. Lyons.
An intensive examination of basic problems in philosophy. Topic for 1978-79: Values and Facts.

131 Logic: Evidence and Argument Fall. 4 credits.

M W F 10:10. J. Bennett.
A course designed to develop skills at analysing and evaluating reasoning, argument and evidence in the sciences, religion, ethics, the law, politics and philosophy.

Courses Primarily for Undergraduates

All 200-level courses are open to freshmen. All 200- and 300-level courses are designed primarily for undergraduates. Some 300-level courses have prerequisites which instructors may waive in individual cases. Graduate students may enroll in 300-level courses unless excluded by the instructor.

[201 Philosophical Problems Not offered 1978-79.]

[210 Ancient Thought Not offered 1978-79.]

211 Ancient Philosophy Fall. 4 credits.

T Th 12:20. G. Fine.
An introduction to the major arguments and theories of the early Greek philosophers and of Plato and Aristotle, in cosmology, theories of knowledge and reality, and ethics.

112 Philosophy

212 Modern Philosophy Spring, 4 credits.

T Th 12:20. A. Wood.

A survey of some major philosophical problems in the Rationalists, Empiricists, and Kant. Typical problems include: the nature and limits of knowledge; perception; the existence of God; free will and determinism; mind and body. Readings from Descartes, Spinoza, Leibniz, Locke, Berkeley, Hume, and Kant.

[213 Existentialism Not offered 1978-79.]

214 Philosophical Issues in Christian Thought

Spring, 4 credits.

T Th 8:00. N. Kretzmann.

Philosophical issues concerning such characteristically Christian concepts as the Trinity, the Incarnation, redemption, predestination, personal immortality, hell, revelation and faith, as treated by philosophers and theologians from the beginnings of Christianity until the present. Readings from the first 1500 years of Christian thought, supplemented by contemporary scholarly and critical literature.

231 Formal Logic Fall, 4 credits.

M W F 11:15. C. Ginet.

Analysis and evaluation of deductive reasoning in terms of formalized language. The logic of sentences and predicates.

241 Ethics Spring, 4 credits.

T Th 10:10-12:05. N. Sturgeon.

Introduction to the philosophical study of moral problems and ethical theories through both historical and contemporary sources. Topics typically include: relativism and scepticism; egoism and utilitarianism; and one or more specific moral issues, such as abortion, rules of war, or reverse discrimination.

242 Social and Political Theory Fall, 4 credits.

M W F 1:25. R. Miller.

A historical survey of philosophical thinking about the nature and norms of human society. Topic for 1978-79: Individualism and its critics—Hobbes, Locke, Rousseau, Marx.

243 Aesthetics Spring, 4 credits.

T Th 2:30. J. Bennett.

An introduction to philosophical problems concerning the nature of art, aesthetic value, and critical reasoning. Classic attempts to define the nature of genuine art; the objectivity of aesthetic judgment; the relation between the value of a work of art and the truth of the ideas it embodies.

[244 Philosophy in Literature Not offered 1978-79.]

245 Biomedical Ethics See course description under Biological Sciences 205.

246 Environmental Ethics See course description under Biological Sciences 206.

247 Women, Values, and Society See course description under Women's Studies 247.

261 Knowledge and Reality Fall, 4 credits.

T Th 2:30. R. Miller.

Introduction to problems concerning the nature of knowledge, certainty and belief, cause, truth, substance, identity, essence, and abstract entities.

262 Philosophy of Mind Spring, 4 credits.

M W F 10:10. S. Shoemaker.

Problems about the mind and our knowledge of it. The relation of mind to body (can thoughts and feelings be neural events in the brain, and how are such mental events and states related to bodily behavior?); our knowledge of the thoughts and feelings of other persons (how can one know that another is a conscious creature like oneself, and not a mere automaton?); our knowledge of our own

minds (introspection and self-awareness); personal identity and the unity of consciousness; freedom of the will.

263 Reason and Religion Fall, 4 credits.

T Th 10:10. A. Wood.

A survey of topics related to the rational understanding and assessment of theism in the western tradition.

[309 Plato Not offered 1978-79.]

310 Aristotle Fall, 4 credits.

M W F 1:25. T. Irwin.

Aristotle's main doctrines and the problems they raise for a contemporary philosopher, especially on language and reality; scientific method and the structure of scientific knowledge; matter, form, and substance; essence and accident; philosophy of nature and the understanding of living organisms; mechanism and purpose; time and change; soul and body.

311 Modern Rationalism Spring, 4 credits.

M W F 1:25. C. Ginet.

Topic for 1978-79: Descartes and Leibniz.

312 Modern Empiricism Fall, 4 credits.

Prerequisite: one course in philosophy.

M W F 10:10. N. Sturgeon.

Locke, Berkeley, and Hume. Substance, causality, and necessity; meaning; the possibility of scientific and moral knowledge. Historical and critical emphasis, with some illustrations of influences on more recent empiricist theories.

313 Medieval Philosophy Spring, 4 credits.

T Th 2:30. N. Kretzmann.

Examination of selected classic works in medieval philosophy.

[314 Topics in Ancient Philosophy Not offered 1978-79.]

[315 Special Topics in the History of Philosophy Not offered 1978-79.]

[316 Kant Not offered 1978-79.]

[317 Hegel Not offered 1978-79.]

[318 Twentieth-Century Philosophy Not offered 1978-79.]

319 Philosophy of Marx Fall, 4 credits.

T Th 2:30. A. Wood.

The philosophical aspects of the thought of Karl Marx. The dialectical method; Marx's concepts of humanity and alienation; the materialist conception of history; the foundations of Marxian economic theory; the Marxian critique of capitalism.

332 Semantics Fall, 4 credits. Prerequisites: one course in philosophy; background in logic.

T Th 10:10. H. Hodes.

Selected topics in philosophy of language, examined in a historical setting. Readings from Frege, Russell, Carnap, Quine, Davidson, Chomsky, and others. Topics will include reference, analyticity, translation, referential opacity, and the relation between semantics and other sciences.

[341 Ethical Theory Not offered 1978-79.]

342 Law, Society, and Morality Fall, 4 credits.

Prerequisite: one course in philosophy.

M W F 11:15. D. Lyons.

An introduction to legal and political philosophy emphasizing the nature of law, the problem of coercion, principles of justice, and general welfare.

[361 Metaphysics and Epistemology Not offered 1978-79.]

[363 Topics in the Philosophy of Religion Not offered 1978-79.]

381 Philosophy of Science Spring, 4 credits.

W 7:30-10:30 p.m. R. Boyd.

An examination of topics that arise in attempting to understand the historical development and the logical setting of science; theories and observation, explanation, and the testing of hypotheses.

383 Philosophy of Choice and Decision Spring, 4 credits. Prerequisite: one course in philosophy or one course with related subject matter.

T Th 10:10. J. Bennett.

Philosophical foundations and applications of theories of rational decision making. Risk and uncertainty, measurement and interpersonal comparison of utilities, applications of game theory, collective choice.

[387 Philosophy of Mathematics Not offered 1978-79.]

[388 Social Theory Not offered 1978-79.]

[389 Philosophy of History Not offered 1978-79.]

390 Informal Study Fall or spring. Credit to be arranged. To be taken only in exceptional circumstances. Must be arranged by the student with his or her adviser and the faculty member who has agreed to direct the study.
Staff.

Advanced Courses and Seminars

All 400-level courses are designed primarily for advanced undergraduates, philosophy majors, and graduate students; they include both lecture courses and seminars. All 600-level courses are seminars designed primarily for graduate students. The 400- and 600-level courses are open to others only with permission of the instructor.

[412 Medieval Philosophy Not offered 1978-79.]

413 Plato and Aristotle Fall, 4 credits.

M 2:30-4:25. T. Irwin.

Topic for 1978-79: Thought and Action in Greek Philosophy. Views of rationality; explanation of action; the nature of the self, the will, reason and desire; responsibility; weakness of will and compulsive desire; free will, determinism and fatalism. Readings in Plato, Aristotle, the Stoics and Epicureans, and in contemporary philosophers. A seminar suitable both for undergraduates and graduate students.

431 Deductive Logic Spring, 4 credits.

Prerequisite: 231 or equivalent.

T Th 12:20. H. Hodes.

The first-order predicate calculus; proof theory and model theory; the completeness theorem. Theories and definitions. Elementary set theory.

[432 Deductive Logic Not offered 1978-79.]

[433 Philosophy of Logic Not offered 1978-79.]

[435 Inductive Logic Not offered 1978-79.]

[436 Intensional Logic Not offered 1978-79.]

[437 Problems in the Philosophy of Language Not offered 1978-79.]

441 Contemporary Ethical Theory Fall, 4 credits.

W 2:30-4:25. J. Bennett.

Seminar for undergraduates and graduate students. Topic for 1978-79: Rawls' *Theory of Justice*.

[442 Problems in Ethics and Philosophy of Mind] Not offered 1978–79.]

443 Topics in Aesthetics Spring. 4 credits.

T Th 2:30. R. Miller.
Topic for 1978–79: Art and Objectivity. Is the truth of the ideas in a work of literature relevant to its aesthetic value? Are we ever justified in claiming objective truth for our aesthetic evaluations? Readings include Hume, Kant, Lukacs.

[461 Metaphysics] Not offered 1978–79.]

[462 Theory of Knowledge] Not offered 1978–79.]

[481 Problems in the Philosophy of Science] Not offered 1978–79.]

490 Special Studies in Philosophy Fall or spring. 4 credits. Open only to honors students in their senior year.
Staff.

611 Ancient Philosophy Fall. 4 credits.

T 3:45–5:40. G. Fine.
Topic for 1978–79: Plato's Metaphysics and Epistemology.

612 Medieval Philosophy Fall. 4 credits.

W 3:45–5:40. N. Kretzmann.
Topic for 1978–79: Scotus, Ockham, *et al.*

613 Modern Philosophers Spring. 4 credits.

T 3:45–5:40. N. Sturgeon.
Topic for 1978–79: Hobbes and the British Moralists.

[619 History of Philosophy] Not offered 1978–79.]

[631 Logic] Not offered 1978–79.]

[632 Semantics] Not offered 1978–79.]

[633 Philosophy of Language] Not offered 1978–79.]

641 Ethics and Value Theory Spring. 4 credits.

W 3:45–5:40. D. Lyons.
Topic to be announced.

[661 Theory of Knowledge] Not offered 1978–79.]

662 Philosophy of Mind Fall. 4 credits.

Th 3:45–5:40. C. Ginet.
Topic for 1978–79: Theory of Action.

[664–665 Metaphysics] Not offered 1978–79.]

681 Philosophy of Science Spring. 4 credits.

Th 3:45–5:40. R. Boyd.
Topic for 1978–79: Explanation.

[682 Philosophy of the Social Sciences] Not offered 1978–79.]

700 Informal Study Fall or spring. Credit to be arranged. To be taken by graduate students only in exceptional circumstances and by arrangement made by the student with his or her special committee and the faculty member who has agreed to direct the study.
Staff.

Related Courses in Other Departments

Chinese Philosophical Literature (Asian Studies 371)

Elementary Mathematical Logic (Mathematics 381)

Greek Philosophy (Classics 224–225)

Introduction to History of Religions (Asian Studies 203)

Kierkegaard and Nietzsche (Comparative Literature 698)

Seminar in Jewish and Islamic Philosophy (Near Eastern Studies 243)

Foundations of Western Thought (Classics 336)

Ancient Philosophy of Science (Classics 337)

Readings in Medieval Natural Philosophy (Society for the Humanities 417)

From Natural Philosophy to Modern Science (Society for the Humanities 418)

Space, Time, and Cause in Antiquity (Society for the Humanities 428)

Contemporary Legal Theory (Law 525)

The Nature of Religious Experience (Asian Studies 250)

Introduction to Asian Religions (Asian Studies 351)

Physics

D. B. Fitchen, chairman; V. Ambegaokar, N. W. Ashcroft, K. Berkelman, H. A. Bethe (emeritus), R. Bowers, G. C. Brown, D. G. Cassel, G. V. Chester, R. M. Cotts, J. W. DeWire, M. E. Fisher, B. Gittelman, K. Gottfried, K. Greisen, L. N. Hand, D. L. Hartill, P. L. Hartman, D. F. Holcomb, T. Kinoshita, J. B. Kogut, J. A. Krumhansl, D. M. Lee, R. M. Littauer, H. Mahr, B. D. McDaniel, N. D. Mermin, H. F. Newhall, J. Orear, R. O. Pohl, J. D. Reppy, R. C. Richardson, E. E. Salpeter, J. C. Scott, R. H. Siemann, A. J. Sievers, E. Siggia, R. H. Silsbee, A. Silverman, P. C. Stein, R. M. Talman, S. A. Teukolsky, M. Tigner, D. H. White, J. W. Wilkins, K. G. Wilson, W. M. Woodward, T. M. Yan, D. R. Yennie

Three introductory physics sequences are open to freshmen: 101–102, 112–213–214–315, and 207–208. In addition, there is a cluster of general-education courses 201 through 205. Advanced placement and credit are offered as outlined in the leaflet, *Advanced Placement of Freshmen*, or consult Professor R. Cotts, 522 Clark Hall. Physics 101–102 (noncalculus) has a prerequisite of three years of college-preparatory math. Both 112 and 207 require calculus (e.g. Math 191 or 111), and additional math is required for subsequent courses in sequence. 101–102 or 207–208 may be taken as terminal physics courses. The three- or four-term sequence 112–213–214 (–315) is recommended for physics majors and engineers.

For those wishing to pursue some physics beyond the introductory level, several courses may be appropriate: 205 Energy, 330 Modern Experimental Optics, 360 Introductory Electronics. Transfer students requesting credit for physics courses taken at another college should consult the department office.

Physics Major

Various options permit the student to concentrate heavily on physics, or to take less physics and pursue an accompanying constellation of courses in a related area. Those desiring a physics concentration as preparation for professional or graduate work should complete 112–213–214 or 112–217–218 (and preferably 315) by the end of the sophomore year. A basic preparation for a less

intensive physics program may include 112–213–214 or 207–208. In either case, it is necessary to complete a concurrent sequence of mathematics courses: Math 191–192–293–294 or 193–194–295–296 are normally recommended, except for students especially interested in continuing the study of pure mathematics, for whom Math 111–122–221–222 (or equivalent) may be preferred.

Prospective majors are urged to make an early appointment at the physics office for advice in planning their programs. Acceptance into the major is normally granted after completion of a year of physics and math at a satisfactory level; the student should propose a tentative plan for completing his or her graduation requirements as well as those for the major. The plan may change from time to time, but it must be approved by the major adviser. The major requirements have two components—a core and a concentration.

Core

(a) 112–213–214 (or 112–217–218) or 207–208; (b) an intermediate physics course in each of four areas: mechanics 431 or 318; electricity and magnetism 432 or 325; modern physics 315 or 443; and laboratory physics 310, 330, 360, or 410. Math courses prerequisite for the physics courses are also necessary. The choice of core is influenced by the intended concentration. For a concentration in physics, 112–213–214 (or 112–217–218), 318, 325, 315 or 443, and 310 or 410 is appropriate, while for concentrations outside physics part (b) of the core might consist of 315, 431, 432, and 410.

Concentration

This component reflects the student's interest in some area related to physics; the array of courses must have internal coherence. The concentration must include at least fifteen credits, unless otherwise stated, with at least eight credits at the junior-senior level (above 300). Examples of concentrations: physics; mathematics; biology; chemistry; astrophysics; natural sciences; engineering; computer science; science, technology, and society; environmental studies; intellectual history; history and philosophy of science; city planning and urban development; business and economics.

The concentration in physics is recommended as preparation for professional or graduate work in physics or a closely related discipline. Twelve credits from physics courses above 300, in addition to those selected for part (b) of the core, are required; the program must include 410. Also, the following are strongly advised: 443; Math 421, 422, and 423; and at least one from 341, 444, 454, Applied and Engineering Physics 401, Astronomy 431–432, Geological Sciences 485–486. Students with a concentration in physics who wish to emphasize preparation for astronomy or astrophysics should consult the astronomy section of this *Announcement*.

A combined biology-chemistry concentration is recommended for premedical students or those who wish to prepare for work in biophysics. The concentration in natural science is particularly appropriate for teacher preparation.

Foreign Language Requirement

Students interested in eventual graduate work in physics are advised to meet this requirement with French, German, or Russian.

The Honors Program

A student may be granted honors in physics upon the recommendation of the Physics Advisers Committee of the physics faculty.

Distribution Requirement

The requirement in physical sciences is met by any two sequential courses such as 101–102 or 207–208; or by any two general-education courses from the group 201–205. "Crossovers" between sequences are permitted if prerequisites are satisfied; however, such crossovers (or the use of a truncated sequence such as 112–213) should be regarded as accidents in the evolution of a student's schedule, not as sound planning.

Prerequisites

Prerequisites are specified in the following course descriptions to illustrate the materials that students should have mastered. Students who wish to plan programs different from those suggested by the prerequisite ordering are urged to discuss their preparation and background with a physics adviser or with the instructors in the courses. In many cases an appropriate individual program can be worked out without exact adherence to the stated prerequisites.

Courses

101–102 General Physics 101, fall, except by special permission; 102, spring (101–102 usually is offered also in the Summer Session.) 4 credits each term. Prerequisites: three years of high school mathematics, including some trigonometry. Course 101 (or 112 or 207) is prerequisite to 102. Includes more modern physics and less mathematical analysis than 207–208 or 112–213–214, but more mathematics than courses in group 201 to 205. Students planning to major in a physical science should elect 207–208 or 112–213–214. A self-paced, mastery-oriented audiotutorial format; students work in a learning center at hours of their own choice. Repeated tests on each unit are given until mastery is demonstrated. One large orientation meeting on Tuesday, September 5 10:10 or 12:20, and on Wednesday, January 24, 7:30 p.m.
G. C. Brown and staff.

Basic principles treated quantitatively but without calculus. Major topics for 101: particle structure of matter; kinematics; forces and fields (including electric fields); momentum, angular momentum, energy (including nuclear energy); relativity; sound waves. For 102: electricity and magnetism; optics; thermal physics; quantum physics. Laboratory emphasizes instrumentation, measurement, and interpretation of data. Text: *Physics for College Students—with Applications to the Life Sciences* by Tilly and Thumm.

112 Physics I: Mechanics and Heat Fall or spring. (Usually also offered during the Summer Session.) 4 credits. Primarily for students of engineering and for prospective physics majors. Prerequisite: coregistration in Math 192 (or 194 or 112), or substantial previous contact with introductory calculus, combined with coregistration in Math 191 (or 193 or 111). Evening examinations October 12, November 16, February 27, and April 3.
Lec, M W 10:10 or 12:20; 2 rec each week; one 2-hr. lab alternate weeks. Fall, K. Berkelman; spring, R. Siemann.

Mechanics of particles; kinematics, dynamics, special relativity, conservation laws, central force fields, periodic motion. Mechanics of many-particle systems: center of mass, rotational mechanics of a rigid body, static equilibrium. Introduction to thermodynamics. At the level of *Fundamentals of Physics* (revised printing, 1974) by Halliday and Resnick.

201 Great Ideas of Physics Fall. 3 credits. Intended for nonscientists; does not serve as a prerequisite to further science courses. Assumes no scientific background, but may use some high school mathematics.
Lec, M W F 2:30; disc to be arranged. H. Mahr. Students will investigate the basic concepts involved

in some of the milestones in the evolution of physics. Topics will be selected from Newtonian mechanics; special relativity; gravitation; the difference between left and right; entropy and the "heat death" of the universe; the nature of light; quantum theory and the indeterminacy principle.

202 Physics in the World Around Us Spring. 3 credits. Intended for nonscientists; does not serve as a prerequisite to further science courses. Assumes no scientific background, but may use some high school mathematics.

Lec M W F 2:30; disc to be arranged. G. Chester. This course will show how the principles of physics explain some of the most striking phenomena we see in the world around us. Two or three topics will be chosen from the following: weather and storms, tides, the flight of birds and airplanes, the color of the sky and sea, and the formation of crystals. Some everyday phenomena that are as yet unexplained may be included for discussion. The level of the course will be that of a typical article in the *Scientific American*.

203 The Physics of Space Exploration Spring. 3 credits. Intended for nonscientists; does not serve as a prerequisite for further science courses. Assumes no scientific background, but may use some high school mathematics.

Lec, M W F 2:30. E. Salpeter. Will show how the principles of physics (plus simple mathematics) are applied to gain knowledge about planets and stars. The physics behind space probes (and their limitations) will be discussed. Interpretation of data from space probes and from earthbound observations will be described. The level of the course will be that of a typical article in *Scientific American*.

204 Physics of Musical Sound Fall. 3 credits. Intended for nonscientists; does not serve as a prerequisite for further science courses. Assumes no scientific background, but will use some high school algebra.

Lec, M W F 2:30; disc to be arranged. R. H. Silsbee. The basic physical characterization of sound in terms of pitch, intensity, and tone quality will be developed, as well as the important concepts necessary to understand many features of the production, propagation, and perception of sound. Among the specific problems that will be discussed are mechanisms of tone production in musical instruments, speculations as to the basis of consonance and dissonance, the structure of musical scales, architectural acoustics, the production of multiphonics on monophonic instruments, and the principles of electronic synthesis of musical sound.

[205 Energy Not offered 1978–79.]

207–208 Fundamentals of Physics 207, fall; 208, spring. 4 credits each term. Prerequisites for 207: high school physics; coregistration in Math 192 or 112, or substantial previous contact with introductory calculus, combined with coregistration in Math 191 or 111. Prerequisites for 208: 207 (or 112 or 101), and at least coregistration in Math 192 or 112. Physics 207–208 is interided as the first college physics course for students majoring in a physical science, mathematics, or an analytically oriented biological science. Evening examinations October 12, November 9, March 1, and April 5.

Lec, M W 9:05 or 11:15; 2 rec each week; one 3-hr lab alternate weeks. Fall, R. Cotts; spring, R. Pohl. Core-plus-branch plan. The first nine-weeks of each semester are devoted to core material (lec/disc/lab format); 207, particle mechanics and waves; 208, electromagnetic fields and circuits. For the last five weeks each term, each student selects one branch topic and the work on this topic is done on an unstructured, self-paced basis. Possible branches: 207, thermodynamics, acoustics and the physics of music, special relativity, gravitation; 208, optics,

introduction to quantum mechanics, nuclear physics, electronics. Core at the level of *Elementary Classical Physics*, 2nd ed., by Weidner and Sells.

213 Physics II: Electricity and Magnetism Fall or spring. (Usually offered also during the Summer Session.) 4 credits. Primarily for students of engineering and for prospective physics majors. Prerequisites: 112 and coregistration in the continuation of the mathematics sequence required for 112. Evening examinations October 12, November 9, December 7, March 1, April 5, and May 3.

Lec, T Th 9:05 or 11:15; 2 rec each week; one 3-hr lab alternate weeks, and open evening labs optional. Fall, J. Orear; spring, R. Littauer. Electrostatics, behavior of matter in electric fields, magnetic fields, Faraday's law, electromagnetic oscillations and waves, magnetism. At the level of *Fundamentals of Physics* (Revised Printing, 1974) by Halliday and Resnick. Lab work supplements the written and oral work; electrical measurements, dc and ac circuits, resonance phenomena, physical electronics, electrical conduction, selected properties of electric and magnetic fields.

214 Physics III: Optics, Waves, and Particles Fall or spring. (Usually offered also during the Summer Session.) 4 credits. Primarily for students of engineering and for prospective physics majors. Prerequisites: 213 and coregistration in the continuation of the math sequence required for 112. (310 may be taken, by consent of the instructor, in place of the 214 lab; credit for 214 is then 3 credits.) Evening examinations September 26, November 2, December 5, February 22, March 15, and April 12.

Lec, T Th 9:05 or 11:15; 2 rec each week; one 3-hr lab alternate weeks. Fall, D. Holcomb; spring, D. Cassell. Wave phenomena; electromagnetic waves; physical optics; quantum effects, matter waves; uncertainty principle; introduction to wave mechanics, elementary applications. At the level of *Fundamentals of Waves, Optics, and Modern Physics* by Young.

217 Physics II: Electricity and Magnetism Fall or spring. 4 credits. A more rigorous version of Physics 213 for students who have done very well in 112 and desire a more analytic treatment than that of 213. Acceptance into the course will be determined by the instructor. Students should seek the approval of their adviser before registering. Prospective physics majors are encouraged to select 217. Students are required to do the laboratory work offered in 213 in order to obtain credit for 217. Evening exams may be scheduled.

Lec, T Th S 11:15; lab, as for 213. Fall, R. Pohl; spring, N. Ashcroft. Fundamentals of electricity and magnetism, including the use of vector calculus. At the level of *Electricity and Magnetism* by Purcell (Vol. II, Berkeley Physics Series.)

218 Physics III: Optics, Waves, and Particles Fall or spring. 4 credits. A special section of 214. Conditions governing enrollment are similar to those of 217. Students are required to do the lab work offered in 214 or to enroll concurrently in 310 (in which case credit for 218 is reduced to 3 credits). Evening exams may be scheduled.

Lec, T Th S 11:15; lab, as for 214 or 310. Fall, G. Chester; spring, J. Orear.

310 Intermediate Experimental Physics Fall or spring. 3 credits. Prerequisite: 208 or 213. May be taken concurrently with 214 or 218 in place of the laboratory work offered in 214, with consent of student's adviser.

Lab, T W or Th F 1:25–4:25. Fall, A. Silverman; spring, J. DeWire. Students select from a variety of experiments and as a final project design and perform an experiment of

their own choice. An individual, independent approach is encouraged. Facilities of the 410 lab will be available for some experiments.

315 Phenomena of Microphysics Fall or spring. 3 credits. Primarily for students of engineering and prospective majors in physics. Prerequisites: 214 and Math 294.

Fall: lec, M W F 9:05; E. Siggia. Spring: T Th S 11:15; J. Scott.

Introduction to the physics of atoms, solids, and nuclei, emphasizing the description of phenomena using the results of elementary quantum and statistical physics. At the level of *Fundamental University Physics*, Vol. III, by Alonso and Finn.

318 Analytical Mechanics Spring. 4 credits. Prerequisites: 208 or 214, one of Math 421, 422, or 423, or permission of instructor. Intended for physics majors concentrating in physics. Similar material is covered in 431 at a less demanding analytical level. (Applied and Engineering Physics 333, fall term, is approximately equivalent.)

Lec, M 11:15-1:15, W F 11:15. R. Cotts.

Newtonian mechanics of particles and systems of particles including rigid bodies; oscillating systems; gravitation and planetary motion; moving coordinate systems, relativistic kinematics; wave propagation; Euler's equations; Lagrange's equations; Hamilton's equations; normal modes and small vibrations. At the level of *Introduction to the Principles of Mechanics* by Hauser.

325 Electricity and Magnetism Fall. 4 credits. Prerequisites: 208 or 214, and coregistration in one of Math 421, 422, or 423, or permission of instructor. Intended for physics majors concentrating in physics. Similar material is covered in 432 at a less demanding analytical level.

Lec, T Th S 11:15, Th 1:25. B. Gittelman.

Electrostatics: electric charge and fields, potential, multipoles, conductors, Laplace equation and formal solutions, field energy, dielectric materials, polarization. Magnetostatics: currents, magnetic fields and vector potential, magnetic materials, field energy. Maxwell's equations, Poynting vector. Electrodynamics: plane waves, fields from moving and oscillating charges. At the level of *Lectures on Physics*, Vol. II, by Feynman and *Foundations of Electromagnetic Theory* by Reitz and Milford.

326 Electromagnetic Waves and Physical Optics Spring. 4 credits. Prerequisite: 325.

Lec, T Th S 9:05, W 1:25. K. Gottfried.

Electrodynamics: applications of Maxwell's equations, wave equation, transmission lines, wave guides, radiation, special relativity. Physical optics: reflection, refraction, dispersion, polarization, Fresnel and Fraunhofer diffraction. At the level of *Classical Electromagnetic Radiation* by Marion.

330 Modern Experimental Optics Spring. 3 credits. Prerequisite: one year of physics.

Lec, M 2:30; lab, T W Th or F 1:25-4:15.

A. Sievers.

A practical, lab-based course for students of physical and biological sciences. Students will select four or five subject units to match their interests and backgrounds. The list of units includes: physics of lasers, image formation, holography, spectroscopy, light pulses, coherence and correlation, diffraction and interference, light sources and detectors. Each unit involves one or more experiments from a set of varying difficulty and sophistication, and readings, supplementary notes, and problems. The course will serve as an introduction to modern optical techniques and equipment used in current research in biology, chemistry, physics, astronomy, etc.

341 Thermodynamics and Statistical Physics Fall. 4 credits. Prerequisites: 214 and Math 294.

Lec, T Th S 9:05, T 2:30. D. Lee.

Statistical physics, developing both thermodynamics and statistical mechanics simultaneously. Concepts

of temperature, laws of thermodynamics, entropy, thermodynamic relations, free energy. Applications to phase equilibrium, multicomponent systems, chemical reactions and thermodynamic cycles. Application of statistical mechanics to physical systems; introduction to treatment of Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics with applications. Elementary transport theory. At the level of *Fundamentals of Statistical and Thermal Physics* by Reif or *Thermal Physics* by Morse.

360 Introductory Electronics (also A&EP 363)

Fall or spring. 4 credits. Prerequisite: 208 or 213 or permission of instructor; no previous experience with electronic circuits is assumed. However, the course moves through the introductory topics (dc and ac circuits, basic circuit elements) rather quickly. Students wishing a somewhat slower-paced treatment might consider Ele E 210 to precede Physics 360.

Lec, M 2:30-4:25; lab, T Th or W F 1:25-4:25. Fall, R. Littauer; spring, A. Kuckes.

Basic analysis and design of semiconductor circuits useful in electronic instrumentation, such as: amplifiers; oscillators and waveform generators; switching, digital, and timing circuits; power supplies. Course notes will be supplied; the level is that of *Basic Electronics for Scientists* (3rd edition, 1977) by Brophy. This text will not be followed in detail.

400 Informal Advanced Laboratory Fall or spring. (Usually offered also during Summer Session.) Variable credit. Prerequisite: two years of physics and permission of instructor.

Lab, as for 410.

Experiments of widely varying difficulty in one or more areas, as listed under course Physics 410, may be done to fill the student's special requirements.

410 Advanced Experimental Physics Fall or spring. 4 credits. Limited to seniors except by special permission. Prerequisites: 214 (or 310 or 360), 318, and 325; or permission of instructor.

Lec, M 2:30-4:25; lab, T W or Th F 1:25-4:25.

P. Hartman and staff.

Lectures and problems on selected topics in experimental concepts and techniques. About seventy different experiments are available among the subjects of mechanics, acoustics, optics, spectroscopy, electrical circuits, electron and ion physics, heat, X rays and crystal structure, solid-state physics, cosmic rays, and nuclear physics. The student is expected to perform three to six diverse experiments, depending on difficulty, selected to meet individual needs and interests. Independent work is stressed.

431-432 Introductory Theoretical Physics I and II 431, fall; 432, spring. 4 credits each term.

Prerequisites: 431, 207-208, and Math 294 or equivalent; 432, 431 or equivalent; or permission of instructor. Primarily for physics majors with concentrations outside physics, and for graduate students in a science other than physics (e.g., chemistry, engineering, biology, geology). Physics 318 and 325 cover similar material at a higher analytical level, and are intended for physics majors concentrating in physics.

Lec, M W F S 11:15; Fall, A. Sievers; spring, R. Talman.

431: mechanics. Includes Newtonian mechanics, Lagrange's and Hamilton's equations, central forces, rigid-body motion, and small oscillations. At the level of *Classical Dynamics* by Marion. 432: electricity and magnetism. Includes electrostatics, magnetostatics, boundary value problems, dielectric and magnetic media, circuit theory, Maxwell's equations, and electromagnetic waves. At the level of *Classical Electromagnetic Radiation*, 3rd ed., by Marion.

443 Introductory Quantum Mechanics Fall. 4 credits. Prerequisites: 318 and 325, or 431-432; Math 421; and some knowledge of atomic physics at

the level of *Fundamental University Physics*, Vol. III, by Alonso and Finn.

Lec, M W F 9:05, M 3:35. V. Ambegaokar.

Introduction to concepts and techniques of quantum mechanics, at the level of *Introduction of Quantum Mechanics*, by Dicke and Wittke.

444 Nuclear and High-Energy Particle Physics Spring. 4 credits. Prerequisite: 443 or permission of instructor.

Lec, M W F 9:05, F 1:25. K. Berkeman.

Behavior of high-energy particles and radiation; elementary particles; basic properties of nuclei; nuclear reactions; nuclear forces; cosmic rays; general symmetries and conservation laws. At the level of *Subatomic Physics* by Frauenfelder and Henley.

454 Introductory Solid-State Physics Spring. 4 credits. Prerequisite: 443, or Chem 793, or permission of instructor.

Lec, T Th S 10:10, Th 3:35. J. Wilkins.

An introduction to modern solid-state physics, including lattice structure, lattice vibrations, thermal properties, electron theory of metals and semiconductors, magnetic properties, and superconductivity. At the level of *Solid State Physics* by Ashcroft and Mermin.

464 Physics of Macromolecules Fall. 3 credits. Prerequisite: a course in quantum mechanics.

T Th 10:10; disc or guest lecturer T 2:30.

D. Fitchen.

An introduction to the physics associated with the models for and the experimental investigation of the structure and physical properties of macromolecules. Primary emphasis will be on macromolecules of biological interest.

481-489 Special Topics Seminar Spring. 2 credits. S-U grades only. Prerequisite: senior physics major status or permission of instructor. F 2:30-4:25.

One selected topic of current interest will be studied. Students will participate in organization and presentation of material.

490 Independent Study in Physics Fall or spring. 1-3 credits. Ordinarily limited to seniors. Prerequisite: permission of professor who will direct proposed work. Individual project work (reading or laboratory) in any branch of physics.

500 Informal Graduate Laboratory Fall or spring. Variable credit.

505-506 Design of Electronic Circuitry 505, fall; 506, spring. 3 credits.

Lec, T Th 10:10. Fall, P. Stein; spring, D. Hartill.

Circuit techniques and design in electronic measurement and instrumentation with emphasis on pulse wave forms. At the level of *Pulse Electronics* by Littauer.

510 Advanced Experimental Physics Fall or spring. 3 credits.

Lab, T W or Th F 1:25-4:25. P. Hartman and staff.

About seventy different experiments are available among subjects of mechanics, acoustics, optics, spectroscopy, electrical circuits, electronics and ionics, heat, X rays, crystal structure, solid-state, cosmic rays, nuclear physics. Students are expected to perform four to eight experiments selected to meet individual needs. Independent work stressed.

520 Projects in Experimental Physics Fall or spring. 1-3 credits. To be supervised by faculty member.

Projects of modern topical interest that involve some independent development work by student. Opportunity for more initiative in experimental work than is possible in 510.

551 Classical Mechanics Fall. 3 credits.

Lec, T Th S 10:10. R. Talman.
Lagrangian and Hamiltonian formulation of classical mechanics. At the level of *Mechanics* by Landau and Lifshitz.

553-554 General Relativity (also Astro 509-510)

553, fall; 554, spring. 4 credits. Offered in alternate years. Prerequisite: knowledge of special relativity at the level of *Classical Mechanics*, by Goldstein.

Fall: lec, T Th 8:30-9:55; spring: lec, T Th 10:10-11:35. S. Teukolsky.

553 is a systematic introduction to Einstein's theory, with emphasis on modern coordinate-free methods of computation. Topics include: review of special relativity, modern differential geometry, foundations of general relativity, laws of physics in the presence of a gravitational field, experimental tests of gravitation theories. At the level of *Gravitation*, by Misner. 554 is a continuation of 553 which emphasizes applications to astrophysics and cosmology. Topics include: relativistic stars, gravitational collapse and black holes, gravitational waves, cosmology.

561 Classical Electrodynamics Fall. 3 credits.

Lec, M W F 10:10. T. Yan.
Maxwell's equations, electromagnetic potentials, electrodynamics of continuous media (selected topics), special relativity, radiation theory. At the level of *Classical Electrodynamics* by Jackson.

562 Statistical Mechanics (also Chem 796)

Spring. 4 credits. Primarily for graduate students. Prerequisite: Chem 793 or equivalent.

Lec, T Th 8-9:50. B. Widom.
Ensembles and partition functions. Thermodynamic properties of ideal gases and crystals. Third law of thermodynamics, equilibrium constants, vapor pressures, imperfect gases, and virial coefficients. Distribution and correlation functions, structure and properties of liquids. Lattice statistics and phase transition. Bose-Einstein and Fermi-Dirac ideal gases. At the level of Hill's *Statistical Thermodynamics*.

572 Quantum Mechanics I Fall or spring.

4 credits.
Lec, M W F 11:15. Fall, K. Gottfried; spring, T. Yan.
Dirac's formulation of quantum mechanics, transformation theory. Symmetries: angular momentum, the exclusion principle, time reversal. Elements of scattering theory and of perturbation theory. At the level of *Quantum Mechanics* by Gottfried. Familiarity with elementary aspects of Schrodinger equation, including its application to simple systems such as hydrogen atom, is assumed.

574 Quantum Mechanics II Spring. 4 credits.

Lec, M W F 11:15. J. Kogut.
Discussion of various applications of quantum mechanics, such as collision theory, theory of spectra of atoms and molecules, theory of solids, emission of radiation, relativistic quantum mechanics. At the level of *Intermediate Quantum Mechanics*, by Bethe and Jackiw. Required of all Ph.D. majors in theoretical physics.

612 Experimental Atomic and Solid-State Physics Fall. 3 credits.

Lec, M W F 1:25. R. Richardson.
Lectures on techniques and design principles, emphasis on study of solids by their interactions with electromagnetic fields. Topics: sources and detectors, scanning and resonance techniques, signal-processing, sample characterization, environmental control.

[614 Experimental High-Energy Physics Not offered 1978-79.]**635 Solid-State Physics I** Fall. 3 credits.

Lec, T Th S 11:15. J. Wilkins.
Introduction to solid-state physics including studies of lattice vibrations, electronic structure of metals

and insulators, with applications to electrical, thermal, transport properties. At the level of *Introduction to Solid State Physics* (4th Edition) by C. Kittel.

636 Solid-State Physics II Spring. 3 credits.

Lec, T Th 2:30-4. V. Ambegaokar.
Concepts developed in 635 extended and applied to survey of the following: band theory and Fermi surface in metals, localized states, magnetism, neutron and light scattering, phenomenological superconductivity.

645 High-Energy Particle Physics Fall. 3 credits.

Lec, T Th 2:30-4. L. Hand.
Physics of nucleons and mesons; strange and charmed particles from an experimental point of view. Strong, electromagnetic, and weak interactions. Introduction to the quark model. At the level of *Introduction to High Energy Physics* by Perkins.

646 High-Energy Particle Physics Spring. 3 credits.

Lec, T Th 2:30-4. B. Gittelman.
We will survey topics of current interest including hadron electroproduction, electron positron annihilation, and high energy neutrino reactions. Lectures and reading material will be at the level of *High Energy Hadron Physics* by Perl. Students will be expected to share in leading the discussions.

Only S-U grades will be given in courses numbered 650 or above.

651 Advanced Quantum Mechanics Fall. 3 credits.

Lec, T Th 12:50-2:15. T. Kinoshita.
Relativistic quantum mechanics with emphasis on perturbation techniques. Extensive applications to quantum electrodynamics. Introduction to renormalization theory. At the level of *Relativistic Quantum Mechanics* by Bjorken and Drell.

652 Quantum Field Theory Spring. 3 credits.

Lec, M W F 10:10. K. Wilson.
Canonical field theory, model field theories, Green's functions, renormalization. Introduction to analytic properties of scattering amplitudes and dispersion relations. Applications to strong interactions. At the level of *Relativistic Quantum Fields* by Bjorken and Drell.

653 Statistical Physics Fall. 3 credits.

Lec, M W F 9:05. N. Ashcroft.
Survey of topics in statistical physics such as approximation methods; scattering of light, X rays, neutrons; Boltzmann equation; phenomenological Fermi liquid theory and theory of simple fluids; introduction to Kubo formulae; superfluidity and superconductivity; computer experiments. At the level of *Statistical Physics* by Landau and Lifshitz.

654 Theory of Many-Particle Systems Spring. 3 credits.

Lec, T Th 10:10-11:35. E. Siggia.
Equilibrium and transport properties of microscopic systems of many particles studied at zero and finite temperatures. Thermodynamic Green's function techniques introduced and applied to such topics as normal and superconducting Fermi systems, superfluidity, magnetism, insulating crystals.

661 High-Energy Phenomena Fall. 3 credits.

Lec, M Th F 3:35. J. Kogut.
Topics of current interest in theory of strong interactions. At the level of *Dispersion Relations* by Klein.

665 Topics in Theoretical Astrophysics (also Astro 555) Fall. 4 credits. Usually offered the fall term of even-numbered calendar years.

Lec, M W F 2:30. E. Salpeter.

Usually concentrates on theory of the interstellar medium (ionization and thermal equilibrium; grain formation and destruction; cloud structure and star formation) but occasionally special topics will be discussed.

[667 Theory of Stellar Structure and Evolution (also Astro 560) Not offered in 1978-79.]**681-689 Special Topics** Offerings to be announced each term.

Typical topics are: group theory, analyticity in particle physics, weak interactions, superfluids, stellar evolution, plasma physics, cosmic rays, general relativity, low-temperature physics, X-ray spectroscopy or diffraction, magnetic resonance.

690 Independent Study in Physics Fall or spring.

Variable credit. Special graduate study in some branch of physics, either theoretical or experimental, under the direction of any professional member of the staff.

Psychology

B. P. Halpern, chairman; E. K. Adkins, H. A. Alker, A. W. Boykin, U. Bronfenbrenner, L. A. Cooper, J. P. Cunningham, R. B. Darlington, R. Dworkin, J. M. Farber, H. M. Feinstein, B. L. Finlay, E. J. Gibson, J. J. Gibson, R. E. Johnston, S. C. Jones, F. Keil, R. Kraut, W. W. Lambert, H. Levin, D. Levitsky, J. B. Maas, R. D. Mack, L. Meltzer, U. Neisser, D. T. Regan, T. A. Ryan, S. R. Shattuck-Hufnagel, K. E. Weick, D. Zahorik

The Major

Prerequisites for admission are: (a) any three courses in psychology (Education 110 may be counted toward the three-course requirement); students often begin with Psychology 101; (b) no grade below C+ in any psychology course; (c) acceptance by the Majors and Advising committee of the Department of Psychology.

Application forms may be obtained at the departmental office and should be filed two weeks before the preregistration period.

Requirements for the major are: (a) a total of forty credits in psychology (including prerequisites) in which students majoring in psychology are expected to choose, in consultation with their advisers, a range of courses that covers the basic processes in psychology (laboratory and/or field experience is recommended); (b) completion, before the beginning of the senior year, of an approved course in statistics, or the passing of an achievement examination administered by the department.

With the permission of the major adviser, courses in other departments may be accepted toward the major requirements.

Concentration in Biopsychology

Psychology majors interested in psychology as a biological science can elect to specialize in biopsychology. Students in this concentration must meet all of the general requirements for the major in psychology and must also demonstrate a solid background in introductory biology; physical sciences, including at least introductory chemistry; and mathematics. Students will design, with their advisers, an integrated program in biopsychology built around courses on physiological, chemical, anatomical, and ecological determinants of human and nonhuman behavior offered by the Department of Psychology. Additional courses in physiology, anatomy, organic chemistry, biochemistry, neurochemistry, neurobiology, and behavioral biology may be designated as part of the psychology major after consultation by the student and his or her biopsychology adviser.

Concentration in Personality and Social Psychology

In cooperation with the Department of Sociology, a concentration in personality and social psychology is available. Psychology majors who wish to specialize in social psychology are expected to meet the general requirements set by the department, including statistics. To ensure a solid interdisciplinary grounding, students in the concentration will be permitted to include in the major courses in sociology and related fields. Advisers will assist the student in the selection of a coherent set of courses from social organization, cultural anthropology, experimental psychology, social methodology, and several aspects of personality and social psychology. Seniors in the concentration may elect advanced and graduate seminars, with the permission of the instructor.

The Honors Program

The honors program is intended to give students an opportunity to examine selected problems in depth, and to carry out independent research under the direction of a faculty member. During the spring term of the junior year, an honors student will enroll in Psychology 494 and will develop a proposal and begin work on a research project. The student will consult with an honors adviser and a faculty sponsor. At the end of the spring term, a report of the semester's work will be submitted for faculty review.

By the fall term of the senior year, honors students will have begun work on their final research projects. They will also enroll in a senior honors seminar (Psychology 498) in which research projects will be discussed. Thesis research will continue in the spring with enrollment in Psychology 499 Senior Honors Dissertation. Final honors standing is based on a written thesis and an oral defense of the thesis, as well as on general academic performance.

Prospective applicants are advised to file applications early in the fall term of their junior year. Decisions on these applications will be made by the faculty at the end of the fall semester. It is possible for a student who has satisfactorily completed independent study or research to be admitted to the program at the end of the junior year. For consideration by the honors committee of the Department of Psychology, applicants must have a minimum cumulative grade average of at least a B+ in all courses in psychology.

Distribution Requirement

The distribution requirement in social science is satisfied by any two courses in psychology (Education 110 may be counted).

101 Introduction to Psychology: The Frontiers of Psychological Inquiry Fall. 4 credits. Students may not receive credit for both Psych 101 and Educ 110.

M W F 10:10 and 1 seminar, hours to be arranged. J. Maas.

The study of human behavior and sleep and dreaming. Topics include brain control, psychological testing, perception, learning, motivation, abnormal behavior, psychotherapy, and other aspects of applied psychology. Emphasis is upon contemporary problems confronting psychologists.

123 Introduction to Psychology: Biopsychology Fall. 3 credits. Not recommended for upperclass biology majors or psychology majors with a concentration in biopsychology.

T Th 9:05 and 1 section, hours to be arranged. E. Adkins and staff.

A survey of behavior emphasizing evolutionary and physiological approaches, designed to introduce students to the interface between biology and psychology. Both human and nonhuman behavior

will be included, together with theoretical issues pertaining to the application of biological principles to human behavior. Films, discussion.

128 Understanding Personality and Social Behavior Spring. 4 credits. Limited to 450 students.

M W F 10:10 and 1 seminar, hours to be arranged. S. C. Jones.

An examination of personality and social influences on the individual's adjustment to self and environment. Both classic and contemporary viewpoints will be considered and evaluated in the light of empirical evidence.

182 The Sociologizing of Freud (also Sociology 182) Spring. 3 credits. Freshman Seminar. Limited to 20 students.

T 1:25-4:25. H. Alker.

This course will emphasize the development of an interdisciplinary perspective for the appraisal of Freud. Classical work from the writings of Freud, Fromm, and Erikson will be included as topics for papers and discussion. The course will also explain why both psychologists and sociologists have found it necessary to assert that Freud neglected the cultural determinants of personal identity in favor of intrapsychic causes.

190 Thought and Intelligence Spring. 4 credits. Prerequisites: Open to juniors and seniors in any field, or to freshmen and sophomores who have had at least one course in psychology. Enrollment limited to 40.

M W F 9:05. U. Neisser

The concepts underlying the measurement of intelligence and the problems involved in interpreting such measurements are considered in the context of psychological studies of problem solving and thinking. Topics include: introspective accounts of thought, experiments on problem solving and concept formation, cross-cultural studies of thinking, the history of the concept of intelligence, reliability and validity of tests, heritability of intelligence, and recent relevant research.

201 Introduction to Psychology as a Laboratory Science Fall. 3 credits. Prerequisite: one course in psychology (normally 101, 123, 128, or 190). High school credit in psychology may meet this prerequisite with permission of instructor.

Lec, M W 10:10; lab, T or Th 10:10-12 or M or W 12:20-2:15. D. Zaborik.

Lectures and laboratory exercises will emphasize basic concepts of measurement, research design, and the relation between theory and experiment. Experiments will be drawn from several areas of psychology, and will be designed to provide experience with some of the most useful psychological research procedures.

205 Perception Fall. 3 credits. Limited to 65 students.

M W F 10:10. J. Farber.

Basic concepts and phenomena in the psychology of perception, with emphasis on the stimulus variables and sensory mechanisms involved. Visual and auditory perception will be discussed in detail, with some attention paid to other senses.

206 Psychology in Business and Industry (also Hotel Administration 314) Spring. 3 credits. Limited to 35 psychology students. Prerequisites: 101, 123, 128, or 190, or permission of instructor. Not recommended for upperclass students in ILR.

M W F 12:20. S. Davis.

The principles of psychology applied to industrial and business systems; personnel selection; placement and training; problems of people at work including evaluation, motivation, efficiency, and fatigue; and the social psychology of the work organization.

[207 Motivation Theory: Contemporary Approaches and Applications Fall. 4 credits. Prerequisite: an introductory psychology course; 201 recommended but not required. Not offered 1978-79. Next offered 1979-80.]

209 Developmental Psychology Spring. 3 credits. Prerequisite: an introductory psychology course.

M W F 9:05; sec to be arranged. F. Keil.

A comprehensive introduction to current thinking and research in developmental psychology. Topics will include perceptual and cognitive development in infancy and childhood, attachment, language development, Piagetian theory and research, moral development, cross-cultural perspectives, and socialization.

[210 Attention and Memory Spring. 3 credits. Prerequisite: an introductory course in psychology. U. Neisser. Not offered 1978-79.]

[212 Historical Roots of Modern Psychology Spring. 4 credits. Prerequisite: one course in psychology or permission of instructor. Not offered 1978-79.]

214 (124) Introduction to Cognitive Psychology Spring. 3 credits. No prerequisites. Next offered fall 1979 and fall semesters thereafter.

M W F 11:15. L. Cooper.

An introduction to psychology emphasizing the perceptual and cognitive processes that underlie human behavior. This course is designed to introduce the student to topics such as perception, memory, language, thinking, development, problem solving, and decision making, and to discuss techniques for investigating problems in these areas.

215 Introduction to Linguistics and Psychology Spring. 3 or 4 credits. The 4-credit option involves a laboratory project or paper. Open to first-year students by permission of instructor.

T Th 8-9:55. S. Shattuck-Hufnagel.

Topics covered include the nature of language, its acquisition, and the influence of the grammar of a language on the psychological processes of perception, memory, and production of sentences.

275 Introduction to Personality Psychology Fall. 4 credits. Prerequisites: an introductory psychology course.

T Th 10:10-11:35 and sec to be arranged.

R. Dworkin.

An introduction to research and theory in personality psychology, emphasizing contemporary approaches. Topics will include the dynamics, structure, and assessment of personality, as well as personality development and change. Biological and sociocultural influences on personality will also be considered.

280 Social Influence Processes: Attitude and Behavior Change (also Sociology 280) Spring. 3 credits.

T Th 10:10-11:25. D. Regan.

Intended to provide an extensive review of the literature on social influence processes. Beginning with the effects of the mere presence of others on behavior, we will discuss theory and empirical research related to conformity, compliance, imitation and modeling, group decision making, and attitude change. The relationship between attitudes and behavior will be examined in detail, and application will be made to naturally occurring social influence situations.

281 Interpersonal Relations and Small Groups (also Sociology 281) Fall. 4 credits. Laboratories limited to 16 students. Prerequisite: prior registration in laboratory-discussion section by signing roster kept by add-drop secretary outside room 238 Uris Hall.

Lec, M W 11:15; lab-disc, a two-hour period to be arranged. L. Meltzer.

The typical processes, relationships, and interpersonal styles found in small groups. Topics include shyness and assertiveness, productive and defensive communication, participation and alienation, conflict and harmony, social pressures, group decision-making, leadership, group emotionality, nonverbal communication, and social skills. The laboratory will involve the class in self-study exercises. Students will also work outside of class, in groups of 4-5, on a term project having two aspects: research on one of the above topics and self-study of the group processes which occur during the conduct of the project. The combination throughout the course of academic and experiential approaches should develop sensitivity to group processes and to the effects we ourselves have on other persons.

[282 Sex Roles (also Sociology 282) Fall. 3 credits. Prerequisite: a course in sociology or 128. M W F 2:30. Not offered 1978-79.]

[285 Personality and Social Systems (also Sociology 285) Fall. 4 credits. Prerequisite: one course in either psychology or sociology. Not offered 1978-79.]

[289 Conformity and Deviance (also Sociology 289) Spring. 4 credits. Prerequisites: one course in psychology or sociology. T Th 2:30-4 and 1 section, hours to be arranged. R. Kraut. Not offered 1978-79.]

[302 Individual Differences Spring. 3 credits. Prerequisite: introductory psychology course. Not offered 1978-79.]

303 Learning Spring. 3 credits. Prerequisite: 201 or a 300-level laboratory course in psychology. T Th 10:10. D. Zahorik.

The fundamental conditions and principles of learning, with emphasis on the basic phenomena of classical and operant conditioning. Traditional and contemporary theories of learning will be reviewed, and selected experimental literature will be discussed with special emphasis upon recent developments in the field.

305 Visual Perception Spring. 3 or 4 credits depending on whether the student chooses to do an independent laboratory project. Prerequisite: 205 or permission of instructor. Limited to 25 students. T Th 10:10. J. Farber.

A detailed examination of theories and processes in visual perception. Topics will include the perception of color, space, and motion; perceptual constancies; adaptation; pattern perception; and aspects of perceptual learning and development.

[308 Perceptual Learning Fall. 3 credits. Prerequisite: 201 or 305 or permission of instructor. E. Gibson. Not offered 1978-79.]

309 Development of Perception and Attention Fall. 3 credits. Prerequisite: 201, 305, or 308, or permission of instructor.

M W F 11:15. E. Gibson.
An ecological view of perceptual development: development of perception of objects, events, the spatial layout, pictures, and symbols.

313 Perceptual and Cognitive Processes Fall. 3 credits. Prerequisite: 205 or 214 (124) or permission of instructor.

T Th 10:10-11:40. L. Cooper.
Survey of research and theory in the area of perceptual and higher mental processes. Emphasis will be on the human as an information processing system. Topics to be covered include visual information processing, pattern recognition, cognition, memory, and artificial intelligence.

316 Auditory Perception Spring. 3 or 4 credits. 4 credit option involves a laboratory project or paper. Prerequisites: 205, 209, 214 (124) or 215 (other psychology, linguistics, or biology courses could serve as prerequisite with permission of the instructor).

Lec. T Th 2:30-4:25; lab, hours to be arranged. S. Shattuck-Hufnagel.

Basic approaches to the perception of auditory information, with special consideration of complex patterns such as speech, music, and environmental sounds.

322 Hormones and Behavior (also Biological Sciences 322) Spring. 3 credits. Prerequisites: one year of introductory biology, a course in psychology or Bio S 321, and junior or senior status. Open to sophomores only by permission.

T Th 10:10-11:30. E. Adkins and R. Johnston.
The relationship between endocrine and neuroendocrine systems and the behavior of animals, including humans. Major emphasis will be on sexual, parental, and aggressive behavior.

324 Biopsychology Laboratory (also Biological Sciences 324) Spring. 3 credits. S-U grades optional. Enrollment limited to 25. Prerequisites: 201 or Bio S 103-104, 123 or Bio S 321, junior or senior status, and permission of instructor.

T Th 1:25-4:25. Staff.
Experiments designed to provide research experience in animal behavior (including learning) and its neural and hormonal mechanisms. A variety of techniques, species, and behavior patterns will be included.

325 Introductory Psychopathology Fall. 3 or 4 credits. The 3-credit option entails lectures, readings, and two exams. The 4-credit option requires an additional seminar-recitation meeting and a term paper. May be taken concurrently with 327 (for 3 credits in 325 and 2 credits in 327) with permission of instructor. Enrollment in 327 is limited. Prerequisite: a course in introductory psychology. T T 2:30-4:25. R. Mack.

A survey of the various forms of psychopathology, child and adult, as they relate to the experiences of human growth and development. Presents a description of the major syndromes, investigations, theories of etiology, and approaches to treatment.

326 Biopsychology of Animal Behavior Fall. 4 credits. Prerequisite: 123 or introductory Bio S course. Taught in alternate years. Not offered 1979-80.

T Th 2:30-4:25. R. Johnston.
Causation, development, and evolution of behavior in animals, primarily birds and mammals. Content areas will include communication and social behavior, courtship and mating, aggression, parental behavior, imprinting, and socialization.

327 Fieldwork in Psychopathology and the Helping Relationship Fall. 2 credits.

Prerequisites: 325 or concurrent registration in 325 and permission of the instructor. Students who wish to take this course may not preregister for it but must consult the professor before classes start in the fall. Enrollment is limited by the fieldwork placements available. Fee \$20.

Hours to be arranged. R. Mack.
An introductory fieldwork course for students currently enrolled in, or who have taken, Psychology 325. In addition to the fieldwork, there will be weekly supervisory/seminar meetings to discuss fieldwork issues and assigned readings and issues.

328 Continuing Fieldwork in Psychopathology and the Helping Relationship Fall or spring. 2 credits each term. S-U grades only. Prerequisites: 325, 327, and permission of instructor. May not be taken more than twice. Fee: \$20. Fieldwork and supervisory times to be arranged. W 4-5. R. Mack.

Designed to allow students who have begun fieldwork as part of Psychology 327 to continue their field placements, under supervision and for academic credit.

[329 Behavioral Maturation (also Biological Sciences 329) Fall. 3 credits. Prerequisites: one year of college biology and one biopsychology course or equivalent. Enrollment limited to 50. Not offered 1978-79.]

[345 Afro-American Perspective in Experimental Psychology (also Africana Studies 345) Spring. 3 or 4 credits. Prerequisite: introductory course in psychology or AS&RC 171. A. W. Boykin. Offered in alternate years. Not offered 1978-79. Next offered 1979-80.]

350 Statistics and Research Design Fall. 4 credits. Prerequisite: a course in the behavioral sciences.

M W F 10:10. R. Darlington.
Devoted about equally to elementary applied statistics—both estimation and hypothesis testing—through two-way analysis of variance, and to general problems in the design and analysis of research projects.

[361 Biochemistry and Human Behavior (also Nutritional Sciences 361) Fall. 3 credits. Prerequisites: Bio S 101-102, Chem 103-104, Psych 123, or permission of instructor. M W F 11:15. D. Levitsky. Not offered 1978-79.]

380 Beliefs and Attitudes (also Sociology 380) Spring. 4 credits. Prerequisites: Psych or Soc 280, or two courses in psychology or sociology.

T Th 10:10-11:45. L. Meltzer.
An intensive analysis of theory, research, measurement, and practical implications concerning beliefs, attitudes, values, opinions, stereotypes, self-concepts, intentions, and other social cognitions. The main emphasis will be comparison of different theoretical concepts such as scripts, frames, dissonance, attributions, and balance. Areas of application will include political behavior, racism and prejudice, sex-role conceptions, persuasion, and population control.

381 Social Psychology (also Sociology 381) Fall. 4 credits. Prerequisite: one course in social psychology. Enrollment limited to 25.

T Th 10:10-12:05. R. Kraut.
How do we learn about other people and influence what they learn about us? Person perception, attribution theory, impression management, and nonverbal communication are relevant topics. Seminar format.

[382 Individual Differences and Psychological Assessment (also Sociology 382) Spring. 4 credits. Prerequisites: introductory course in psychology or sociology, a previous of concurrent course in statistics, and junior standing. Offered in alternate years. M W F 2:30. H. Alker. Not offered 1978-79.]

383 Social Interaction (also Sociology 383) Spring. 4 credits. Prerequisite: one course in psychology or sociology. Enrollment limited to 30.

T Th 10:10-11:25; lab, Th 3-5. D. Hayes.
Analysis of human face-to-face interactions, with the emphasis on behavior. Research by Kendon, Ekman, Hall, Goffman, Garfinkel, Bales, and Chapple as well as relevant work in sociobiology and ethnomethodology are reviewed.

385 Theories of Personality (also Sociology 385) Spring. 4 credits. Prerequisite: 101, 128, 214 (124), or 275, or permission of instructor.

M W F 12:20. W. Lambert.
An intermediate analysis of comparative features of the historically and currently important theories of

personality, with an evaluation of their systematic empirical contribution to modern personality study, to psychology and to other behavioral sciences.

386 Human Ethology (also Sociology 386) Fall. 4 credits. Prerequisites: a course in social psychology or animal social behavior or permission of instructor. Offered alternate years. R. Kraut and R. Johnston. Not offered 1978-79.]

387 Psychological Aspects of Political Behavior (also Sociology 387) Fall. 4 credits. Prerequisites: junior standing and a course in social or personality psychology, or permission of instructor.

M W F 2:30. H. Alker.
A survey of contributions from psychology and sociology to the explanation of political behavior. Topics include power styles, ideology, social movements, psychocultural theories of war, manipulation techniques, political competence, and Machiavellianism.

402 Current Research on Psychopathology

Spring. 4 credits. Prerequisite: Psychology 325.
T Th 10:10-11:35, sec to be arranged. R. Dworkin.
Current research and theory on the nature and etiology of schizophrenia, the affective disorders, and psychopathy. Approaches from various disciplines will be considered. Minimal attention to psychotherapy.

407 Selected Issues in Human Motivation

Spring. 4 credits. Limited to 20. Prerequisites: 207 or 10 credits in psychology, and permission of instructor. Offered in alternate years. A. W. Boykin. Not offered 1978-79.]

411 Memory and Human Nature Fall. 4 credits. Prerequisite: Psych 201, 210 or 214 (124) or permission of instructor. Enrollment limited to 20.

T Th 2:30-4. U. Neisser.
Memory and other cognitive activities will be considered in their natural and social context. Laboratory studies of memory will be reviewed to the extent that they help us to understand ordinary mnemonic activities. Specific topics include memory for remote events and for one's childhood; for controversial and unacceptable material; for stories and conversations; for events; individual, developmental, and cultural differences in memory; effects of schooling and of specific skills.

416 Psychology of Language Fall. 4 credits.

Prerequisite: 215 or permission of instructor.
M W F 9:05. F. Keil.
An advanced treatment of the nature of the human capacity for language. Topics will include the nature of linguistic theory, syntax and semantics, aspects of language use (comprehension, memory/knowledge, thought and action, communication), and language acquisition.

422 Developmental Biopsychology Spring.

4 credits. Prerequisites: a course in introductory biology and a course in biopsychology or neurobiology (such as Psych 123 or Bio S 321)
M W F 9:05. B. Finlay.
Various aspects of the relation of the development of the nervous system to the unfolding of behavior will be discussed. Topics will include how growing neurons seek, recognize, and communicate with their targets; normal neuroembryology and the emergence of reflexive and complex behavior; how experience affects the developing brain; hormonal influences on brain structure and future behavior; and reorganizational capabilities of the young mammalian brain in response to trauma.

425 Brain and Behavior Fall. 3 or 4 credits.

Prerequisites: a course in introductory biology and a course in biopsychology or neurobiology (such as Psych 123 or Bio S 321). 4 credit option includes a discussion section and requires an additional paper.
M W F 9:05. B. Finlay.

We will study the relation between structure and function in the central nervous system. Human neuropsychology and the contribution of work in animal nervous systems to the understanding of the human nervous system will be stressed. Some topics to be discussed include visual and somatosensory perception, the organization of motor activity, emotion and motivation, psychosurgery, and the neuropsychology of memory and language.

426 Seminar and Practicum in Psychopathology

Spring. 4 credits. Prerequisites: open to majors in psychology or the equivalent (e.g. HDFS) who have taken 325 and have junior or senior status. Limited to 16 students. Permission of instructor required in all cases.

T Th 2:30-4:25, fieldwork times to be arranged.

R. Mack.
A fieldwork and seminar course for advanced students who have mastered the fundamental concepts of personality and psychopathology. An opportunity to explore in depth the various forms of psychopathology, etiology, and treatment, to discuss these in seminar, and to work with mental health professionals and those who seek their help.

427 Community Mental Health Fall. 4 credits.

Prerequisites: junior or senior status, Psych 325. Not offered 1978-79.]

440 Sleep and Dreaming Spring. 4 credits.

Prerequisites: advanced undergraduate or graduate standing and permission of instructor. Enrollment limited to 15. J. Maas. Not offered 1978-79.]

443 The Politics of I.Q. (cosponsored with Science, Technology, and Society) Fall.

3 credits. Prerequisite: elementary knowledge of theories and measurement of intelligence from prior courses or independent reading will be assumed. The genetics of intelligence will not be covered. Permission of instructor. Limited to 20. H. Levin. Not offered 1978-79.]

445 Research Excursions in Black Psychology

Spring. 4 credits. Prerequisites: 345, or 20 credits of behavioral sciences, or graduate standing, and permission of instructor. Offered in alternate years.
T Th 2:30-4:25. W. W. Boykin. Not offered 1978-79.]

464 Motivation and Human Learning Spring.

4 credits. Prerequisites: 303, 307, or permission of instructor. Offered in alternate years. Not offered 1978-79.]

465 Mathematical Psychology Spring. 4 credits.

Prerequisites: one year of college mathematics (finite mathematics and/or calculus), a course in probability or statistics, and a course in psychology. Offered in even numbered years.

M W F 10:10. J. Cunningham.
Mathematical approaches to psychological theory will be discussed. Possible topics include choice and decision, signal detectability, measurement theory, scaling, and stochastic models.

467 Seminar: The Examined Self—A Psychohistorical View Spring. 4 credits.

Prerequisites: nine credits of psychology including 325 or equivalent, and permission of instructor before preregistration. H. Feinstein. Not offered 1978-79.]

468 American Madness Spring. 4 credits.

Prerequisite: 325 and permission of instructor.
T 12:20-2:15. H. Feinstein. Not offered 1978-79.]

469 Seminar: Psychotherapy: Its Nature and Influence Spring. 4 credits. Enrollment limited to

senior psychology majors. Prerequisites: 325 or equivalent and permission of instructor before preregistration.

W 7:30-10:30 p.m. R. Mack.

A seminar on the nature of psychotherapy. Issues related to therapeutic goals, differing views of the nature of man, ethical concerns, and research problems also will be considered. Presentations by therapists of differing orientations and experiential and role-play exercises will be an integral part of the seminar experience.

471 Statistical Methods in Psychology I Fall. 4 credits. Prerequisite: 201 or equivalent, or permission of instructor.

M W F 11:15. J. Cunningham.
Basic probability, descriptive and inferential statistics. Topics include parametric and nonparametric tests of significance, Bayesian inference, correlation, and simple linear regression. The level of the course is that of W. L. Hays, *Statistics for Psychologists*.

472 Statistical Methods in Psychology II

Spring. 2 credits. Prerequisites: 471 or 350 or permission of instructor. Offered the first 7 weeks of spring.

M W F 10:10. J. Cunningham.
Analysis of variance, experimental design, and related topics. The level of the course is that of W. L. Hays, *Statistics for Psychologists*.

473 Statistical Methods in Psychology III

Spring. 2 credits. Prerequisite: 472 or permission of instructor. Offered the last 7 weeks of spring.

M W F 10:10. R. Darlington.
General-linear-model approach to analysis of variance, analysis of covariance, and multiple regression, at the level of *Multiple Regression in Behavioral Research* by F. Kerlinger and E. Pedhazur.

475 Analysis of Nonexperimental Data Fall.

2 credits. Prerequisite: 473 or permission of instructor. Offered the first 7 weeks of fall in odd-numbered years.
T Th 10:10-12:05. R. Darlington. Not offered 1978-79.]

476 Representation of Structure in Data

Spring. 3 credits. Prerequisite: one year of college mathematics (finite mathematics and/or calculus) or permission of instructor. Offered in odd-numbered years.

M W F 10:10. J. Cunningham.
Spatial and discrete representations of preferences and psychological distances will be discussed. Topics include unidimensional and multidimensional scaling, unfolding, individual differences scaling, hierarchical clustering, and graph-theoretic analysis.

478 Psychometric Theory Fall. 2 credits.

Prerequisite: 473 or permission of instructor. Offered the first 7 weeks of fall in even-numbered years.
T Th 10:10-12:05. R. Darlington.
Statistical methods relevant to the use, construction, and evaluation of psychological tests.

481 Advanced Social Psychology (also Sociology 481)

Fall. 4 credits. Prerequisite: a course in social psychology or permission of instructor. Limited to 30 students.
T Th 10:10-11:25. D. Regan.
Selected topics in social psychology are examined in depth, with heavy emphasis on experimental research. Readings are usually original research reports. Topics discussed may include: social comparison theory; social and cognitive determinants of the emotions; cognitive dissonance; attribution processes; interpersonal attraction, aggression, altruism, and compliance; and research methods in social psychology.

482 Death and Dying Spring. 4 credits.

Prerequisites: junior or senior status and 6 credits in sociology or psychology. Enrollment limited to 40 students.

Sec I, T 2:30-4:25; sec II, Th 2:30-4:25.
W. Collins.

Course will explore issues of death and dying in modern American society, from psychological and sociological perspectives as well as those of health related professions. Possible inadequacies in the current practice will be examined and alternatives discussed.

485 Advanced Personality Fall. 4 credits. Prerequisites: previous course at 200 or 300 level in personality or graduate standing. H. Alker. Offered in alternate years.

M W F 9:05. H. Alker.
A survey of the research literature in differential psychology on personality, intelligence, creativity, psychopathology, sex, and race. Conflicts between experimental (manipulative and correlational) research approaches will be considered in terms of both their "relevance" and scientific quality. General problems in personality assessment will also be considered.

486 Insanity and Society (also Sociology 486) Spring. 4 credits. Prerequisites: one course in social psychology and one course in psychopathology or the sociology of deviance.

T 7:30-10:30 p.m. R. Kraut.
Insanity as a social role, lay and professional recognition of insanity, effects of this recognition on the insane, mental hospitalization, shifts in the definition and treatment of insanity over time and culture, and legal aspects of insanity are topics that will be covered. There will be little emphasis on intrapsychic process. Sociological and social psychological questions will be considered.

488 Research Practicum in Socialization (also Sociology 488) Spring. 4 credits. Prerequisites: two courses in social psychology or human development and one course in statistics, or permission of instructor.

Th 2:30-4:25. U. Bronfenbrenner.
Supervised participation in field and experimental studies bearing on the impact of family support systems on socialization practices and outcomes. The work concentrates on the American phase of a project being conducted cooperatively in five industrialized societies.

489 Seminar: Selected Topics in Social Psychology (also Sociology 489) Fall. 4 credits. Prerequisites: one course in psychology and one course in social psychology or sociology and permission of instructor.

T 2:30-4:30. S. C. Jones.

490 Historical Roots of Modern Psychology (also Education 490; Human Development and Family Studies 490; Industrial and Labor Relations 470) Spring. 4 credits. Prerequisites: At least three courses in behavioral science, or consent of the instructor.

M W F 12:20-1:10. P. Carlson and staff.
This course is intended for sophomores, graduate students, majors, and nonmajors. This course will be a survey of the major historical antecedents of contemporary psychology, including the philosophical tradition (from Aristotle through the Enlightenment), the medical-therapeutic tradition, and the rise of modern science and experimental psychology. Scholars from across the university will give presentations in their own specialties. Students will do concentrated work in their own area of interest.

491 (492) Principles of Neurobiology Laboratory (also Biological Sciences 491 (492)) Fall. 4 credits. Prerequisites: Bio S 496 (498) or Psych and Bio S 495 or written permission of instructors. Enrollment limited to 36.

M W or T Th 12:20-4:25. P. G. Aitken, B. P. Halpern, D. N. Tapper.
Laboratory practice with neurobiological preparations and experiments, designed to teach the students the techniques, experimental designs, and research strategies used to study biophysical and

biochemical properties of excitable membranes, sensory receptors, and the central nervous system transformation of afferent activity as well as the characteristic composition and metabolism of neural tissue. Theoretical content will be at the level of *Junge's Nerve and Muscle Excitation*.

494 Junior Honors Spring. 4 credits. Prerequisite: admission to the department honors program.
Staff.

495 Sensory Function (also Biological Sciences 495) Fall. 3 credits. Prerequisites: Bio S 321 or equivalent and Psych 422 or 425; or Bio S 496 (498) or 692 or 696; or written permission of the instructor. Offered in alternate years. Not offered 1979-80.
T-Th 9:05. B. P. Halpern.

An examination of the basic principles of sensory function, with emphasis on processes at the receptor level. Filtering, transduction, and the pattern of the initial neural response will be studied. One sensory system will be followed from environmental energy patterns through central nervous system responses, and will serve as a general model. The course will be taught using the Socratic method, in which the instructor asks questions of the students. Students should bring a recent photograph of themselves to the first class.

496 Supervised Study Fall or spring. 2 or 3 credits. Undergraduates must attach to their course registration material written permission from the staff member who will supervise the work and assign the grade.
Staff.

497 Supervised Study Fall or spring. 4 credits. Undergraduates must attach to their course registration material written permission from the staff member who will supervise the work and assign the grade.
Staff.

498 Senior Honors Dissertation Fall. 4 credits. Prerequisite: admission to the departmental honors program.
Staff.

499 Senior Honors Dissertation Spring. 4 credits. Prerequisite: admission to the departmental honors program.
Staff.

Advanced Courses and Seminars

Advanced seminars are primarily for graduate students, but with the permission of the instructor, they may be taken by qualified undergraduates. The selection of seminars to be offered each term will be determined by the needs of the students.

A listing and description of advanced seminars is available at the beginning of each semester. Please contact the Department of Psychology Office. Except where indicated, the following courses may be offered either term; 4 credits.

510-511 Perception

512-514 Visual Perception

513 Learning

515 Motivation

517 Language and Thinking

518 Psycholinguistics

519-520 Cognition

521 Psychobiology

522 Topics in Perception and Cognition

523 Physiological Psychology

525 Mathematical Psychology

531 History of Psychology

535 Animal Behavior

541 Statistical Methods

543 Psychological Tests

544 Topics in Psychopathology and Personality

545 Methods in Social Psychology

547 Methods of Child Study

561 Human Development and Behavior

580 Experimental Social Psychology (also Sociology 580)

582 Sociocultural Stress, Personality, and Somatic Pathology (also Sociology 582)

583-584 Proseminar in Social Psychology (also Sociology 583-584)

585 Social Structure and Personality (also Sociology 585)

586 Interpersonal Interaction (also Sociology 586)

587 Personality (also Sociology 587)

588 Social Change, Personality, and Modernization (also Sociology 588)

591 Educational Psychology

595 The Teaching of Psychology

596 The Improvement of College Teaching

599 Interactive Computer Applications in Psychological Research

611 Practicum in Research

621 Thesis Research

682 Social Psychology (also Sociology 682)

683 Seminar in Interaction (also Sociology 683)

684 Seminar: Self and Identity (also Sociology 684)

690 Nutrition and Behavior (also Nutritional Sciences 690)

691 Independent Research

692 Independent Study

Summer Session Courses

The following courses are also frequently offered in the summer session though not necessarily by the same instructor as during the academic year. Information regarding these courses and additional summer session offerings in psychology will be available from the Psychology Department before the end of the fall semester.

101 Introduction to Psychology: The Frontiers of Psychological Inquiry

124 Introduction to Psychology: The Cognitive Approach

128 Introduction to Psychology: Personality and Social Behavior

- 209 Developmental Psychology**
- 215 Introduction to Linguistics and Psychology**
- 281 Interpersonal Relations and Small Groups (also Sociology 281)**
- 286 Nonverbal Behavior and Communication (also Sociology 286)**
- 325 Introductory Psychopathology**
- 381 Social Psychology**
- 385 Theories of Personality**
- 469 Psychotherapy: Its Nature and Influence**

Sociology

D. P. Hayes, chairman; R. Alba, H. A. Alker, P. D. Allison, R. Avery, B. Bowser, S. Caldwell, B. Edmonston, R. K. Goldsen, J. B. Jacobs, J. A. Kahl, R. Kraut, W. W. Lambert, R. McGinnis, L. Meltzer, B. C. Rosen, J. M. Stycos, H. Velez, W. F. Whyte, R. M. Williams, Jr.

Sociology Major

Sociology can serve either as a broad, liberal-arts approach to the study of people in society, or as preprofessional training appropriate for graduate study in sociology itself or in such fields as law, business, public administration, planning, and social welfare. To help the student organize a specific program within this large range, the department offers a series of alternative concentrations (with change from one to another usually permitted), as described below.

The director of undergraduate studies will help the prospective major to choose among the concentrations and will designate a faculty adviser to each student who is accepted into the program. A helpful pamphlet is issued each semester listing all the courses in sociology on campus (including those in other departments), organized by major topics. It is available in the department office, third floor, Uris Hall.

Concentration I—Human Society

This concentration permits a broad study of society on a comparative basis, combining humanistic and scientific approaches. Given the range of possibilities, this concentration is not tightly structured and the student will develop a personal plan in consultation with an adviser.

Prerequisites: Any two courses in sociology at the 100 or 200 level with an average grade of B– or better.

Major Program: Thirty-two additional credits in sociology, of which twelve may be in related departments if acceptable to the adviser as part of a coherent plan of study. At least eight credits must be in courses at the 400 level or above.

Concentration II—Research Training

This alternative is for students who aim for careers in social science research or teaching. It prepares students for graduate work in social science, and it provides training leading directly to postbaccalaureate jobs in research organizations.

Prerequisites: Any two courses in sociology at the 100 or 200 level with an average grade of B– or better, and one year of college mathematics, especially calculus and probability statistics (e.g. Mathematics 107–108 or Mathematics 111–112).

Major Program: Students in this concentration must complete at least 44 additional credits of courses in sociology. These must include: (a) three courses in research methods, such as Soc 321, 325, 424, 425; (b) two courses in sociological theory; (c) one semester of the honors sequence (Soc 495) or a graduate seminar; and (d) at least two semesters of supervised research experience with faculty in sociology.

Concentration III—American Institutions and Public Policy

This concentration centers on the analysis of key institutions in American society and the trends and conflicts that underlie current public issues. Considerable attention is given to sociological studies by government, academic, and private agencies that influence public policy.

Prerequisites: Any two courses in sociology at the 100 or 200 level with an average grade of B– or better.

Major Program: Thirty-four additional credits, including (a) two courses in related fields chosen from Africana Studies 290, Economics 101, Government 111 or 302, History 312 or 341, or Industrial and Labor Relations 261; and (b) seven courses in sociology, including two courses in research methods such as Sociology 321 and 325, and two advanced courses chosen from Sociology 404, 441, 442, 462, or related graduate courses or seminars.

Concentration IV—Personality and Social Psychology

Offered in cooperation with the Department of Psychology, this concentration approaches personality and social psychology from a sociological perspective. To ensure a solid interdisciplinary grounding, students will be encouraged to develop some competence in psychology, cultural anthropology, and social institutions and processes.

Prerequisites: Two courses in sociology at the 100 or 200 level with an average grade of B– or better, including at least one from among Soc 280, 281, 285, and 289.

Major Program: Thirty-two additional credits, including two courses in sociological methods (Soc 321 and 325 or equivalents), three courses in personality and social psychology, and two courses in social institutions and processes. Courses in cultural anthropology and experimental psychology may be included within the major if approved by the adviser. At least two courses must be in courses at the 400 level or above.

Concentration V—Population Studies

This concentration permits the intensive study of human populations from a social science perspective. Students are encouraged to combine population studies with a concentration in a related program such as women's studies, American studies, an area program, or biology and society.

Prerequisites: Sociology 130 or 230 plus one other course in sociology with an average grade of B– or better.

Major Program: Thirty-six additional credits in sociology, including (a) Soc 431 and either 321 or 325; (b) Soc 378 or 430; (c) two additional courses in population or closely related fields. Twelve hours of the total requirement for the major may be in related fields if approved by the adviser.

Social Relations Major

See page 137.

The Honors Program

The honors program is designed to offer the opportunity for original research under direct guidance of a member of the faculty. For admission to the honors program, students should file an application with the department during their junior year or at the beginning of their senior year. Honors candidates must have a general average of at least 2.7 and an average of 3.0 in sociology courses. The level of honors is determined by the faculty on recommendation from the student's honors committee after presentation of the research essay.

Distribution Requirement

The distribution requirement in social sciences is satisfied by any two courses in sociology; students without background are advised to choose from those at the 100 or 200 level. These courses also may serve as prerequisites for or parts of the major in sociology. Freshman seminars do not qualify for either purpose.

Freshman Seminars

Freshman Seminars will be offered in fall and spring semesters. Consult the Freshman Seminar booklet and the department course lists for seminar descriptions, instructors, and times.

Introductory Courses

There is no single introductory course in sociology. Various alternative approaches to the field are offered in the 100- and 200-level courses, any two of which will serve as adequate preparation for most advanced courses. Open to freshmen through seniors, they have no prerequisites unless otherwise specified.

107 Introduction to Sociology: Conflict and Cooperation Fall. 3 credits. Limited to freshmen and sophomores.

M W F 11:15. R. M. Williams, Jr.
Are human societies fundamentally cooperative or conflictual? In what ways? Why? And with what consequences? Examination of contemporary sociological analyses and the views of such precursors as Hobbes, Marx, Kropotkin, Sumner, and Simmel. Data from current research will be reviewed.

141 Introduction to Sociology: Applications to Policy Fall. 3 credits.

M W F 10:10. S. Caldwell.
Concentrates on sociology applied to actual decisions by regulatory commissions, executive agencies, courts, Congress, and other public policymakers. How does sociology become useful? Who makes it useful? What effects do personal values have on its uses? How well does expert knowledge coexist with political process? For fall 1978, the course will cover topics such as welfare reform, teenage pregnancies, Social Security, daycare school effectiveness, a national family policy, and energy.

147 Introduction to Sociology: Institutions and Inequality. Spring. 3 credits.

M W 12:20 and 1 hour to be arranged. R. Alba.
An introduction to basic aspects of social structure, including culture, social roles, the nature of groups, and social control. A major theme throughout will be the implications of different institutional arrangements for inequalities of wealth, honor, and power. The varied solutions of different societies to the same fundamental problems of societal organization will also be considered.

172 Introduction to Sociology: Urban Society Spring. 3 credits.

M W F 11:15. B. Bowser.

The sociological analysis of urbanism and urbanization. Alternative explanations of industrial urban development will be assessed with a specific focus on urban community studies, historical and contemporary, that serve as models of social structure, and group (class, ethnic, race, etc.) divisions. Trends in the United States and in other countries will also be examined, using such information as a basis for considering contemporary problems and the urban future.

207 Ideology and Social Concerns Spring, 3 credits (4 credit option available).

M W F 10:10. R. M. Williams, Jr.
Analysis of social bases of public policies at national, state, and local levels. Relates demographic, social, and cultural factors to the changing recognition of problems and to shifting modes of collective action, such as direct mobilization, legislation, administration, adjudication. Representative recent public issues to be examined will include affirmative action, environmental regulation, military affairs, social security and income maintenance, the community mental health movement, civil rights, and personal privacy.

230 Population Problems Spring, 3 credits (4 credit option available).

T Th 9:05 and 1 hour to be arranged.
B. Edmonston.
The practical and scientific significance of population growth and composition. Fertility, migration, and mortality in relation to social and cultural factors and in relation to questions of population policy. National and international data will receive approximately equal emphasis.

243 Family Fall, 3 credits (4 credit option available).

T Th 10:10 and 1 hour to be arranged. B. C. Rosen.
The structure and function of the family both in the West and cross-culturally. Specific areas examined include sex roles, socialization, mate selection, sex and sexual controls, internal familial processes, disorganization, and social change.

245 Inequality in America Spring, 3 credits (4 credit option available).

M W F 1:25. J. Kahl.
Recent trends in the unequal distribution of income, occupation, and education in the United States; inheritance of riches and of poverty; importance of ethnic membership; sex differences; deliberate attempts by government policy to alter these trends; evaluation of the "war on poverty."

252 Public Opinion Spring, 3 credits (4 credit option available).

T Th 10:10 and 1 hour to be arranged.
R. K. Goldsen.
Analysis of television as a social institution—how it works and how it saturates the cultural habit within which public opinion forms.

255 Sociology of Science and Technology Spring, 3 credits (4 credit option available).

T Th 2:30 and 1 hour to be arranged. P. Allison.
How the growth of knowledge is facilitated and impeded by the social behavior of scientists, including competition, teamwork, communication, secrecy, conformity and deviance; causes and consequences of scientific revolutions; factors affecting scientific careers; history of science as a social institution.

264 Race and Ethnicity Fall, 3 credits (4 credit option available).

M W F 10:10. R. Alba.
An examination of the importance of race and ethnicity in contemporary American society. Some review of historical background through such topics

as the Old-World roots of ethnic cultures, migration, slavery, and American responses to immigration. Of fundamental concern is the tension between assimilation and the persistence of racial and ethnic identities, traced through patterns of mobility, intermarriage, and organized crime. Blacks, Jews, Italians, and other ethnic groups will be considered.

265 The Hispanic Americans Spring, 3 credits (4 credit option available).

T Th 10:10–11:25. H. Velez.
Analysis of the present-day Hispanic experience in the United States. An examination of sociohistorical backgrounds as well as the economic, psychological, and political factors that converge to shape and influence a Hispanic group-identity in the United States. Course is intended to provide perspectives for understanding the diverse Hispanic migrations, their plight in urban and rural areas, and the unique problems faced by the different Hispanic groups. Groups to be studied will include Dominicans, Chicanos, Cubans, and Puerto Ricans.

280 Social Influence Processes: Attitude and Behavior Change (also Psychology 280) Spring, 3 credits.

T Th 10:10–11:25. D. Regan.
Intended to provide an extensive review of the literature on social influence processes. Beginning with the effects of the mere presence of others on behavior, we will discuss theory and empirical research related to conformity, compliance, imitation and modeling, group decision making, and attitude change. The relationship between attitudes and behavior will be examined in detail, and application will be made to naturally occurring social influence situations.

281 Interpersonal Relations and Small Groups (also Psychology 281) Fall, 4 credits. Laboratories limited to 16 students. Prerequisite: prior registration in lab-discussion section by signing roster kept by add-drop secretary outside room 238 Uris Hall.

Lec, M W 11:15; lab-disc, a two-hour period to be arranged. L. Meltzer.
The typical processes, relationships, and interpersonal styles found in small groups. Topics include shyness and assertiveness, productive and defensive communication, participation and alienation, conflict and harmony, social pressures, group decision-making, leadership, group emotionality, nonverbal communication, and social skills. The laboratory will involve the class in self-study exercises. Students will also work outside of class, in groups of 4–5, on a term project having two aspects: research on one of the above topics and self-study of the group processes which occur during the conduct of the project. The combination throughout the course of academic and experiential approaches should develop sensitivity to group processes and to the effects we ourselves have on other persons.

[289 Conformity and Deviance (also Psychology 289) Spring, 4 credits. Prerequisite: one course in psychology or sociology. R. Kraut. Not offered 1978–79.]

Intermediate and Advanced Courses

These courses are open to all students who meet the course prerequisites.

321 Field and Laboratory Techniques in Sociology Fall, 4 credits. Prerequisite: a course in sociology.

T Th 10:10–11:25; lab, Th 3–5. D. Hayes.
Research design and the operational side of laboratory methodology, with a series of field and laboratory projects. Students will carry out several studies from planning to analysis stages.

325 Evaluating Statistical Evidence Spring, 4 credits.

M W F 10:10. R. Alba.
A first course in the use of statistical evidence in the social sciences. Theory is supplemented with numerous applications. Includes an introduction to multivariate causal analysis.

330 Population and the Environment Fall, 4 credits.

M W F 10:10. R. Avery.
Course will concentrate on the question of the existence of environmental problems related to population variables. Emphasis will be on the assumptions, framework of analysis, and underlying data used in theories relating population and the environment. National and international studies will be covered.

[348 Sociology of Law Fall, 4 credits. J. Jacobs. Not offered 1978–79.]

352 Prisons and Other Institutions of Coercion Spring, 4 credits. Prerequisite: a course in the social sciences.

M W 1:25 and 1 hour to be arranged. J. Jacobs.
Course focuses primarily on the institution of imprisonment; how prisons are linked to the larger social structure; how they differ from country to country and in the same society over time; and how the character of life within the prison community is determined by the interaction and competition of prisoners, guards, administrators, and outside actors. Readings are drawn predominantly from the sociological literature, but history and literature are also assigned. Throughout the course comparisons are made with two other institutions of legitimate coercion, the armed forces and the urban police.

356 Contemporary Sociology for Scientists and Engineers Spring, 4 credits. Prerequisites: elementary finite mathematics or consent of the instructor.

T Th 10:10–11:40. R. McGinnis.
An introductory survey of sociological concepts, models, and research that bear on public policies which will influence the careers of scientists and engineers. Processes such as stratification, mobility, aging, and productivity will be stressed in their relation to public policies that affect the higher education and labor force deployment of scientists and engineers.

357 Medical Sociology Fall, 4 credits. Prerequisite: a course in the social sciences.

M W F 11:15. B. Edmonston.
Health, illness, death, and the health institutions from a sociological perspective. Course will cover factors affecting health care; organization of the medical professions; health and illness behavior; social epidemiology; and key issues in policies affecting the administration and delivery of medical care in the United States.

367 After the Revolution: Mexico and Cuba Fall, 4 credits. Prerequisite: two courses in the social sciences.

M W F 1:25. J. Kahl.
A comparison of the economic, political, and social development of Mexico and Cuba following their revolutions. Assigned readings will be in English.

[368 Contemporary Brazil (also History 348) Fall, 4 credits. Prerequisite: two courses in the social sciences. J. Kahl and T. Holloway. Not offered 1978–79.]

378 Economics, Population, and Development (also Economics 378) Spring, 4 credits.

M W F 10:10. M. Haines.
An introduction to the economic aspects of population and the interaction between population change and economic change. Particular attention

will be paid to economic views of fertility, mortality, and migration and to the impact of population growth on economic growth, development, and modernization.

380 Beliefs and Attitudes (also Psychology 380)

Spring. 4 credits. Prerequisite: Soc or Psych 280 or two courses in psychology or sociology.
T Th 10:10–11:45. L. Meltzer.

An intensive analysis of theory, research, measurement, and practical implications concerning beliefs, attitudes, values, opinions, stereotypes, self-concepts, intentions, and other social cognitions. The main emphasis will be comparison of different theoretical concepts such as scripts, frames, dissonance, attributions, and balance. Areas of application will include political behavior, racism and prejudice, sex-role conceptions, persuasion, and population control.

381 Social Psychology (also Psychology 381)

Fall. 4 credits. Prerequisite: one course in social psychology. Enrollment limited to 25.

T Th 10:10–12:05. R. Kraut.
How do we learn about other people and influence what they learn about us? Person perception, attribution theory, impression management, and nonverbal communication are relevant topics. Seminar format.

[382 Individual Differences and Psychological Assessment (also Psychology 382)]

Spring. 4 credits. Offered alternate years. Prerequisites: an introductory course in psychology or sociology, junior class standing and a previous or concurrent course in statistics. H. Alker. Not offered 1978–79.]

383 Social Interaction (also Psychology 383)

Spring. 4 credits. Prerequisite: one course in sociology or psychology. Enrollment limited to 30.

T Th 10:10–11:25, lab Th 3–5. D. Hayes.
Analysis of human face-to-face interactions with the emphasis on behavior. Research by Kendon, Ekman, Hall, Goffman, Garfinkel, Bales, and Chapple as well as relevant work in sociobiology and ethnomethodology are reviewed.

385 Theories of Personality (also Psychology 385)

Spring. 4 credits. Prerequisite: Psych 101, 128, or 275 or permission of the instructor.

M W F 12:20. W. Lambert.
An intermediate analysis of comparative features of the historically and currently important theories of personality, with an evaluation of their systematic empirical contribution to modern personality study, to psychology, and to other behavioral sciences.

[386 Human Ethology (also Psychology 386)]

Fall. 4 credits. Offered alternate years. Prerequisite: a course in social psychology or in animal social behavior or permission of instructor. R. Kraut and R. Johnston. Not offered 1978–79.]

387 Psychological Aspects of Political Behavior (also Psychology 387)

Fall. 4 credits. Prerequisites: junior class standing and a course in social or personality psychology or permission of instructor.

M W F 2:30. H. Alker.
A survey of contributions from psychology and sociology to the explanation of political behavior. Topics include power styles, ideology, social movements, psychocultural theories of war, manipulation techniques, political competence, and Machiavellianism.

404 Advanced Principles of Sociology (also Rural Sociology 404)

Fall. 4 credits.

T Th 10:10–12:15. P. Eberts.
An advanced undergraduate seminar for senior majors in sociology and rural sociology. The course will focus on: (1) the central concepts of the sociological tradition; (2) major classical theorists

(Marx, Weber, Durkheim, Tocqueville) and contemporary counterparts; (3) application of the classical ideas in contemporary research.

420 Mathematics for Sociologists

Fall. 4 credits.
Hours to be arranged. R. McGinnis.
Elementary matrix algebra, probability theory, and calculus.

424 Multivariate Analysis with Quantitative Data

Spring. 4 credits. Prerequisite: a college course in statistics (such as Soc 325) and matrix algebra.

T Th 10:10–11:40. P. Allison.
The general linear regression model with interval-scaled variables. Detecting violations of assumptions of the model in real data and providing remedies. Both single and multiple equation models (including path analysis).

425 Categorical Data Analysis

Fall. 4 credits. Prerequisite: 424 or equivalent.

T Th 10:10–11:45. P. Allison.
Techniques for including categorical (discrete) variables in multivariate models. Log-linear analysis of multidimensional contingency tables; dummy variable and spline regression; logit, probit and regression models with categorical dependent variables. Emphasis on applications, especially to longitudinal (panel) data.

426 Policy Research: Uses, Methods, Case Studies (also Rural Sociology 426)

Spring. 3 credits. Prerequisite: a course in multivariate statistics.

T Th hours to be arranged. S. Caldwell and M. Miller.
Design, structure, and techniques of policy research. Consideration of general model form, experimental and nonexperimental design, micro and macro forecasting models, and generalizability of findings. Stress will be on utilization of results through examination of actual case studies.

[430 Social Demography]

Spring. 4 credits. Prerequisites: junior class standing or permission of instructor. B. Edmonston. Not offered 1978–79.]

431 Techniques of Demographic Analysis

Fall. 4 credits. Prerequisite: 230 or 330.
M W 2:30 and one hour to be arranged. R. Avery.
A description of the nature of demographic data and the specific techniques used in their analysis. Mortality, fertility, migration, and population projection will be covered, as well as applications of demographic techniques to other classes of data.

[433 Human Fertility in Developed Nations]

Spring. 4 credits. Offered alternate years. Prerequisite: 230 or 330 or permission of instructor. R. Avery. Not offered 1978–79.]

[434 Human Fertility in Developing Nations]

Fall. 4 credits. Offered alternate years. Prerequisite: 230 or permission of instructor. J. M. Stycos. Not offered 1978–79.]

438 Human Migration and Residential Mobility

Spring. 4 credits. Offered alternate years. Prerequisite: 230 or 330 or permission of instructor.

T 1:25–3:20. R. Avery.
An analysis of international and internal migration as it affects the social and economic structure of societies and the groups in movement. Major theoretical and methodological investigations will be examined. Special emphasis will be given to determinants and consequences of residential mobility within industrial urban centers.

441 Structure and Functioning of American Society I

Fall. 4 credits. Prerequisite: one course in sociology or permission of instructor.
M W F 9:05. R. M. Williams, Jr.

Critical study of the institutions of kinship, stratification, the economy, the polity, education, and religion. Special attention is given to values and their interrelations, and to deviance and evasion. A survey of groups and associations making up a pluralistic nation is included.

[442 Structure and Functioning of American Society II]

Spring. 4 credits. Not offered 1978–79.]

462 Society and Consciousness

Spring. 4 credits. By consent of instructor. Limited to 15 students.

Hours to be arranged. R. Goldsen.
An examination of the role of the social system in the formation of human consciousness.

481 Advanced Social Psychology (also Psychology 481)

Fall. 4 credits. Prerequisite: a course in social psychology or permission of the instructor.

T Th 10:10–11:25. D. Regan.
Selected topics in social psychology are examined in depth, with a heavy emphasis on experimental research. Readings consist for the most part of original research reports. Topics discussed may include some of the following: social comparison theory, social and cognitive determinants of the emotions, cognitive dissonance, attribution processes, interpersonal attraction, aggression, altruism, compliance, and research methods in social psychology.

485 Advanced Personality (also Psychology 485)

Fall. 4 credits. Prerequisite: a previous course at 200 or 300 level in personality, or graduate standing. Offered alternate years.

M W F 9:05. H. Alker.
A survey of the research literature in differential psychology on personality, intelligence, creativity, psychopathology, sex, and race. Conflicts between experimental (manipulative and correlational) research approaches will be considered in terms of both their "relevance" and scientific quality. General problems in personality assessment will also be considered.

486 Insanity and Society (also Sociology 486)

Spring. 4 credits. Prerequisite: one course in social psychology and one course in psychopathology or the sociology of deviance.

T 7:30–10:30 p.m. R. Kraut.
Insanity as a social role, lay and professional recognition of insanity, effects of this recognition on the insane, mental hospitalization, shifts in the definition and treatment of insanity over time and culture, and legal aspects of insanity are topics that will be covered. There will be little emphasis on intrapsychic process. Sociological and social psychological questions will be considered.

488 Research Practicum in Socialization (also Psychology 488)

Spring. 4 credits. Prerequisites: two courses in social psychology or human development and one course in statistics, or permission of instructor.

Th 2:30–4:25. U. Bronfenbrenner.
Supervised participation in field and experimental studies bearing on the impact of family support systems on socialization practices and outcomes. The work concentrates on the American phase of a project being conducted cooperatively in five industrialized societies.

489 Seminar: Selected Topics in Social Psychology (also Psychology 489)

Fall. 4 credits. Prerequisites: one course in psychology and one course in sociology or social psychology and permission of instructor.

T 2:30–4:30. S. Jones.
491 Selected Topics in Sociology Fall or spring. 2 credits. With permission of instructor only. Hours to be arranged.

492 Selected Topics in Sociology Fall or spring. 4 credits. With permission of instructor only. Hours to be arranged.

495 Honors Research: Senior Year Fall or spring. 4 credits. Limited to sociology majors with permission of instructor. Hours to be arranged. D. Hayes and staff.

496 Honors Thesis: Senior Year Fall or spring. 4 credits. Prerequisite: 495. Hours to be arranged. D. Hayes and staff.

497 Social Relations Seminar (also Anthropology 495) Spring. 4 credits. Limited to senior undergraduates majoring in social relations. Staff.

541 Social Organization and Change Spring. 4 credits. Prerequisite: graduate standing or permission of instructor.

M W 1:25–3. R. M. Williams, Jr.

An analysis of major problems in theory and research, with emphasis on substantive knowledge and systematic hypotheses. Subjects included are social processes, social structures, cultural content, and social and cultural change. Attention is given to the nature and size of the social system (small groups, communities, large organizations, societies) and also to both macro and micro social processes and properties (integration, authority, conformity, and deviance).

Graduate Seminars

These are primarily for graduate students but may be taken by qualified advanced undergraduates with consent of the instructor. Seminars to be offered any term will be determined in part by the interests of the students but it is unlikely that any seminar will be offered more frequently than alternate years. Lists and descriptions of seminars will be available from the Sociology Department well in advance of each semester. The listing below indicates seminars which are likely to be offered in 1978–79, but others may be added, so students should check with the department before each term. All seminars are offered for four credits unless otherwise specified.

603 Classical Theory—Marx, Weber, and Durkheim Fall. J. Kahl.

632 Research Seminar in Population Spring. R. Avery and B. Edmonston.

647 Stratification and Mobility Spring. R. Alba and S. Caldwell.

655 Latin American Society and Politics (also Government 655) Spring. J. Kahl and E. Kenworthy.

670 Economic Demography and Development (also Economics 670) Fall. M. Haines.

682 Socialization (also Psychology 682) Fall. W. Lambert and B. C. Rosen.

683 Social Interaction (also Psychology 683) Spring. D. Hayes, R. Kraut, and L. Meltzer.

691–692 Directed Research Fall or spring. Credit (up to 4 credits) to be arranged. With permission of instructor only.

695 Thesis Research Fall or spring. Credit (up to 6 credits) to be arranged. With consent of thesis director only.

Theatre Arts

R. C. Shank, chairman; P. Alexander, M. A. Carlson, S. R. Cole, P. J. Curtis, J. Desmond, K. Draudt, D. L. Fredericksen, I. J. Hauptman, M. Lawler, J. Morgenroth, A. Shank, B. O. States, D. Tschetter, J. A. Zych

The Major

All students who wish to major in theatre arts must complete Theatre Arts 240 and thirty additional credits in the department, which will include substantial work in theatre history, literature, and theory, and in any two of the following four areas: (1) technical production and design, (2) acting/directing, (3) dance, (4) cinema. In addition, majors must complete at least twelve credits of related work outside the department.

Students who wish to major in dance must have completed or proved competency in intermediate modern technique by the beginning of their junior year. Dance majors are required to take a minimum of one technique class each term. The courses required of all dance majors are: (1) 301 (four semesters, one credit each semester); (2) 210–211; (3) 314–315; and (4) 316. In addition to the twenty-three credits listed above, dance majors are required to take twenty credits in related fields to be chosen in consultation with their adviser.

Opportunities for performance in theatre, dance and cinematography are available to the entire student body through the facilities of the department. Students may participate in the wide variety of theatrical performances presented each term in the University Theatre of Willard Straight Hall, the Drummond Studio in Lincoln Hall, and the Dance Studio in Helen Newman Hall, as actors, dancers, directors, playwrights, designers, or technicians. Auditions for particular productions are scheduled throughout the year.

The College of Arts and Sciences, through this department and in consort with 15 other colleges and universities, offers up to a full year's study at the Centre Universitaire Américain du Cinéma à Paris. The Centre's program is theoretical, critical, and historical. It is most useful to students pursuing an independent major in film studies—as an intensive supplement to their Cornell film courses. Fluency in French is required, and 375 and 376 are prerequisites. Inquiries should be addressed to D. Fredericksen, Cornell's liaison with the Centre.

The department administers the Charles B. Moss Scholarship. The recipient is chosen by the department from among those majors in the department who demonstrate exceptional ability.

Distribution Requirement

The distribution requirement in the expressive arts is satisfied by any two of the three- or four-credit courses at the 200 level or above in the Department of Theatre Arts.

Freshman Seminar Requirement

The Freshman Seminar requirement may be satisfied by Theatre Arts 120, 130, 140, or 240. Interested students are directed to the Freshman Seminar booklet.

Honors

Candidates for the degree of Bachelor of Arts with honors in Theatre Arts must fulfill the requirements of the major, maintaining an average of A– in departmental courses and an average of B in all courses. Any such student may, at the beginning of the second semester of the junior year, form a committee of three faculty members to guide and evaluate the honors work. The work will culminate in

an honors thesis or practicum to be presented not later than April 1 of the senior year, and an examination to be held not later than May 1.

Theatre Laboratory

Courses 151 and 152 are offered either term. Course 155 is offered fall term, 156 spring term. These courses may be repeated for credit but no student may earn more than four credits applicable towards graduation. Acting, directing, and managerial and technical responsibilities in production of theatre and dance are under the supervision of the departmental staff. Participation is also open to students without credit.

Courses 151, 152, 155 and 156 may be added or dropped without penalty at any time during the semester.

151 Technical Theatre Fall or spring. 1 credit. S-U grades only.

Orientation meeting in Willard Straight Theatre at 7:30 p.m. on first day of instruction. Staff. Practice in construction, painting, and lighting for the University Theatre productions under the supervision of the set designer or the technical director.

152 Technical Theatre Fall or spring. 1 credit. S-U grades only.

Orientation meeting in Willard Straight Theatre at 7:30 p.m. on first day of instruction. P. Alexander. Practice in costuming and makeup for the University Theatre productions under the supervision of the costume designer.

155 Rehearsal and Performance Fall. 1–2 credits; no more than 2 credits each semester. S-U grades only. Credit for participation in producing the play (acting, directing, etc.) under the supervision of faculty of this department. The student should add this course only after having received a position on the production staff or having been cast in a play.

156 Rehearsal and Performance Spring. 1 credit. S-U grades only. Same as 155.

Acting

280 Introduction to Acting Fall or spring. 3 credits. Sections limited to 16 students. Prerequisite: registration through departmental roster in 104 Lincoln Hall.

Sec 1, 2, 3, and 4: T Th 12:30–2:15; sec 5 M W 10:10–12; sec 6 M W 2:30–4:25. Staff. Introduction to the problems and basic technique of the actor. Practice in creative exercises, improvisation, psychological sets, and physical images.

380 Intermediate Acting Fall or spring. 3 credits. Sections limited to 16 students. Prerequisites: 280 and registration through departmental roster in 104 Lincoln Hall.

Sec 1, M W 2:30–4:30; sec 2, T Th 10:10–12. J. Zych. Continuation of 280 with emphasis on methodology and scene study.

381 Advanced Acting Fall or spring. 3 credits. Prerequisites: 380 and permission of instructor. Fall: T Th 2:30–4:30, R. Shank; spring: M W 10:10–12, S. Cole.

Practical emphasis upon integration of conception, preparation of role, and techniques of presentation.

780 Graduate Acting Fall or spring. 2 credits. May be repeated for credit.

Sec 1, M W 2:30–4:30, S. Cole; sec 2, T Th 2:30–4:30, J. A. Zych. Study and practice of fundamental and advanced techniques and methodology.

American Mime

575 American Mime Orientation I Fall. 2 credits. Prerequisite: 280. Students enrolled in American Mime must contact the Department of Theatre Arts about supplies one month before the beginning of classes.

F 2-4. P. Curtis and other teachers from the American Mime Theatre.

American Mime is a unique performing art created by a particular balance of playwriting, acting, moving, pantomime, and theatrical equipment. It is a complete theatre medium defined by its own aesthetic laws, terminology, techniques, script material, and teaching methods, in which nonspeaking actors, in characterization, perform the symbolic activities of American Mime plays through movement that is both telling and beautiful.

576 American Mime Orientation II Spring. 2 credits. Prerequisite: 575 or permission of instructor.

F 2-4. P. Curtis and other teachers from the American Mime Theatre.

Continuation of 575.

Voice and Speech

682 Voice and Speech for Performance Fall. 2 credits.

M W F 9:05. J. Wilson.

Emphasis is on voice production; breathing and relaxation, articulation, and understanding of the special demands made on a voice during performance.

683 Voice and Speech for Performance Spring. 2 credits. Prerequisite: 682.

M W F 9:05. J. Wilson.

Continued work on the task of making sound meaningful; emphasis is on range, balance, and tone.

782 Advanced Voice and Speech for Performance Fall. 2 credits.

M T W Th F 10:45-1. J. Wilson.

Emphasis is on achieving maximum flexibility and freedom of the voice. Areas stressed are breathing, vowels and consonants, and acting problems related to the voice.

783 Advanced Voice and Speech and Performance Spring. 2 credits. Prerequisite: 782.

M T W Th F 10:45-1. J. Wilson.

Continuation of 782 but with a focus on pitch, resonance, tone, tempo, and style.

Dance

Enrollment in all dance courses take place at Helen Newman Hall. Courses in dance technique are offered each semester—modern: four levels; fundamentals through advanced; and ballet: elementary and intermediate. T'ai chi, a Chinese system of movement for health, self-defense, and meditation, is also offered. Freshmen and sophomores may satisfy the physical education requirement by taking any of these courses. Up to four units of credit may be earned (one each semester) for enrollment in intermediate or advanced technique only (see Theatre Arts 301). Schedules for technique classes are available in the Dance Office, Helen Newman Hall.

Students may receive credit for performance in student/faculty concerts. In addition, a repertory and performance workshop will be offered. Staff will choreograph and conduct rehearsals for performance of original dance works. Admission with consent of the instructor. Hours will be arranged through the Dance Office, Helen Newman Hall. One credit may be earned for this (see Theatre Arts 155-156 Rehearsal and Performance)

200 Dance and Movement for the Theatre Fall. 3 credits. Concurrent enrollment in a technique class at the appropriate level is required.

Staff.

Basic dance technique, improvisation, and composition designed to help the actor improve use of the body as an expressive instrument.

201 Dance and Movement for the Theatre

Spring. 3 credits. Prerequisite: 200.

Staff.

Continuation of 200.

210 Beginning Dance Composition and Music Resources (also Women's Physical Education 210)

Fall. 4 credits. Prerequisites: Music 141, intermediate technique level, and permission of instructor. Concurrent enrollment in a technique class at the appropriate level is required.

Staff.

Parallel studies in the basic vocabulary of movement and in fundamental problems of musical-expression in relation to dance.

211 Beginning Dance Composition and Music Resources (also Women's Physical Education 211)

Spring. 4 credits. Prerequisite: 210.

Staff.

Continuation of 210.

301 Dance Technique (also Women's Physical Education 301)

1 credit. S-U grades only. May be repeated for up to four credits. Credit will be given for enrollment only in intermediate and advanced sections. May not be taken for credit if concurrently being used to satisfy physical education requirement. Contact Women's Physical Education for schedule of sections.

Staff.

307 Asian Dance and Dance Drama (also Asian Studies 307)

3 credits.

Staff.

Historical background and performance techniques of East Indian dance. Further information will be available in the Dance Office.

310 Advanced Dance Composition (also Women's Physical Education 310)

Fall. 4 credits.

Prerequisite: 211.

Staff.

Problems in composition for groups and music resources for dancers.

311 Advanced Dance Composition (also Women's Physical Education 310)

Staff.

Further problems in composition for groups.

314 History of Dance Fall. 3 credits.

M W 3:35. Staff.

A survey of the history of dance from ancient times to the Renaissance with emphasis on the development of theatrical forms in Western civilization.

315 History of Dance Spring. 3 credits.

M W 3:35. Staff.

A survey of the history of dance from the Renaissance to contemporary times with emphasis on the development of theatrical forms in Western civilization.

316 Human Biology for the Performing Arts (also Anthropology 316)

Fall. 5 credits.

T Th 10:10-12:05. K. A. R. Kennedy and dance staff.

A laboratory course of anatomy, physiology, and kinesiology for students of dance, physical education, performing arts, fine arts, and anthropology. Body systems and functions are studied from an evolutionary perspective.

318 Period Dance Spring. 2 credits. Prerequisite:

elementary ballet or elementary modern technique. Staff.

A sampling of the social dances from the Renaissance to the present with emphasis on pinpointing basic differences in movement styles and customs in the various periods.

410 Individual Problems in Composition (also Women's Physical Education 410)

Fall or spring. 3 credits. Prerequisite: 311.

Staff.

Individual problems in composition.

418 Seminar in History of Dance Spring.

3 credits. Prerequisite: 315 or permission of instructor. See instructor for description of the particular aspect of history of dance to be investigated.

Directing

398 First Principles of Directing Fall. 3 credits.

Prerequisites: one semester of acting and one semester of stagecraft or stage design.

M W 2:30-4:25. R. Shank.

The structure of visual and temporal patterns as interpretation of the script; rehearsal procedures and techniques; the relationship of the technical and design arts to the directorial approach.

498 Advanced Directing Spring. 4 credits.

Prerequisite: 398 or permission of instructor.

M W 2:30-4:25. R. Shank.

499 Projects in Directing Fall or spring. Credit to be arranged. Prerequisite: permission of the departmental staff.

Staff.

The planning and execution of directing projects by advanced students in the public facilities of the Department of Theatre Arts.

Theatre Production and Design

351 Theatre Practice Fall or spring. 2 credits.

May be repeated for credit. Prerequisites: previous technical assistance in Cornell University Theatre productions and permission of instructor.

Staff.

Advanced projects in design or technical production under the supervision of the set designer or the technical director.

352 Theatre Practice Fall or spring. 2 credits.

May be repeated for credit. Prerequisites: previous technical assistance in Cornell University Theatre productions and permission of instructor.

Department majors will have priority.

P. Alexander.

Advanced projects in design or technical production under the supervision of the costume designer.

354 Stagecraft Fall or spring. 4 credits.

Prerequisite: Sophomore standing or permission of instructor.

M W 12:20. Staff.

Lectures and demonstrations on theatre structure and equipment, scene construction and painting, and stage lighting. Practice in scene construction and lighting for University Theatre productions.

362 Stage Lighting Spring. 3 credits.

Prerequisite: 354.

T Th 11:15. Staff.

An introduction to lighting design for the theatre, concentrating on the principal approaches for the designer using light as the medium. A technical foundation in the types and functions of the different lighting instruments, control equipment, light sources, and color will be dealt with during arranged laboratory sessions.

364 Stage Design I Fall. 4 credits. Prerequisite: permission of instructor.

T Th 10:10-11:25. D. Tschetter.

Introduction to scenic design through history, theory, procedure, and practicum.

365 Stage Design II Spring. 4 credits.
Prerequisite: 364.

T 2:30–5. D. Tschetter.

Continuation of Stage Design I. Advanced problems in rendering, model construction, special effects, budgeting, and scheduling.

366 Costume Design I Fall. 4 credits.
Prerequisite: permission of instructor.

T Th 12:20; labs to be arranged. P. Alexander. Introduction to costume design involving color, space, line, and drawing techniques. Students will learn to use period research. Includes two hours of classwork, four hours of lab each week, home assignments, and two weekends of work backstage.

367 Costume Design II Spring. 4 credits.
Prerequisite: 366 or permission of instructor.

T Th 11:15 and labs to be arranged. P. Alexander. Continuation of Costume Design I with emphasis on design and research. Requires same commitment of hours as Costume Design I.

465 Advanced Stage Design Fall. 4 credits.
Prerequisites: 364 and 365.

D. Tschetter.

Projects in studio theatre and mainstage production. Exercises focused toward practical problems encountered by the working designer. Familiarization with professional organizations, unions, and examinations.

466 Advanced Costume Design Fall and spring. 4 credits. Prerequisites: 366 and 367 or permission of instructor.

P. Alexander.

Large scale projects involving total show design and defense. May design and build studio show. One hour classwork each week plus individual conferences as needed, four hours of lab each week, home assignments, and work backstage.

467 Costume Construction I Fall. 4 credits.
Prerequisite: permission of instructor and some knowledge of sewing.

M W 10:10–11:40, labs to be arranged.

P. Alexander.

Learning to draft basic patterns for the stage and basic costume construction techniques. Four hours of classwork and three hours of work in costume shop each week.

468 Costume Construction II Spring. 4 credits.
Prerequisite: 467 or permission of instructor.

M W 10:10–11:40, labs to be arranged.

Individual projects patterning historical theatrical costumes. Four hours of classwork and three hours of work in costume shop each week.

Playwriting

348 Playwriting Fall. 4 credits. Prerequisite: permission of instructor.

T 2–4:25. B. States.

A laboratory for the discussion of student plays. Each student is expected to write two or three one-act plays, or one full-length play.

[349 **Advanced Playwriting** Not offered 1978–79.]

Theatre History, Literature, and Theory

240 Introduction to the Theatre Fall or spring. 3 credits. This course may be taken to satisfy the Freshman Seminar requirement.

Fall: M W F 11:15; I. Hauptman. Spring:

M W F 1:25–2:15; S. Cole.

A survey of the elements of drama and theatre intended to develop appreciation and rational enjoyment of the theatre in all its forms. Not a production course.

300 Independent Study Fall or spring. 1–4 credits; no more than four credits each semester. May be repeated for credit.
Staff.

Individual study of special topics. Open to juniors and seniors with permission of the departmental member directing the study.

324 Wives, Lovers, Cuckolds (also Women's Studies 324) Fall. 4 credits. Prerequisites: one literature course.

T Th 2:30–3:45. P. Vogel.

This course proposes to examine the relationship between comedy and adultery—the "external" (and hence formulaic) triangle between wife, lover, and cuckold. The seminar will read and discuss both comic theory and such representative plays as: *Amphitryon* (Plautus), *The Mandrake* (Machiavelli), *Othello*, *The Country Wife* (Wycherley), *Candida* (Shaw), *The Circle* (Maughan), and the 38th version of *Amphitryon* by Giraudoux.

325 Classic and Renaissance Drama (also Comparative Literature 352) Fall. 4 credits.

T Th 2:30–3:45. S. McMillin.

Readings in world drama from the Greeks to Shakespeare, including such dramatists as Aeschylus, Sophocles, Euripides, Aristophanes, Plautus, Seneca, Calderón, Kyd, Marlowe, Shakespeare, Jonson, and Webster, with emphasis on the Greek and the Elizabethan periods.

326 European Drama, 1660 to 1900 (also Comparative Literature 353) Spring. 4 credits.

T Th 10:10–11:25. I. Hauptman.

Readings from major dramatists from Molière to Ibsen, including such authors as Racine, Congreve, Sheridan, Schiller, Goethe, Hugo, Büchner, Gogol, Turgenyev, Zola, Hauptmann, and Chekhov.

327 Modern Drama (also Comparative Literature 354) Spring. 4 credits.

M W F 1:25. B. States.

Readings from major dramatists of the twentieth century, including Ibsen, Chekhov, Strindberg, Shaw, Pirandello, Ionesco, Brecht, Beckett, Pinter, and others.

[333 **History of the Theatre I** Not offered 1978–79.]

[334 **History of the Theatre II** Not offered 1978–79.]

335 American Drama and Theatre Fall. 4 credits.

T Th 10:10–11:25. I. Hauptman.

A study of the American theatre and representative American plays with emphasis on drama from O'Neill to the present.

337 Backgrounds of the Modern Experimental Theatre Fall. 4 credits.

W 12:20–3:20. M. Carlson and S. Cole.

A study of the critics, directors, and traditions which have contributed significantly to modern experiments in theatrical production. Particular attention will be given to influences from the Orient and Eastern Europe.

[425 **Shakespeare: King Lear and the Stages of History (also English 425)** Not offered 1978–79.]

442 Ibsen and Chekhov (also Comparative Literature 472) Fall. 4 credits.

T Th 10:10–11:40. M. Carlson.

Study of the major dramas of Ibsen and Chekhov in historical perspective and as illustrations of the development of each author's dramatic technique.

[632 **Critical Writing Workshop** Not offered 1978–79.]

[633 **Seminar in Theatre History** Not offered 1978–79.]

[636 **Seminar in Dramatic Analysis and Criticism** Not offered 1978–79.]

637 Seminar in Dramatic Theory Fall. 4 credits.
W 2:30–4:25. I. Hauptman.

[638 **Seminar in Theory of the Theatre** Not offered 1978–79.]

699 Seminar in Theories of Directing Spring. 4 credits.
R. Shank.

700 Introduction to Research and Bibliography in Theatre Arts Spring. 1 credit.
T 12:20–2. I. Hauptman.

730 Literature and the Theatre Fall. 4 credits.
May be repeated for credit.

T Th 1:15–2:15. M. Carlson.

Analysis of various types of dramatic literature from the point of view of the theatrical medium.

990 Theses and Special Problems in Drama and the Theatre

See also:

Shakespeare (English 227)

Shakespeare (English 327)

Representative English Dramas (English 372)

Drama of the Restoration and Eighteenth Century (English 434)

Irish Literature (English 472)

Shakespeare (English 627)

Dramatic Literature: Tragedy (English 672)

Greek and Roman Drama (Classics 300)

Japanese Nô Theatre (Asian Studies 400)

Faust (German 356)

Introduction to German Literature (German 201–202)

Novels, Plays, Essays (French 390)

Theatre in Sixteenth Century France (French 452)

French Film and Literature in the Twentieth Century (French 490)

Modern Drama in Spanish America (Spanish 332)

Spanish Drama of the Golden Age (Spanish 351)

Post-Civil War Drama in Spain (Spanish 391)

Shakespeare and Madness (Society for Humanities 419)

The Idea of India in English Literature from the Eighteenth Century to the Present (Society for Humanities 420)

Cinema

375 History and Theory of the Commercial Narrative Cinema Fall. 4 credits. A charge of \$5 is made to help defray the expense of screenings. This fee is to be paid in class during the first week.

T Th 2:30–5. D. Fredericksen.

Within the context of history, the description, interpretation, and evaluation of commercial narrative films as works of art and as objects of mass consumption. Emphases include the articulation of a "cinematic language," "realism," "popular art," and

"modernism." Contemporary methods of analysis such as the auteur theory, genre theory, and semiotics are introduced.

[376 History and Theory of Documentary and Experimental Film] Fall. 4 credits. A charge of \$5 is made to help defray the cost of screenings. This fee is to be paid in class during the first week. T Th 2:30-5. D. Frederickson. Not offered 1978-79. Next offered fall 1979.]

377 Fundamentals of 16mm Filmmaking Fall. 4 credits. A charge of \$10 is made to help defray maintenance expenses. This fee is to be paid in class during the first week. Limited to 15 students. M W F 2-4:25. D. Frederickson. The mechanics and expressive potentials of 16mm filmmaking, including sound. Each student makes two short films. No prior filmmaking experience is assumed.

378 Russian Film in the 1920s and French Film in the 1960s Spring. 4 credits. A charge of \$5 is made to help defray the expense of screenings. This fee is to be paid in class during the first week. Prerequisite: 375.

T Th 2:30-5. D. Frederickson. An intensive treatment of two quite different periods of innovation in film history. Emphasis on the relationship between theory and practice. Major figures covered include Eisenstein, Pudovkin, Vertov, Dovzhenko, Godard, Malle, Duras, Resnais, Bresson, and Truffaut.

[379 International Documentary Film from 1945 to the Present] Spring. 4 credits. A charge of \$5 is made to help defray the expense of screenings. This fee is to be paid in class during the first week. Prerequisite: 376. T Th 2:30-5. D. Frederickson. Not offered 1978-79. Next offered spring 1980.]

475 Seminar in the Cinema I Fall. 4 credits. May be repeated for credit. Prerequisite: 375 or permission of the instructor. Prior work in depth psychology will be helpful.

T Th 10:10-11:30. D. Frederickson. Topic for fall 1978: C. G. Jung and the Cinema. Readings from the three major areas of Jung's writing (personality types, the structure and dynamics of the psyche, and archetypal imagery) will be considered for their usefulness in analyzing films. Contrasts between Freud and Jung will be considered, as will the question of the limits of a depth psychological approach to film.

476 Seminar in the Cinema II Spring. 4 credits. Prerequisite: 475 or permission of the instructor.

M W 2-4:25. D. Frederickson. Topic for spring: Feeling and Feelings in the Cinema. The central concern will be the relevance of a general theory of feeling as an evaluating process and of the differentiation and expression of feelings to our experience and criticism of films. Discovery and discussion of the ways in which films structure feeling and feelings for the "educating of feeling" and within rhetorics of stereotyping will be the major critical tasks. Discussion of such films as *The Blue Angel*, *Rules of the Game*, *Rebel Without a Cause*, *A Diary for Timothy*, *Hiroshima mon amour*, and *Hour of the Furnaces*.

The Africana Center has a unique and specialized program of study that offers an undergraduate degree through the College of Arts and Sciences and a graduate degree (Master of African and African-American Studies) through the University's Graduate School.

The purpose of the program is to prepare students for professional careers relevant to the learning and leadership needs of the African-American community. It envisions that the knowledge and methodology of various fields and disciplines will be brought to bear upon the history, present state, and dynamics of the black people and cultures in the Americas, Africa, and the Caribbean. Our curriculum is designed to reflect a multidisciplinary approach to the experience of African peoples throughout the world. The Africana Center's courses are open to both majors and nonmajors.

Africana Major

The undergraduate program offers interdisciplinary study of the fundamental dimensions of the Afro-American and African experiences. Because of the comprehensive nature of the program, it is to the students' advantage to declare themselves as Africana majors as early as possible. The following are prerequisites for admission to the major. Students should submit: (1) a statement of why they want to be an Africana studies major; (2) a tentative outline of what area of study they are considering (African or Afro-American) for the undergraduate concentration; (3) a full transcript of courses taken and grades received. The center's undergraduate faculty representative will review the applications and notify students within two weeks of the status of their request.

After acceptance as a major in the Africana Center, a student must maintain a C+ cumulative average in the center's courses while completing the major program. The Africana major must complete thirty-six credits in courses offered by the center, to include the following four core courses: 231, 290, 360, 431. Beyond the core courses, the student must take eight credits of center courses numbered 200 or above and fifteen credits numbered 300 or above. Within this selection the student must take at least one of the following AS&RC courses: 203, 204, 283, or 301. The program of an undergraduate major may have a specifically Afro-American focus or a specifically African focus.

Joint Majors

The center encourages joint majors in the College of Arts and Sciences and in other colleges. Joint majors are individualized programs that must be worked out between the departments concerned. The center's undergraduate faculty representative, Professor R. Harris, will assist students in the design and coordination of joint major programs. However, in any joint major program the center will require that at least sixteen credits be taken in AS&RC courses, including 290.

Double Majors

In the case of double majors (as distinct from joint majors) students undertake to carry the full load of stipulated requirements for a major in each of the two departments they have selected.

The Honors Program

The honors program offers students the opportunity to complete a library research thesis, a field project in conjunction with a report on the field experience, or a project/experiment designed by the student. The requirements for admission to the honors program for all students—regular majors, joint majors, and double majors—are a B- cumulative average in all courses and a B+ cumulative average in the center's courses. Each student accepted into the honors program will have an honors faculty committee,

consisting of the student's adviser and one additional faculty member, which is responsible for final evaluation of the student's work. The honors committee must approve the thesis or project proposal before May 1 of the student's junior year. The completed thesis and/or project report should be filed with the student's faculty committee by May 10 of the senior year.

Distribution Requirement

The following AS&RC courses satisfy distribution requirements in the categories as listed. Social sciences: any two of 171, 172, 231, 290, 301, 302, 344, 345, 346, 351, 352, 410, 420, 460, 484, 485, 495, 550. History: any two of 203, 204, 231, 283, 344, 360, 361, 370, 381, 460, 475, 483, 490. Humanities: any two of 219, 422, 431, 432, 465, 492. Expressive arts: any two of 137, 138, 285, 303, 465.

Language Requirement:

Swahili fulfills the College of Arts and Sciences language requirement. Successful completion of AS&RC 131, 132, 133, and 134 gives qualification in Swahili. Successful completion of AS&RC 202 gives proficiency in Swahili. Africana majors are not required to take Swahili, but the center recommends the study of Swahili to complete the language requirement.

Freshman Seminar Courses

The following Africana Center courses satisfy the Freshman Seminar requirement: 137, 138, 171, 172, 203, 204, 290.

131 Swahili Fall. 4 credits. Requires no previous knowledge of the language.

A. Nanji.
Beginning Swahili; grammar part I.

132 Swahili Spring. 4 credits. Prerequisite: Swahili 131 or previous study of the language.

A. Nanji.
Elementary reading and continuation of grammar.

133 Swahili Fall. 4 credits. Prerequisites: Swahili 131, 132.

A. Nanji.
Advanced study in reading and composition.

134 Swahili Spring. 4 credits. Prerequisites: Swahili 131, 132, 133 or permission of instructor.

A. Nanji.
Advanced study in reading and composition.

137 Afro-American Writing and Expression Fall. 4 credits.

T Th 10:10-11:35. C. Fontenot. Designed to promote clear and effective communication skills, using black-oriented materials as models for writing assignments and oral discussions.

138 Applied Writing Methods on Afro-American Topics Spring. 3 credits.

T Th 10:10-11:35. C. Fontenot. A writing skills course which will explore traditional and nontraditional research sources, using Afro-American experiences as the primary subject matter.

171 Infancy, Family, and the Community Fall. 4 credits.

T Th 3:15-4:30. W. Cross. Survey of key psychological dimensions of the black experience covering such issues as (1) race and intelligence; (2) black identity; (3) black family structure; (4) black English; (5) black middleclass; and (6) nature of black psychology.

172 Teaching and Learning in Black Schools Spring. 4 credits.

T Th 3:15-4:30. W. Cross.

Special Programs and Interdisciplinary Studies

Africana Studies and Research Center

J. Turner, director; Y. ben-Jochannan, W. Cross, C. Fontenot, R. Harris, F. Hayes, J. Higginson, C. Mbata, R. Murapa, A. Nanji

A course designed for freshmen and sophomores that will be devoted to the history and contemporary issues of black education, such as the struggle for, black studies, the development of independent black grammar, and problems of public schools in black communities.

190 An Introduction to Modern Political Systems Fall or spring, 4 credits.

An analytical interpretation of the sociopolitical and economic systems of sub-Saharan African countries as well as the nationalist struggles in southern Africa.

202 Swahili Literature Fall, 4 credits. Prerequisite: Swahili 134.

A. Nanji.
Students will gain mastery over spoken Swahili and at the same time be introduced to the predominant Swahili literary forms.

203 History and Politics of Racism and Segregation Fall, 4 credits.

T Th 12:20-2:15. C. Mbata.
A cross-cultural study in historical context of the evolution of racist thought and practice in southern Africa and North America.

204 History and Politics of Racism and Segregation Spring, 4 credits.

Th Th 12:20-2:15. C. Mbata.
The course will deal in a historical context with patterns of racism and segregation using southern Africa and North America as case histories. The study will be undertaken within a theoretical framework that broadly defines racism and segregation and their implications.

219 Issues in Black Literature Fall, 4 credits.

The course will examine literature written for black children and analyze the literature as it pertains to black life from 1960 to the present. Students will engage in writing a pamphlet containing their essays, fiction, and poetry, as well as compiling a bibliography of literature for black children.

231 Black Political Thought in the United States Fall, 3 credits.

M W F 3:10-4. F. Hayes.
This is an introductory course that will review and analyze the major political formulations developed and espoused by black people in the struggle for liberation. Such themes as slave resistance, nationalism, Pan-Africanism, emigration, anti-imperialism, socialism, and the political thought of black women will be discussed. Black political thought will be viewed in its development as responses to real conditions of oppression and exploitation.

283 Black Resistance: South Africa and North America Fall, 4 credits.

C. Mbata.
A study of black political movements in South Africa and North America and their responses to the situations of race relations that formed the contexts of their operations.

285 Black Drama Spring, 3 credits.

M 2-4:25. C. Fontenot.
This course is intended to serve as an introduction to the history of black drama, and to provide the means through which students can cultivate their interests in dramaturgical criticism and production techniques. Each student in the course will read a number of black plays, write a critical paper on black drama, and participate in the production of a play.

290 The Sociology of the Black Experience Fall, 3 credits.

M W F 3:10-4. J. Turner.

An introductory course to the sociology of the black experience, and to the field of Afro-American studies. Required for all undergraduate students majoring at the African Center.

301 Seminar: Psychological Aspects of the Black Experience Fall, 4 credits. Prerequisite: permission of instructor.

W. Cross.
Existing research will be used to raise specific questions about new cultural political awareness in the black community. The focus of the course will be individual conversion experiences within the context of social movements. The transformations of political groups (for example, Black Panther Party) and outstanding activists/intellectuals (such as Malcolm X) are utilized as reference points for analytical discussion of theory.

302 Social and Psychological Effects of Colonization and Racism Spring, 4 credits. Offered in alternate years.

Staff.

303 Blacks in Communication Media and Film Workshop Spring, 3 credits.

The course will focus on the general theory of communications, the function of media in an industrialized society, and the social, racial, and class values implied in the communication process. There will be group writing projects, a term paper, and the screening of significant American and Third World films.

344 Neocolonialism and Government in Africa: Problems of Africanization and Development Fall, 3 credits.

Designed to study the problems of government in Africa with emphasis on Ghana, Nigeria, Kenya, Uganda, Tanzania, Zambia, and Malawi.

[345 Afro-American Perspectives in Experimental Psychology (also Psychology 345)] Spring, 3 or 4 credits. Prerequisite: introductory course in psychology or AS&RC 171. Offered in alternate years. A. W. Boykin. Not offered 1978-79.]

346 African Socialism and Nation Building Spring, 4 credits.

This course is designed to explore and critically analyze the various theories of African socialism as propounded by theorists and practitioners. It will seek to compare those ideas extending from Nyerere's "Ujamaa" (for example, traditional social and economic patterns of African society) to Nkrumah's "Scientific Socialism" (such as the desirability and practicality of the Marxian type of socialism in Africa).

351 Politics in the Afro-Caribbean World: An Introduction Fall or spring, 4 credits. Offered according to demand.

A study of the social, political, economic, and psychological forces that have shaped Caribbean societies.

352 Pan-Africanism and Contemporary Black Ideologies Spring, 4 credits.

A historical study of Pan-Africanism that will review and analyze the literature and activities of early black Pan-African theorists and movements.

360 Ancient African Nations and Civilizations Fall, 3 credits.

T Th 12:20-1:40. J. Higginson.
An introduction to African history beginning with early civilizations in pre-European Africa.

361 Afro-American History (from African Background to the Twentieth Century) Fall, 3 credits.

M W F 10:10. R. Harris.
Designed to explore major themes of the black historical experience in America from African origin to the twentieth century. A major concern will be the

changing status of black people over time and their attempts to cope with bondage, racism, circumscription, and oppression.

370 Afro-American History: The Twentieth Century Spring, 3 credits.

T Th 10:10-11:15. R. Harris.
The course will explore major themes of the black historical experience in America during the twentieth century, and will assess the socioeconomic, political, and cultural condition of Afro-Americans after a presence of more than three hundred and fifty years in this country.

381 Contemporary African History Spring, 3 credits.

M W 10:10-12:05. J. Higginson.
This course will take as its point of departure the historical sources of the present problems on the African continent as they appear from 1500 to the present time. Important phases of study will include the impact of the Atlantic slave trade, the European Scramble of 1884, various forms of African resistance to colonial occupation to 1914, and the prospects of protracted social unrest in Africa south of the Zambezi River.

400 Ideology and Development Fall, 4 credits.

The course will survey literature on the political economy of the West African subregion. Emphasis will be placed on contemporary West African economic problems and prospects.

410 Black Politics and the American Political System Fall, 4 credits.

The course is designed to engage students in a survey and analysis of the theoretical and empirical basis of black politics in America. It is a sociohistorical investigation and evaluation of the variety of practical political activities among black people in the United States.

420 Social Policy and the Black Community in the Urban Economy Spring, 4 credits. Offered in alternate years.

J. Turner.

422 African Literature Spring, 4 credits.

The main focus will be on the basic themes in the twentieth-century literature produced by Africans south of the Sahara.

425 Advanced Seminar in Black Theatre Fall, 4 credits.

The course involves the study and production of the total black theatre.

431 History of Afro-American Literature Fall, 4 credits.

M W F 3:10-4. C. Fontenot.
This course will be an extensive examination of the impact that Afro-American literature has had on describing, explaining, and projecting the Afro-American experience from 1619 to the present.

432 Modern Afro-American Literature Spring, 4 credits.

A study of fiction by black writers, focusing on the political and sociological component that influenced the development and growth of black writing in relationship to literary themes and attitudes current in specific periods and movements from post-World War I to the present.

460 History of African Origins of Major Western Religions Fall or spring, 4 credits. Prerequisite: sophomore status or permission of instructor.

Y. ben-Jochannan.
The course is designed to develop an understanding of the basic origins of the philosophical, theosophical, and magical-religious teachings responsible for Judaism, Christianity, and Islam.

465 Black Critique: Towards Defining and Developing a Black Aesthetic Spring. 4 credits. A study of aesthetic-moral-cultural values and judgments that black people can develop, recognize, and viably respect as black aesthetics.

475 Black Leaders and Movements in Afro-American History Spring. 4 credits.

T Th 3:35-4:25. R. Harris.

This course will provide the opportunity for a comprehensive analysis of the personalities, ideas, and activities central to the struggle for Afro-American liberation, ranging from eighteenth-century figures to the present time. Rebellion, emigration, assimilation, nationalism, accommodation, protest, cultural pluralism, separation, integration, and revolution will mark some of the central issues.

483 Themes in African History Offered in alternate years. 4 credits.

C. Mbata.

485 Racism, Social Structure, and Social Analysis Seminar Spring. 4 credits.

W 2-4:25. J. Turner.

The course will be directed toward an examination of the social structure of American society and the relationship of racial and class categories to social stratification. An analysis of power structures and the social salience of socioeconomic connections of governmental decision makers and the corporate structure will be developed.

495 Political Economy of Black America Spring. 4 credits.

T Th 12:20-2:15. F. Hayes.

An examination of the role that black labor has played in the historical development of United States monopoly, capitalism, and imperialism. Emphasis will be placed on the theory and method of political economy, and a concrete analysis of the exploitation of black people as slave labor, agricultural labor, and proletarian labor.

498-499 Independent Study 498, fall; 499, spring.

Hours to be determined. Africana Center faculty.

For students working on special topics with selected readings, research projects, etc., under the supervision of a member of the Africana Studies and Research Center faculty.

500 Political Ideology, Planning, and Development in Africa Spring. 4 credits. Offered in alternate years. Prerequisite: 344, 346, or permission of instructor.

C. Mbata.

505 Workshop in Teaching About Africa 4 credits. Offered in alternate years. Prerequisites: 203 and 204, or 360 and 361, or permission of instructor.

C. Mbata.

510 Historiography and Sources (The Development of Afro-American History) Fall. 4 credits. Prerequisite: upperclass or graduate standing, or permission of instructor.

T Th 11:15. R. Harris.

Through a critical examination of the approach, methodology, and philosophy of major writers in this field such as James W. C. Pennington, George Washington Williams, W. E. B. DuBois, Carter G. Woodson, John Hope Franklin, Benjamin Quarles, Lerone Bennett, Jr., and Vincent Harding, we will trace the evolution of Afro-American history from its origin to the present. The nature and purpose of Afro-American history, especially the role of the black historian in the context of a racist and oppressive society, will be analyzed. Attention will be given to sources for studying black history with each participant fashioning a conceptual framework for application to the materials and evidence of the black experience in America.

515 Comparative Political History of the African Diaspora 4 credits. Offered in alternate years. Prerequisites: upperclass or graduate standing, or two of the following courses: 203, 204, 283, 360, 361, 475, 484, 490.

520 Historical Method, Sources, and Interpretation Fall. 4 credits. Offered in alternate years. Prerequisites: upperclass or graduate standing, or two of the following courses: 203, 204, 361, 475, 484, 490.

C. Mbata.

550 Transnational Corporations in Africa and Other Developing Countries Spring. 4 credits. Prerequisites: upperclass or graduate standing, or permission of instructor.

Examines the role of transnational enterprises as an economic and political factor in the Third World, their relations with the host government and their interaction with both the private and public sectors of the economy of the host country. Special emphasis on Africa and Latin America.

551 Political History of Social Development in the Caribbean 4 credits. Offered according to demand. Prerequisite: upperclass or graduate standing or permission of instructor.

571 Seminar: Psychological Issues in the Black Community Spring. 4 credits. Prerequisite: permission of instructor.

W. Cross.

A critical examination of existing theory and research on identity development and identity transformation in Afro-American life, including black identity metamorphosis that occurs within the context of social movements. Particular attention will be given to the following: (1) the interface between social systems and identity development and maintenance; (2) dual consciousness; (3) functions of identity in daily life; (4) conversion and deconversion within the contexts of the contemporary black movement; (5) the psychohistorical implications of unidimensional theories of black self-concept; (6) the relationships among identity, behavior, and ideology.

698-699 Thesis 698, fall; 699, spring. Africana Studies and Research Center students only. Africana Center faculty.

Ancient Mediterranean Studies

Study of the major ancient cultures of the Mediterranean involves a large number of disciplines in several departments at Cornell. The concentration in Ancient Mediterranean Studies aims at providing a coordinated program for students who do not elect to major in this area. (Relevant majors are offered by the Department of Classics and the Department of Near Eastern Studies.) There are no prerequisites for the concentration, which is open to freshmen as well as upperclass students regardless of their majors. The concentration will serve one or both of two main purposes: (1) An introduction to the group of cultures that form the roots of modern Western culture. Mediterranean traditions of politics, religion, thought, literature, and art have continued and developed in new ways in the West since the end of antiquity. An understanding of those traditions as well as the issues and concerns from which they grew is valuable in itself and provides an illuminating perspective essential to understanding our own culture. (2) An introduction to the liberal arts through the study of works of the highest quality in literature, art, history, philosophy, government, and science.

Courses are listed below under four headings: general courses, civilization (history, art, and archaeology), literature, and thought. General courses are intended to be introductory to all three areas of civilization, literature, and thought. To fulfill the requirements of the concentration the student

must complete a minimum of five courses selected in consultation with an adviser in the concentration. Advisers are listed below under civilization, literature, and thought.

Types of Programs

A student may wish to concentrate entirely in one of the three main areas (civilization, literature, or thought), or to elect a program which draws from two or all three of these areas, such as a study of the civilization, literature, and thought of one period—for example, Classical Greece (fifth and fourth centuries, B.C.). Many other coherent programs may be arranged by the student and adviser.

Civilization

A. H. Bernstein (History), J. Cohen (Near Eastern Studies), J. Coleman (Classics), J. Ginsburg (Classics), P. Kuniholm (Classics), J. O'Donnell (Classics), D. I. Owen (Near Eastern Studies), P. A. Rahe (History), A. Ramage (History of Art)

Introduction to Classical Archaeology (Classics/History of Art 220)

Minoan-Mycenaean Art and Archaeology (Classics/History of Art 221)

[Introduction to Roman Law (Classics 304) Not offered 1978-79.]

Arts and Monuments of Athens (Classics/History of Art 320)

[Archaeology of Cyprus (Classics/History of Art 321) Not offered 1978-79.]

Greeks and their Eastern Neighbors (Classics 322)

[Art and Archaeology of Archaic Cyprus (Classics/History of Art 326) Not offered 1978-79.]

[Pagan and Christian at Rome (Classics 332) Not offered 1978-79.]

Greek Historians (Classics 345)

[Arts of the Roman Empire (Classics 350/History of Art 322) Not offered 1978-79.]

Women in Classical Greece and Rome (Classics/Women's Studies 363)

[Cicero and His Age (Classics/History 365) Not offered 1978-79.]

Seminar in Aegean Archaeology (Classics 629)

[Biblical Law (Comparative Literature 325) Not offered 1978-79.]

The Ancient City: Plato and Machiavelli (History 261)

[Emergence of Greek Democracy (History 265) Not offered 1978-79.]

[Crisis of Greek Civilization (History 266) Not offered 1978-79.]

The Roman Republic (History 267)

Rome of the Caesars (History 268)

[Archaic Greece, 776-500 B.C. (History 450) Not offered 1978-79.]

Greece from Cleisthenes to Cleon, 514-429 B.C. (History 452)

Thucydides and the Peloponnesian War, 432–404 B.C. (History 453)

[Greece in the Age of Lysander and Agesilaus, 410–360 B.C. (History 454) Not offered 1978–79.]

[Philip of Macedon and Alexander the Great (History 455) Not offered 1978–79.]

Roman Imperialism (History 460)

The Roman Revolution (History 461)

[The High Roman Empire (History 462) Not offered 1978–79.]

[Decline and Fall of the Roman Empire (History 463) Not offered 1978–79.]

[Social and Economic History of Ancient Rome (History 561) Not offered 1978–79.]

[Roman Africa (History 562) Not offered 1978–79.]

[Roman Cities, People, and Monuments (History of Art 105) Not offered 1978–79.]

[Beginnings of Civilization (History of Art 210) Not offered 1978–79.]

[Art of the Ancient Near East (History of Art 316) Not offered 1978–79.]

[Painting in the Greek and Roman World (History of Art/Classics 323) Not offered 1978–79.]

[Numismatics (History of Art 424) Not offered 1978–79.]

[Greek Sculpture (History of Art/Classics 431) Not offered 1978–79.]

The History of Ancient Israel (Near Eastern Studies 243–244)

[Ancient Seafaring (Near Eastern Studies 249) Not offered 1978–79.]

Introduction to Biblical Archaeology (Near Eastern Studies 285)

[Age of the Patriarchs (Near Eastern Studies 344) Not offered 1978–79.]

[The History of the Ancient Near East (Near Eastern Studies 345) Not offered 1978–79.]

[Interconnections in the Eastern Mediterranean World in Antiquity (Near Eastern Studies 385) Not offered 1978–79.]

Archaeology of the Ancient Near East (Near Eastern Studies 387)

[Seminar in Syro-Palestinian Archaeology (Near Eastern Studies 481) Not offered 1978–79.]

Literature

F. M. Ahl (Classics), C. M. Carmichael (Comparative Literature), K. Clinton (Classics), M. Collins (Near Eastern Studies), W. J. Dannhauser (Government), T. Irwin (Philosophy), G. M. Kirkwood (Classics), D. Malone (Classics), G. M. Messing (Classics), J. O'Donnell (Classics), P. Pucci (Classics), I. Rabinowitz (Near Eastern Studies)

The Ancient Epic: Homer and Vergil (Classics 238)

Greek and Roman Drama (Classics/Comparative Literature 300)

[Greek Foundations of Western Literature (Classics/Comparative Literature 331) Not offered 1978–79.]

[Latin Foundations of Western Literature (Classics/Comparative Literature 333) Not offered 1978–79.]

Ancient Wit: An Introduction to the Theory and Form of Comic and Satiric Writing in Greece and Rome (Classics/Comparative Literature 339)

[Genre and Period in Greek and Roman Literature (Classics/Comparative Literature 430) Not offered 1978–79.]

[Studies in Christian Origins (Comparative Literature 326) Not offered 1978–79.]

Old Testament Seminar (Comparative Literature 421)

[New Testament Seminar (Comparative Literature 426) Not offered 1978–79.]

[The Literature of the Old Testament (Comparative Literature 328) Not offered 1978–79.]

[Readings in the New Testament (Comparative Literature 429) Not offered 1978–79.]

[Freshman Seminar in Biblical Literature (Near Eastern Studies 141) Not offered 1978–79.]

Readings in Classical Hebrew Prose (Near Eastern Studies 231)

Readings in Classical Hebrew Poetry (Near Eastern Studies 232)

The Literature of Ancient Israel I (Near Eastern Studies 331)

[The Literature of Ancient Israel II (Near Eastern Studies 332) Not offered 1978–79.]

Classics and Renaissance Drama (Theatre Arts 325)

Thought

E. Asmis (Classics), C. M. Carmichael (Comparative Literature), M. Collins (Near Eastern Studies), W. J. Dannhauser (Government), G. Fine (Philosophy), T. Irwin (Philosophy), J. O'Donnell (Classics), P. A. Rahe (History)

Philosophy

[Greek Philosophy (Classics 224) Not offered 1978–79.]

[Hellenistic and Roman Philosophy (Classics 225) Not offered 1978–79.]

Foundations of Western Thought: Plato and his influence (Classics 336)

The Ancient City: Plato and Machiavelli (History 261)

Ancient Thought (Philosophy 210–211)

[Plato (Philosophy 309) Not offered 1978–79.]

Aristotle (Philosophy 310)

[Topics in Ancient Philosophy (Philosophy 314) Not offered 1978–79.]

[Special Topics in the History of Philosophy (Philosophy 315) Not offered 1978–79.]

Topics in Ancient Philosophy (Philosophy 413)

Science

[Greek Science (Classics 222) Not offered 1978–79.]

Ancient Philosophy of Science (Classics 337)

[Science in Western Civilization (History 281) Not offered 1978–79.]

[Science in Classical Antiquity (History 481–482) Not offered 1978–79.]

Law and Politics

[Introduction to Roman Law (Classics 304) Not offered 1978–79.]

[Biblical Law (Comparative Literature 325) Not offered 1978–79.]

Classics in Political Thought (Government 363)

Religion

The Genius of Christianity (Classics 226)

Greek Mythology (Classics/Comparative Literature 236)

[Greek and Roman Mystery Religions (Classics 237) Not offered 1978–79.]

[Pagan and Christian at Rome (Classics/Comparative Literature 332) Not offered 1978–79.]

[Greek Religion (Classics 360) Not offered 1978–79.]

[Augustine (Classics 426) Not offered 1978–79.]

The Church of Our Fathers (Classics 428)

[Studies in Christian Origins (Comparative Literature 326) Not offered 1978–79.]

The Literature of the Old Testament (Comparative Literature 328)

Old Testament Seminar (Comparative Literature 421)

[New Testament Seminar (Comparative Literature 426) Not offered 1978–79.]

[Readings in the New Testament (Comparative Literature 429) Not offered 1978–79.]

[Topics in the Philosophy of Religion (Philosophy 363) Not offered 1978–79.]

Arts and Sciences College Course

Arts and Sciences 200 Information and Knowledge in Science and Engineering (also Astronomy 215) Fall, 4 credits.

T Th 10:10–11:35. M. Harwit.

Topics to be covered include: the exact and probabilistic laws of nature; messages, information content, and entropy; the Heisenberg uncertainty principle as a fundamental limitation on what we can know about the behavior of physical systems; coding of messages, cryptography, unbreakable codes, error correcting codes; self-replicating machines; transmission of genetic information in biology; mutations and biological evolution; transmission, storage, and processing of information in machines and in animals; robots and artificial intelligence; transmission of information across the universe—astronomical data and communication with intelligent civilizations. Level of *Scientific American*.

Biology and Society

S. M. Brown, Jr. chairman; R. Boyd, B. Edmonston, T. Eisner, J. Fessenden-Raden, D. Greenwood, J. Haas, S. Levin, W. Provine, R. Root, J. M. Stycos, B. Wallace, S. Zahler

The Biology and Society major within the College of Arts and Sciences is a multidisciplinary program for students with special interests in such problems as food and population, energy, the environment, conservation of our natural resources, genetic engineering, and the right to medical care, as well as for students who plan postgraduate study in health and medicine, law, or other related fields.

Because the Biology and Society major is multidisciplinary, students must attain a basic understanding of each of the several disciplines it comprises, including introductory courses in the fields of chemistry, mathematics, genetics, ecology, and history. In addition, majors are required to take the two-semester course in Biology and Society, a set of electives, and a special senior seminar. Programs incorporating these required courses are designed in consultation with a special group of faculty advisers to accommodate each student's individual goals and interests.

The courses listed below are directly relevant to the Biology and Society major. Descriptions of cosponsored courses are located among the listings of those respective departments. For further information on the Biology and Society major, including courses of related interest, specific course requirements, and application procedures, contact Professor S. M. Brown, Jr., Program on Science, Technology, and Society, 628 Clark Hall.

Biology and Society I: The Biocultural Perspective (Anthropology 301 and Biological Sciences 301)

Biology and Society II: Biology, Society, and Ethics (Anthropology 302 and Biological Sciences 302)

Biomedical Ethics (Biological Sciences 205 and Philosophy 245)

Environmental Ethics (Biological Sciences 206 and Philosophy 246)

Senior Seminar in Biology and Culture (Biology and Society 400-401, College Scholar 425-426, and Society for the Humanities 425-426) Fall or spring. 4 credits each term. Prerequisite: permission of instructor.

T 2:30-4:30. T. Eisner, W. Provine.
Selected topics on the interaction of biology and culture.

Senior Seminar in Federal Regulations: Establishment and Enforcement (Biology and Society 402) Spring. 4 credits. Prerequisite:

Anthro 302 or Bio S 302 or permission of instructor.
T 2:30-4:30; occasionally Th 2:30-4:30 for guest lecturers. J. Fessenden-Raden.

A comprehensive probe to ascertain how Federal regulations are established, why certain provisions are included, how interpretations of the regulations are established, and how regulations are enforced. The role of the biologist and individual or group at each stage will be discussed. Speakers will include a local congressman, congressional staff person, regulatory agency staff person, lobbyist, and college president.

China-Japan Program

T. L. Mei, director; J. McCoy, associate director; M. G. Bernal, K. Biggerstaff, N. C. Bodman, K. Brazell, S. Cochran, B. deBary, D. R. DeGlopper, R. T. Freeman, A. G. Grapard, E. M. Gunn, E. H. Jordan, D. P. Mozingo, T. J. Pempel, C. A. Peterson, H. Shadick, R. J. Smith, C. Steenstrup, M. W. Young

The China-Japan Program is made up of faculty members who have a commitment to teaching and research on China and Japan. The program is interdisciplinary and is organized to encourage and assist students in the study of the two great civilizations of East Asia. In addition to offering a substantial number of courses in the languages of China and Japan, program faculty members cover most of the major disciplines by means of courses given in several departments of the arts college. The program is especially rich in courses that deal with the history, literatures, societies, culture, and arts of East Asia. Undergraduates wishing to concentrate their studies on China or Japan may do so by declaring a major in the Department of Asian Studies and selecting an adviser from the faculty members listed above. Students interested in majoring in Asian Studies with a focus on either China or Japan should consult the chairman of the Department of Asian Studies in 156 Rockefeller Hall. Graduate students interested in Chinese and Japanese studies should consult the *Announcement of the Graduate School*. For further information, contact the director or any staff member in the China-Japan Program Office, 140 Uris Hall.

China

Language and Literature Courses

Elementary Chinese (Chinese 101-102)**Cantonese Basic Course (Chinese 111-112)****Intermediate Chinese I (Chinese 201-202)****Chinese Conversation (Chinese 203-204)****Introduction to Classical Chinese (Chinese 213-214)****Intermediate Chinese II (Chinese 301)****Intermediate Chinese III (Chinese 302)****Chinese Conversation, Intermediate (Chinese 303-304)****[Intermediate Cantonese II (Chinese 311-312)**
Not offered 1978-79.]**Chinese Philosophical Texts (Chinese 313)****Classical Narrative Texts (Chinese 314)****History of the Chinese Language (Chinese 401-402)****Linguistic Structure of Chinese: Phonology and Morphology (Chinese 403)****Linguistics Structure of Chinese: Syntax (Chinese 404)****Chinese Dialects (Chinese 405)****Readings in Modern Chinese Literature (Chinese 411-412)****T'ang and Sung Poetry (Chinese 420)****Chinese Directed Reading (Chinese 421-422)****Readings in Folk Literature (Chinese 430)****Seminar in Chinese Poetry and Poetics (Chinese 603)****Seminar in Chinese Fiction (Chinese 605)****Chinese Dialect Seminar (Chinese 607)****Seminar in Chinese Folk Literature (Chinese 609)****Advanced Directed Reading (Chinese 621-622)****Intensive Chinese (FALCON 161-162)**

[Revolutions and Social Values in Modern Chinese Literature (Asian Studies 103) Not offered 1978-79.]

Three Ways of Thought (Asian Studies 104)

[Chinese Philosophical Literature (Asian Studies 371) Not offered 1978-79.]

[Chinese Poetry (Asian Studies 372) Not offered 1978-79.]

Twentieth-Century Chinese Literature (Asian Studies 373)**Chinese Narrative Literature (Asian Studies 374)****Sino-Tibetan Linguistics (Linguistics 662)****Chinese Linguistics (Linguistics 700)****Area Courses****China in Western Eyes: 1300-1976 (Anthropology 143)**

[Traditional Chinese Culture and Society (Anthropology 343) Not offered 1978-79.]

Chinese Government and Politics (Government 347)**Comparative Revolutions (Government 350)****Foreign Policy of China (Government 390)**

[Comparative Communism (Government 446) Not offered 1978-79.]

[Capitalism and Communism: Chinese and Japanese Patterns of Development (Government 462) Not offered 1978-79.]

[Politics of China (Government 645) Not offered 1978-79.]

Graduate Seminar in Comparative Communism (Government 648)

[Readings from Mao Tse-tung (Government 651) Not offered 1978-79.]

[Culture and the Mass Line in China (Government 654) Not offered 1978-79.]

China and the European Psyche (History 293)**Chinese Views of Themselves (History 294)****Warfare in Premodern Societies (History 360)****History of China up to Modern Times (History 393)****History of China in Modern Times (History 394)****Seminar in Premodern Chinese History (History 492)****Self and Society in Chinese History (History 493)**

Undergraduate Seminar: The First Chinese Revolution, 1880-1930 (History 494)

Chinese Historiography and Source Materials (History 691)

Problems in Modern Chinese History (History 693-694)

Seminar on Medieval Chinese History (History 791-792)

Seminar on Modern Chinese History (History 793-794)

The Arts of Early China (History of Art 383)

Chinese Painting and Ceramics (History of Art 385)

[Arts of the T'ang Dynasty (History of Art 483) Not offered 1978-79.]

Japan

Language and Literature Courses

Elementary Japanese (Japanese 101-102)

Accelerated Introductory Japanese (Japanese 123-124)

Intermediate Japanese I (Japanese 201-202)

Intermediate Conversation (Japanese 203-204)

Intermediate Reading (Japanese 301-302)

Advanced Conversation (Japanese 303-304)

Introduction to Literary Japanese (Japanese 305-306)

Advanced Japanese (Japanese 401-402)

Linguistic Structure of Japanese (Japanese 404)

Intermediate Literary Japanese (Japanese 405-406)

Oral Narration and Public Speaking (Japanese 407-408)

Directed Reading (Japanese 421-422)

Intensive Japanese (FALCON 161-162)

Japanese Conceptions of Beauty (Asian Studies 101)

[Ideas and Images in Japanese Culture (Asian Studies 102) Not offered 1978-79.]

Japanese Poetry and Drama (Asian Studies 375)

Modern Japanese Fiction (Asian Studies 376)

[Japanese Narrative Literature (Asian Studies 377) Not offered 1978-79.]

Japanese Nô Theater (Asian Studies 400)

Honors and Supervised Reading (Asian Studies 401-402)

The Japanese Film (Asian Studies 414)

Area Courses

[Contemporary Japan (Government 100) Not offered 1978-79.]

Japanese Religions (Asian Studies 451)

Japanese Historiography and Source Materials (Asian Studies 462)

Urban Anthropology (Anthropology 143)

[Japanese Culture and Society (Anthropology 345) Not offered 1978-79.]

Politics in Contemporary Japan (Government 346)

[Politics of Industrial Societies (Government 348) Not offered 1978-79.]

[Politics of Productivity: Germany and Japan (Government 430) Not offered 1978-79.]

General—East Asia

Chinese and Japanese Bibliography and Reference Works (Asian Studies 460)

Introduction to Asian Civilization (History 190-191)

Introduction to Art History: Asian Traditions (History of Art 280)

[Capitalism and Communism: Chinese and Japanese Patterns of Development (Government 462) Not offered 1978-79.]

The Nature of Religious Experience (Asian Studies 250)

Introduction to Asian Religions (Asian Studies 351)

Mahayana Buddhism (Asian Studies 352)

[Zen Buddhism (Asian Studies 453) Not offered 1978-79.]

Seminar on Asian Religions (Asian Studies 650)

Folk Literature of East Asia (Asian Studies 386)

Seminar in East Asian Literature (Asian Studies 700-701)

Directed Research (Asian Studies 703-704)

Anthropological Approaches to the Study of Buddhism in Asia (Anthropology 619)

United States and Asia (Government 387)

Seminar in International Relations of Asia (Government 687)

Buddhist Art in Asia (History of Art 381)

Ceramic Art of Asia (History of Art 482)

Problems of Asian Art (History of Art 580)

College Scholar Program

The College Scholar Program is designed to serve those students whose interests and talents do not easily fit into the usual departmental majors, who demonstrate exceptional promise, and who show the maturity to plan and carry out, with the help of their adviser, a well-designed program of studies that does not necessarily follow the College requirements. College Scholars do not all design the same kind of program: some, for instance, may pursue two diverse interests, while others design a well-integrated educational plan. Although they do not need to present a program that lists each course they plan to take, they are expected to have a firm

sense of what they would like to accomplish at Cornell. The program allows them to explore the college's many offerings with a little more freedom than is available to other students.

Each year up to forty freshmen are chosen for the program. College Scholars must complete 120 credits of course work, a senior project, the physical education requirement, and, unless they receive permission to accelerate, eight terms in the college. They are not required to complete a major or fulfill the distribution requirement, but members of the College Scholar Advisory Board believe that the spirit of the requirements is a good one.

Applications to the College Scholar Program are due before the final class day of spring term. Interested students should contact the Office of Special Programs, 159 Goldwin Smith Hall, for further information.

Candidates for honors must maintain a 3.5 average in all courses and must complete two College Scholar seminars. Nonscientists should complete one seminar in some aspect of science, and scientists at least one in the humanities or social sciences. During the senior year candidates for honors must complete a thesis or honors project. Students interested in the honors program should confer with the director of the College Scholar Program before the start of their senior year.

College Scholar 396-397 Independent Study 396, fall; 397, spring. 1 or 2 credits. Permission of program office required.

College Scholar 398-399 Independent Study 398, fall; 399, spring. 3 or 4 credits. Permission of program office required.

College Scholar 498-499 Honors Research 498, fall; 499, spring. 4-8 credits. A total of 8 credits is allowed for these courses.

College Scholar Seminar Program

The program offers several seminars each year that are intended to help students understand the nature of academic disciplines, the relationships between disciplines, and the nature of critical inquiry. College Scholars are encouraged to take these seminars.

College Scholar 350 Tolstoy and the Disciplines (also Russian Literature 350) Spring. 4 credits. Limited to 20.

P. Carden and A. Stulglova.

College Scholar 425-426 Biology and Culture (also Society for the Humanities 425-426) 425, fall; 426, spring. 4 credits each term. Limited to 15. T 2:30-4:30. T. Eisher and W. Provine.

College Scholar 464 Seminar on Technology Assessment (also Civil and Environmental Engineering B416) Spring. 3 credits. R. Bowers and N. Orloff.

German Area Studies Major

See p. 95.

Independent Major Program

The Independent Major Program allows students to design their own majors if they wish to pursue an interest that cannot be met within an established major. Students who wish to study one fairly specialized field that cuts across several departments may plan an independent major with the help of a faculty adviser. Proposals for independent majors are assessed by a board of faculty members; board members consider whether the plan is equivalent in coherence, breadth, and depth to a departmental major and whether it is well-

suited to the student's academic preparation and ability. Students should consult the director of the Independent Major Program, Office of Special Programs, 159 Goldwin Smith Hall, for further information. Deadlines for submitting independent major proposals are September 13, October 16, January 31, and March 12.

Candidates for honors must have a cumulative average of 3.0, no grade below B in courses in the major, and a cumulative average of 3.5 for courses in the major. During their senior year candidates for honors must complete a thesis or honors project. Students interested in the program should confer with the director of the Independent Major Program before the start of the senior year.

Independent Major 301–302 Independent Study
301, fall; 302, spring. 2 credits each term.
Permission of program office required.

Independent Major 351–352 Independent Study
351, fall; 352, spring. 3 or 4 credits each term.
Permission of program office required.

Independent Major 498–499 Honors Research
498, fall; 499, spring. 4 to 8 credits. A total of 8 credits is allowed for these courses.

Intensive English Program

E. J. Beukenkamp, director

This full-time, noncredit, nondegree program is designed to meet the requirements of foreign students who need to acquire proficiency in English in order to pursue university-level studies in the United States, as well as for visitors, businessmen, and others seeking competence in the language.

The intensive nature of the courses leads to a command of the language in all its aspects—listening, speaking, reading, and writing—in the shortest possible time. Courses are offered both fall and spring semesters at three levels: beginning (TOEFL score below 370), intermediate (TOEFL score below 450), and advanced.

Students who have gained full admission to or who already are registered in degree granting programs of Cornell University should refer to p. 92 for information regarding courses in English as a second language.

The Intensive English Program is administered by the Department of Modern Languages and Linguistics, Cornell University, Morrill Hall, Ithaca, New York 14853. Application materials and information are available directly from the program or by calling 607/256-4863.

Center for International Studies

See p. 211.

Program of Jewish Studies

J. Cohen, coordinator (Jewish History, The Church and the Jews, Rabbinics); M. F. Collins (Bible, Dead Sea Scrolls, Apocryphal and Rabbinic Literature); W. J. Dannhauser (Jews and Germans, Contemporary Jewish Thought, Gershom Scholem); S. L. Gilman (Yiddish Literature, German/Jewish History and Literature); A. G. Korman (Holocaust Studies, Jewish Labor Movements); D. I. Owen (Ancient Jewish History and Archaeology); E. Rosenberg (Modern European and Anglo-American Literature)

The Program of Jewish Studies is included in the framework of the Department of Near Eastern Studies. The program has grown out of the conviction that Judaic civilization merits its own comprehensive and thorough treatment and that proper understanding of any culture is inconceivable without adequate knowledge of the language, literature, and history of the people that created it. Accordingly, the offerings in the area of Hebrew

language and literature have been considerably expanded and courses in ancient, medieval, and modern Jewish history have been added to the program.

Although further expansion of the program is anticipated, it presently enables students to obtain basic instruction and specialization in the fields of Semitic languages, the Hebrew Bible, the Apocryphal and Tannaitic literatures, medieval Hebrew literature, modern Jewish thought, modern Hebrew literature, and ancient, medieval, and modern Jewish history. In some of these fields students may take courses on graduate and undergraduate levels. Faculty in other departments provide additional breadth to the program by offering courses in related areas of study. For descriptions of the courses included in the program, see courses listed under Near Eastern Studies, p. 109.

Latin American Studies

D. K. Freebairn, director; S. Barraclough, L. Crowder, T. Davis, R. Goldsen, W. Goldsmith, C. Greenhouse, J. Haas, D. Hazen, J. Henderson, T. Holloway, B. J. Isbell, J. Kahl, E. Kenworthy, L. King, T. Lynch, R. McDowell, C. Morris, J. Murra, T. Poleman, W. Rogers, B. Rosen, E. M. Santi, D. Solá, J. M. Stycos, M. Suárez, H. D. Thurston, A. Van Wambeke, W. Whyte, L. Williams, F. Young

The Latin American Studies Program encourages and coordinates faculty and student interests in Latin America. A variety of special lectures, films, and seminars supplement the regular course offerings. Undergraduate students may arrange a Latin American concentration or an independent major in Latin American studies, and graduate students may pursue a minor in Latin American studies while majoring in the graduate field of their choice. The College of Arts and Sciences offers Latin American studies courses in anthropology, economics, government, history, and sociology. In addition, there is a varied language, literature, and linguistics curriculum in Spanish, Portuguese, and Quechua. The student may also pursue Latin American studies in the College of Agriculture and Life Sciences; the College of Architecture, Art, and Planning; the College of Human Ecology; and the School of Industrial and Labor Relations.

Courses offered in the various departments include:

Economics of Agricultural Development (Agricultural Economics 464)

[Seminar on Latin American Agricultural Policy (Agricultural Economics 665) Not offered 1978–79.]

Geography and Appraisal of Soils of the Tropics (Agronomy 401)

The Discovery of America (Anthropology 150)

Urban Anthropology (Anthropology 313)

[Ethnology of Lowland South America (Anthropology 332) Not offered 1978–79.]

Ethnology of the Andean Region (Anthropology 333)

The Earliest Civilization (Anthropology 350)

[Interpretation of the Archaeological Record (Anthropology 352) Not offered 1978–79.]

Archaeology of the Americas I (Anthropology 354)

Archaeology of the Americas II (Anthropology 355)

Mesoamerican Thought and Culture (Anthropology 356)

[Investigation of Andean Institutions: Archaeological Strategies (Anthropology 435) Not offered 1978–79.]

[Andean Research (Anthropology 633) Not offered 1978–79.]

Problems in Archaeology: Early Man in America (Anthropology 663)

Problems in Archaeology: The Andes (Anthropology 664)

Regional Planning and Development in Developing Nations (City and Regional Planning 670)

Seminar in Project Planning in Developing Countries (City and Regional Planning 773)

[Economic History of Latin America (Economics 325/525) Not offered 1978–79.]

[Economic Problems of Latin America (Economics 565) Not offered 1978–79.]

[Politics of Latin America (Government 340) Not offered 1978–79.]

Latin American Society and Politics (Government 655 and Sociology 655)

Latin American History to 1825 (History 210)

Latin American History Since 1825 (History 211)

Agrarian History of Latin America (History 347)

[Contemporary Brazil (History 348 and Sociology 368) Not offered 1978–79.]

[Undergraduate Seminar in Latin American History (History 449) Not offered 1978–79.]

[Seminar in Latin American History (History 649) Not offered 1978–79.]

Special Studies of Problems of Agriculture in the Tropics (International Agriculture 602)

Elementary Portuguese (Portuguese 121–122)

[Advanced Composition and Conversation (Portuguese 303–304) Not offered 1978–79.]

Seminar in Portuguese Linguistics (Portuguese 700)

Portuguese Intermediate Composition and Conversation (Portuguese 203–204)

Portuguese Advanced Readings (Portuguese 305–306)

Quechua Elementary Course (Quechua 131–132)

Quechua Intermediate Course (Quechua 133–134)

Seminar in Quechua Linguistics (Quechua 700)

Freshman Seminar: Literature as Game in Modern Spanish–American Fiction (Romance Studies 106)

Intermediate Spanish Grammar and Composition (Romance Studies 212)

[Advanced Spanish Grammar and Composition (Romance Studies 312) Not offered 1978–79.]

Readings in Modern Spanish-American Literature (Romance Studies 317)

[Latin American Civilization (Romance Studies 323) Not offered 1978-79.]

Modern Drama in Spanish America (Romance Studies 332)**Popular Culture in Contemporary Spanish-American Prose (Romance Studies 336)****Women in Hispanic Literature (Romance Studies 340)****Ideology of the Independence and Romanticism (Romance Studies 389)****Modern Hispanic Poetry (Romance Studies 398)****Spanish-American Literature of the Colonial Period (Romance Studies 479)****Quixote and the Modern Hispanic Novel (Romance Studies 496)****Hispanic Americans (Sociology 265)****After the Revolution: Mexico and Cuba (Sociology 367)**

[Contemporary Brazil (Sociology 368) Not offered 1978-79.]

[Human Fertility in Developing Nations (Sociology 434) Not offered 1978-79.]

Research Seminar in Population: Costa Rica (Sociology 632)**Latin American Society and Politics (Sociology 655 and Government 655)**

[History of the Spanish Language (Spanish 401-402) Not offered 1978-79.]

Applied Linguistics of Spanish (Spanish 407)**Grammatical Structure of Spanish (Spanish 408)****Hispanic Dialectology (Spanish 601)****Linguistic Structure of Ibero-Romance (Spanish 602)****Contemporary Theories of Spanish Phonology (Spanish 603)****Contemporary Theories of Spanish Grammar (Spanish 604)****Seminar in Hispanic Linguistics (Spanish 700)****Law and Society**

The existence at Cornell of a wide variety of courses concerning the law as a social and historical phenomenon makes it possible for students to study law and society as a minor field. Students who wish to graduate with a concentration in law and society should consult one of the advisers listed below to work out a coherent program of study including at least four courses from among those approved for this purpose.

The law and society advisers for the 1978-79 year are: H. Alker (psychology), C. Carmichael (comparative literature), E. Eisenach (government), C. Greenhouse (anthropology), C. Holmes (history), J. B. Jacobs (sociology), D. B. Lyons (philosophy), D. T. Regan (psychology)

The following courses currently qualify for the concentration in law and society:

Law and Culture (Anthropology 328)

[Introduction to Roman Law (Classics 304) Not offered 1978-79.]

[Biblical Law (Comparative Literature 325) Not offered 1978-79.]

[Economics and the Law (Economics 304) Not offered 1978-79.]

Public Regulation of Business (Economics 352)**Law and Society (Government 100)****The Nature, Functions, and Limits of Law (Government 313)****Common Law and Lawyers in America (Government 314)**

[Law and Social Science (Government 324-325) Not offered 1978-79.]

[Civil Liberties in the U.S. (Government 327) Not offered 1978-79.]

Constitutional Politics (Government 328)**International Law (Government 389)****English Constitutional History to 1485 (History 250)****English Constitutional History to Present (History 255)****American Constitutional Development (History 318)****Early Development of Anglo-American Common Law (History 359)**

[Church and State During the Middle Ages (History 367) Not offered 1978-79.]

Law and Authority in Nineteenth-Century America (History 430)**Law, Society, and Morality (Philosophy 342)****Contemporary Ethical Theory (Philosophy 441)****Psychological Aspects of Political Behavior (Psychology 387)**

[Sociology of Law (Sociology 348) Not offered 1978-79.]

Prisons and Other Institutions of Coercion (Sociology 352)

[Criminology (Sociology 353) Not offered 1978-79.]

The Law and Environmental Control (Civil and Environmental Engineering 615, College of Engineering)**Labor Relations, Law, and Legislation (Industrial and Labor Relations 201, School of Industrial and Labor Relations)****Protective Labor Legislation (Industrial and Labor Relations 341, School of Industrial and Labor Relations)**

[Legal and Market Controls of Technological Change (The Law School) Not offered 1978-79.]

The Frederick George Marcham Scholar Program

Each year the Frederick George Marcham Scholar Program supports a special seminar program. For information contact M. Kammen, A. D. White Center for the Humanities.

Center for Applied Mathematics

The Center for Applied Mathematics administers a broadly based interdepartmental graduate program that provides opportunities for study and research over a wide range of the mathematical sciences. This program is based on a solid foundation in analysis, algebra, and methods of applied mathematics. The remainder of the graduate student's program is designed by the student and his or her Special Committee. For more detailed information on opportunities for graduate study in applied mathematics contact the director of the Center for Applied Mathematics.

There is no special undergraduate degree program in applied mathematics. Undergraduate students interested in an application-oriented program in mathematics may select either the Option I or Option II major in mathematics or a suitably oriented program in some department of the College of Engineering.

Medieval Studies

A. B. Groos, graduate faculty representative;
B. B. Adams, F. M. Ahl, A. J. Berger, V. T. Bjarnar, R. G. Calkins, J. Cohen, A. M. Colby-Hall, R. T. Farrell, C. Gilbert, T. D. Hill, J. J. John, R. E. Kaske, N. Kretzmann, G. Mazzotta, G. M. Messing, C. Morón-Arroyo, J. M. Najemy, J. O'Donnell, D. M. Randel, B. Tierney, F. van Coetsem, W. Coetsem III

Undergraduates interested in medieval studies have an opportunity to take courses in the following areas of instruction: medieval Hebrew, medieval Arabic, medieval Latin, Old English, Middle English, medieval Irish and Welsh, Old Provençal, medieval French, medieval Spanish, medieval Italian, Old Saxon, Old High German, Middle High German, Gothic, Old Norse (Old Icelandic), Old Russian, comparative literature, medieval art and architecture, medieval history, Latin paleography, medieval philosophy, musicology, comparative Slavic linguistics, comparative Romance linguistics, and comparative Germanic linguistics.

Undergraduates who wish to undertake an independent major or a concentration in medieval studies should consult the graduate faculty representative for medieval studies, Professor A. B. Groos, 180 Goldwin Smith Hall.

Information for prospective graduate students is contained in the *Announcement of the Graduate School* and in a brochure on medieval studies, which can be obtained from the graduate faculty representative.

Freshman Seminars**101 The Literary Experience of the Middle Ages**
Fall, 3 credits.

M W F 9:05, 12:20, T Th 8:30-10. Staff.
An exploration of several major works and their historical, social, and philosophical contexts. Readings for discussion include: *Beowulf*, Old English poetry, an Icelandic saga, an Arthurian romance by Chrétien de Troyes, *Tristan and Isolde*, selections from Chaucer or Malory, and a "medieval" work by a modern writer such as J. R. R. Tolkien or T. H. White.

102 The Literary Experience of the Middle Ages

Spring, 3 credits.

M W F 9:05, 12:20, T,Th 8:30-10, Staff.

An exploration of several major works and their historical, social, and philosophical contexts. Readings for discussion include: an Icelandic saga, a Germanic epic (*Nibelungenlied*), an Arthurian romance of Chrétien de Troyes, the Grail quest (*Parzival*), selections from Chaucer or Malory, and a "medieval" work by a modern writer such as J. R. R. Tolkien or T. H. White.

For further information about the following and related courses, including those offered in alternate years, consult the listings for Classics, Comparative Literature, English, History, History of Art, Modern Languages and Linguistics (including Germanic Studies, Romance Studies, and Russian Literature), Music, Near Eastern Studies, and Philosophy.

Classics**202 New Testament Greek**[214 **Introduction to Medieval Latin** Not offered 1978-79.]**216 Virgil****226 The Genius of Christianity**[332 **Pagan and Christian at Rome** Not offered 1978-79.]**337 Ancient Philosophy of Science**[348 **Christianity in Britain and Ireland** Not offered 1978-79.]**366 Late Latin**[368 **Medieval Latin Literature** Not offered 1978-79.]**412 The Latin Epic after Virgil**[423 **Vulgar Latin** Not offered in 1978-79.][426 **Augustine** Not offered 1978-79.]**428 The Church of the Fathers****Comparative Literature**[326 **Studies in Christian Origins** Not offered 1978-79.]**328 The Literature of the Old Testament**[334 **Dante in Translation** Not offered 1978-79.]**343 Medieval Literature****349 Women in Medieval Literature**[359 **Being, God, and Mind: The Key Concepts of European Thought from Plato to Vico****421 Old Testament Seminar****429 Readings in the New Testament**[441 **The Other World in Medieval Romance** Not offered 1978-79.]**446 Allegory and Symbolism****English****313 Middle English Literature****319 Chaucer**[411 **Old English in Translation** Not offered 1978-79.][415 **The English Language** Not offered 1978-79.]**611 Readings in Old English****612 Beowulf****613 Middle English Literature****619 Chaucer**[710 **Graduate Seminar in Medieval Literature** Not offered 1978-79.]**712 Advanced Old English**[718 **Graduate Seminar in Medieval Literature: Piers Plowman** Not offered 1978-79.]**French****347 Masterpieces of Medieval Literature**[401-402 **History of the French Language** Not offered 1978-79.]**447-448 Medieval Literature**[602 **Linguistic Structures of Old and Middle French** Not offered 1978-79.][637 **Old French Dialectology** Not offered 1978-79.]**648 Medieval Seminar: Le Roman de la Rose**[649 **Introduction to French Philology** Not offered 1978-79.]**Germanic Studies****401 Introduction to Germanic Linguistics**[402 **History of the German Language** Not offered 1978-79.]**405-406 Introduction to Medieval German Literature**[602 **Gothic** Not offered 1978-79.]**603-604 Old Saxon, Old High German, Old Low Franconian, Old Frisian****609-610 Old Icelandic****611-612 Seminar in Old Icelandic Literature I and II****623 Seminar in Middle High German Literature I****624 Seminar in Medieval German Literature****710 Seminar in Germanic Linguistics****720 Seminar in Comparative Germanic Linguistics**[753 **Tutorial in Middle High German Literature** Not offered 1978-79.]**History****263 The Earlier Middle Ages****264 The High Middle Ages**[350 **Early Renaissance Europe** Not offered 1978-79.][365 **Medieval Culture 400-1150** Not offered 1978-79.]**366 Medieval Culture 1100-1300**[367 **Church and State During the Middle Ages** Not offered 1978-79.]**368 St. Francis of Assisi and the Franciscans**[369 **The History of Florence 1250-1350** Not offered 1978-79.]**664-665 Latin Paleography****668-669 Seminar in Medieval History****History of Art**[230 **Introduction to Art History: Medieval Art** Not offered 1978-79.][333 **Early Medieval Art** Not offered 1978-79.]**334 Romanesque Art and Architecture****335 Gothic Art and Architecture**[336 **Italian Late Medieval Art** Not offered 1978-79.][337 **The Medieval Illuminated Book** Not offered 1978-79.]**341 Flemish Painting**[342 **Medieval and Renaissance German Art** Not offered 1978-79.]**531 Problems in Medieval Art and Architecture****Italian**[327-328 **Dante: La Divina Commedia** Not offered 1978-79.][334 **Dante in Translation** Not offered 1978-79.][335 **Boccaccio** Not offered 1978-79.][437 **Petrarch** Not offered 1978-79.]**Linguistics****404 Comparative Methodology****410 Historical Linguistics**[623-624 **Old Irish** Not offered 1978-79.][625-626 **Middle Welsh** Not offered 1978-79.][627 **Advanced Old Irish** Not offered 1978-79.][628 **Comparative Celtic Grammar** Not offered 1978-79.][629 **Advanced Middle Welsh** Not offered 1978-79.][671-672 **Comparative Slavic Linguistics** Not offered 1978-79.]**Music**[317 (617) **Music and Poetry in France: Late Middle Ages and Renaissance** Not offered 1978-79.]**481 Music in Western Europe to Josquin**[783-784 **Seminar in Medieval Music** Not offered 1978-79.][789-790 **Liturgical Chant in the West** Not offered 1978-79.]

Near Eastern Studies

[253 **Classical Islam** Not offered 1978-79.]**333 The Historical Development of Rabbinic Legal Literature**[334 **Biblical Interpretation in Rabbinic Literature** Not offered 1978-79.]**341 The History of the Jewish People III (429-1492)**[371 **Medieval Hebrew Literature** Not offered 1978-79.][374 **The Mystics of Islam** Not offered 1978-79.][376 **Topics in the Civilization of Islam** Not offered 1978-79.][442 **Seminar in Jewish History: The Medieval Church and the Jews** Not offered 1978-79.]

Philosophy

214 Philosophical Issues in Christian Thought**310 Aristotle****313 Medieval Philosophy**[315 **Special Topics in the History of Philosophy** Not offered 1978-79.]**612 Medieval Philosophy**

Romance Linguistics

321-322 History of the Romance Languages[323-324 **Comparative Romance Linguistics** Not offered 1978-79.]

Russian

401-402 History of the Russian Language[601 **Old Church Slavic** Not offered 1978-79.][602 **Old Russian** Not offered 1978-79.]**621 Russian Literature from the Beginnings to 1700**

Society for the Humanities

413 Early Celtic Art and Mythology**414 Druids, Kings, and Commoners in Gaul and Ireland****417 Readings in Medieval Natural Philosophy****418 From Natural Philosophy to Modern Sciences, 1200-1600****421-422 Poetic Influence in the Middle Ages**

Spanish

440-441 Medieval Literature

Women's Studies

364 Women in Medieval Literature (also Comparative Literature 349)

Religious Studies

A. W. Wood, chairman; C. M. Arroyo, R. Baer, J. Bishop, J. Boon, R. Borker, R. Calkins, C. Carmichael, K. Clinton, M. Colacurcio, T. Frank, J. John, T. Kirsch, N. Kretzmann, S. O'Connor, J. O'Donnell, D. Owen, D. Randel, M. Schub, C. Strout, B. Tierney

Religious studies is an interdisciplinary program reflecting a wide variety of academic interests and disciplines. The intention of the program is to provide a formal structure for the study of the religions of mankind at the undergraduate level. A student may fulfill the requirement for a concentration in religious studies by completing a minimum of four courses that have been approved by an adviser in the area of concentration. The program is administered by a committee; the chairman is A. W. Wood, 327 Goldwirth Smith Hall.

Courses in religious studies are offered in the following departments: Anthropology, Archaeology, Asian Studies, Classics, Comparative Literature, English, History, History of Art, Natural Resources, Near Eastern Studies, Philosophy, and Romance Studies. Some of the courses listed below will not be offered in 1978-79. Consult the appropriate departmental listings.

Methodology and Interdisciplinary Approaches

Introduction to the Study of Religion (Asian Studies 203)**Myth, Ritual, and Symbol (Anthropology 424)**

Anthropology

Sociodrama and Aesthetics (Anthropology 320)**Comparative Religious Systems (Anthropology 322)****Structuralism (Anthropology 417)****Ethnology of Island Southeast Asia (Anthropology 334)****Ethnology of Mainland Southeast Asia (Anthropology 335)****Roots of Social Anthropological Theory (Anthropology 611)****Vanguard Theories and Ethnology (Anthropology 614)****Anthropological Approaches to the Study of Buddhism (Anthropology 619)**

Architecture

History of Asian Architecture: A Theoretical Approach (Architecture 433)**Architecture and its Cultural Content (Architecture 667-68)**

Asian Studies

Ideas and Images in Japanese Culture (Asian Studies 102)**Three Ways of Thought (Asian Studies 104)****Introduction to Hinduism (Asian Studies 301)****Introduction to Buddhism (Asian Studies 302)****Chinese Philosophical Literature (Asian Studies 371)****Chinese Imaginative Literature (Asian Studies 372)****Japanese Poetry and Drama (Asian Studies 375)****Japanese No Theater (Asian Studies 400)****Issues and Problems in Indian Philosophy (Asian Studies 405)****Paths of Liberation in the Bhagavad Gita (Asian Studies 406)****Myths and Symbols in Indian Religion (Asian Studies 410)**

The Classics

New Testament Greek (Classics 202)**The Genius of Christianity (Classics 226)****The Church of the Fathers (Classics 425)****Greek Religion (Classics 360)****The Greek Experience (Classics 211)****The Roman Experience (Classics 212)****Greek and Roman Mystery Cults (Classics 237)****Pagan and Christian at Rome (Classics 332)****Christianity in Britain and Ireland (Classics 348)****St. Augustine (Classics 412)**

Comparative Literature

Biblical Law (Comparative Literature 325)**Literature of the Old Testament (Comparative Literature 328)****Literature and Religion (Comparative Literature 329 and Spanish 399)****Old Testament Seminar (Comparative Literature 421)****New Testament Seminar (Comparative Literature 426)****Seminar on the Deuteronomistic School of Writers (Comparative Literature 428)****Readings in the New Testament (Comparative Literature 429)****Studies in Christian Origins (Comparative Literature 326)****Dante (Comparative Literature 344)****Seminar on Coded Communication (Comparative Literature 423)****Allegory and Symbolism (Comparative Literature 446)****Medieval Seminar: The Miracle Play (French 642)**

English Literature

Milton (English 329)**Early American Literature (English 361)****The American Renaissance (English 362)****Paradise and Fall in Modern English Literature (English 408)****American Transcendentalism (English 662)****Political Religion in America (English 667)**

History

Introduction to Asian Civilization: Origins to 1600 (History 190)

Medieval History (History 263)

Major Themes in American Religious History (History 346)

Medieval Culture, 400–1150 (History 365)

Medieval Culture, 1100–1300 (History 366)

Church and State During the Middle Ages (History 367)

Undergraduate Seminar on Religion and Culture in the Middle Ages (History 368)

India Under British Colonialism (History 390)

Southeast Asian History to the Fourteenth Century (History 395)

Food and Famine in Indian History (History 399)

The Medieval Chinese World (History 492)

History of Art

Introduction to Art History: Beginnings of Civilization (History of Art 210)

Introduction to Art History: Medieval Art (History of Art 230)

Introduction to Art History: Asian Traditions (History of Art 280)

Art in Primitive Societies (History of Art 314)

Pre-Columbian Art (History of Art 315)

Art of the Ancient Near East (History of Art 316)

Early Medieval Art and Architecture (History of Art 333)

Romanesque Art and Architecture (History of Art 334)

Gothic Art and Architecture (History of Art 335)

The Medieval Illuminated Book (History of Art 337)

Medieval and Renaissance German Art (History of Art 342)

The Arts of Early China (History of Art 383)

Chinese Painting (History of Art 385)

Studies in Indian and Southeast Asian Art (History of Art 386)

Problems in Medieval Art and Architecture (History of Art 531)

Natural Resources (Agriculture and Life Sciences)

Religion, Ethics, and the Environment (Natural Resources 407)

Seminar in Environmental Values (Natural Resources 611)

Near Eastern Studies

Freshman Seminar in Biblical Literature. World in Crisis: The Response of Jewish Apocalyptic (Near Eastern Studies 141)

Readings in Classical Hebrew Prose (Near Eastern Studies 231)

The History of Ancient Israel I: to 450 B.C.E. (Near Eastern Studies 243)

The History of Ancient Israel II: 450 B.C.E.–429 C.E. (Near Eastern Studies 244)

Classical Islam (Near Eastern Studies 253)

The Literature of Ancient Israel I (Near Eastern Studies 331)

Nationalism and Religion in Modern Jewish History (Near Eastern Studies 321)

Topics in the Civilization of Islam (Near Eastern Studies 376)

The Historical Development of Rabbinic Legal Literature (Near Eastern Studies 333)

The Literature of Ancient Israel II (Near Eastern Studies 332)

The History of the Jewish People III: 429–1492 (Near Eastern Studies 341)

Seminar in Jewish History: The Medieval Church and the Jews (Near Eastern Studies 442)

Philosophy

Religion and Reason (Philosophy 263)

Medieval Philosophy (Philosophy 313)

Topics in the Philosophy of Religion: Existentialist Theology (Philosophy 363)

Women's Studies

Women and Religion (Women's Studies 100)

Major in Russian and Soviet Studies

The College offers a major in Russian and Soviet studies, the requirements for which are:

1. Qualification in Russian.
2. At least one course relating to Russia, at the 200 level or above, in each of the following departments: government, economics, history, and Russian literature. (A course in another department may be substituted for one of the above with the consent of the major adviser.)
3. At least three additional courses, at the 300 level or above, in one of the following departments: government, economics, history or Russian literature. These courses shall be selected in consultation with the student's adviser and shall be approved as appropriate for a major in Russian and Soviet studies.

Each student majoring in Russian and Soviet studies will be assigned a major adviser in the department of his or her special interest who is also a specialist on Russia. Interested students should contact Professor W. Pintner, Department of History.

Science, Technology, and Society

See p. 211.

Concentration in Personality and Social Psychology

Sponsored jointly by the Departments of Psychology and Sociology. See p. 117 or p. 121.

Social Relations Major

The major in social relations is offered jointly by the Department of Anthropology and the Department of Sociology. It provides the student with basic competence in cultural anthropology, social

psychology, and sociology, and gives particular emphasis to the common methods of research in these disciplines. The student is expected to obtain a grasp of the common interests and unique insights of the three disciplines, and in the senior Social Relations Seminar is expected to integrate aspects of their theory and data.

Prerequisites: The candidate must apply to the Committee on Admission to the Social Relations Major, offering the following: (a) either a course in sociology or Anthropology 201; (b) either Psychology 101 or 128 or Sociology 280; and (c) either Sociology 325 or Industrial and Labor Relations 210 or equivalent.

The Major

The major calls for a minimum of thirty-six credits of course work as follows: (a) three pairs or other combinations of related courses at the 300 level or above, to be selected in consultation with the major adviser. These six courses must include two courses from each of the following disciplines: anthropology, social psychology, sociology; (b) at least one course in methods, to be selected from the following: anthropological methods, techniques of experimentation (psychology) methods in sociology, advanced psychological statistics, philosophy of science or of social science, advanced statistics (such as Industrial and Labor Relations 311); (c) at least one course in theory related to social relations; (d) the senior seminar in social relations (Sociology 497 or Anthropology 495). A list of the courses that may be used to satisfy the requirements for a major in social relations is available from any of the major advisers. Students seeking admission to the program in social relations should apply to the Social Relations Committee, 323 Uris Hall.

Society for the Humanities (A. D. White Center for the Humanities)

Michael Kammen, director. Fellows for 1978–79: P. Henry Blyth (St. Mary's College, London); James A. Boon (Cornell University); Philip Grierson (Gonville and Caius College, Cambridge University); Andrew Harvey (All Souls College, Oxford University); Victor B. Lieberman (Hatfield Polytechnic, Hertfordshire, England); Garrett Olmsted (Harvard University); Richard Sorabji (King's College, London); Edith Sylla (North Carolina State University); William D. Vanech (Brown University); Winthrop Wetherbee (Cornell University).

The center awards annual fellowships for research in the humanities in three categories: senior fellowships, faculty fellowships, and junior postdoctoral fellowships. The fellows offer, in line with their research, informal seminars intended to be exploratory or interdisciplinary.

Unlike other courses, the center's seminars begin the second week of each semester. These seminars are open to graduate students and suitably-qualified undergraduates. Students wishing to attend should telephone the center (256-4725) early in the first week of term to arrange a short interview with the fellow offering the course. There are no examinations, and it is at the discretion of the fellow whether to require only oral reports, or, in addition, a research paper. Students wishing credit for the course should formally register in their own college. Persons other than those officially enrolled may attend as visitors with permission of the fellow.

All seminars are held in the A. D. White Center for the Humanities, 27 East Avenue.

101–102 Freshman Seminar: Science as Literature Fall or spring. 3 credits.

Hours to be arranged. J. Lumley. Science as literature focuses on two voices: the scientist's and the nonscientist's. By reading

scientists such as Darwin, Einstein, and Bronowski we explore who the scientist is, how he does his research, how or if he differs from his colleagues in the arts, and what his responsibilities are to society. By reading Koestler and Calvino, we examine the reflection of science in nonscientific writing. Emphasis will be on the interaction of science and literature.

413 Early Celtic Art and Mythology Fall. 4 credits.

T 1:25-3:10. G. Olmsted.
An introduction to the development of artistic style during the Iron Age in western Europe and its transformation under Romanization, emphasizing the iconographic motifs relevant to the elucidation of early Irish and Welsh mythic literature. The course, which is not merely a study of the art, will utilize various sources of material: Irish and Welsh manuscript tradition, classical commentary, and archaeology in piecing together the religious system of early Celtic peoples.

414 Druids, Kings, and Commoners in Gaul and in Ireland Spring. 4 credits.

T 1:25-3:10. G. Olmsted.
An introduction to the social structure and the economy of early Celtic society. Utilizing the archaic Irish legal tracts and the relevant information from archaeology and classical commentary, the course will attempt to reconstruct the basic structure of the earliest documented nonclassical western European society.

416 Structures and Materials in Antiquity Spring. 4 credits.

M 3:35-5:20. H. Blyth.
The seminar will study certain structural principles and properties of materials which were appreciated in antiquity, discuss the degree to which they were exploited, and the effect of that exploitation on society. The materials studied will include bronze, iron, and steel, and historical examples will mainly be drawn from ancient Crete, Greece, and Italy.

417 Readings in Medieval Natural Philosophy Fall. 4 credits.

Th 1:25-3:10. E. Sylla.
Through reading medieval works, with emphasis on the works of the "Merton School," participants in this seminar will examine some of the key concepts of medieval philosophy and consider the disciplinary structure of thirteenth and fourteenth-century thought, particularly the relations between physics, logic, and theology.

418 From Natural Philosophy to Modern Science, 1200-1600 Spring. 4 credits.

W 1:25-3:10. E. Sylla.
This seminar will examine selected aspects of late medieval natural philosophy and attempt to trace what happened to medieval ideas during the transition to the Scientific Revolution. Attention will be paid both to the content of science and to concepts of what science itself is.

419 Shakespeare and Madness Fall. 4 credits.

W 1:25-3:10. A. Harvey.
The seminar will concentrate upon the major tragedies, but with reference to the comedies and history plays as well. We will examine all aspects of Shakespeare's treatment of madness: cultural, medical, theatrical and linguistic. Particular attention will be given to Shakespeare's complex relationship with Erasmus and the Tradition of Folly. We will make a close study of the "language of madness," beginning with Ophelia and ending with Lear.

420 The Idea of India in English Literature from the 18th Century to the Present Spring. 4 credits.

Th 1:25-3:10. A. Harvey.
Many different types of writing will be examined: diaries (such as the Eden diaries); the autobiographies of military figures as well as civil servants; the novels of Kipling, Forster, Ruth Jhabvala, Praver, Naipaul, and Paul Scott.

421-422 Poetic Influence in the Middle Ages

421, fall; 422, spring. 4 credits each term.
Prerequisite: consent of instructor. Knowledge of Latin or Old French will be useful but is not required. Though the work of the first term will be to a certain extent preparatory for that of the second, students may attend either term of the course separately.

W 3:35-5:20. W. Wetherbee.
Study of a series of literary relationships chosen to illustrate the medieval poet's sense of poetic tradition, and of the nature, value, and problems of poetic influence. Topics for the fall term will include the relation of Ovid and Vergil to the Old French *Eneas*; the roles of Ovid's *Ars amatoria* and *Metamorphoses* in the *Roman de la Rose*; and the function of Vergil and Statius in Dante's *Commedia*. The spring term will center on Chaucer's *Troilus*, and the "presence" in that work of Vergil, Ovid, Statius, Dante and the *Roman*.

423 Jacobean Ethnology Fall. 4 credits.

M 3:35-5:20. J. Boon.
We will examine works in religious, political, economic, and intellectual history and in the symbolism, rhetoric, and ceremony associated with the "Rosicrucian Enlightenment" in order to understand the cross-cultural perceptions of Britain and Holland as they launched their mercantilist systems. The critical period between 1597 and 1625 will be assessed anthropologically.

424 The Motives of Comparative Mythology Spring. 4 credits.

M 3:35-5:20. J. Boon.
How do members of one cultural tradition come to idealize (in Durkheim's sense) another as paragon? We pursue this question with reference to classical and Biblical motifs in western movements; the differing interests of Romantics and Victorians in Sanskrit; the thread of Rosicrucian themes running from Jacobean ethnology through German Romanticism; and perhaps on to American theories of language and culture or to those of Frazer, Dumézil, and Lévi-Strauss.

425-426 Biology and Culture 425, fall; 426, spring. 4 credits each term. Enrollment limited to 15.

T 2:30-4:30. T. Eisner and W. Provine.
An undergraduate seminar devoted to selected topics on the interaction of biology and culture.

427 Being, God, and Mind: The Key Concepts of European Thought from Plato to Vico (also Romance Studies 359 and Comparative Literature 359) Fall. 4 credits.

M W F 12:20-1:15. C. Morón-Arroyo.
A study of the origins of scientific languages; body/soul, matter/form, act/potentiality, being. A study of the ideological background of Western literatures: the conception of human personality and the presentation of character, the conception of reality, and the sense of literary structures. A study of the fusion of Greek thought and the Bible and its reflection in the development of the ideas of freedom and equality in western thought.

428 Space, Time, and Cause in Antiquity Spring. 4 credits.

M 1:25-3:10. R. Sorabji.
Inquiry into theories of space and time during the period 550 B.C. to 550 A.D., when theories of atoms of space and atoms of time, of static time, and of the specious present developed—partly in response to

paradoxes devised by the earliest Greek philosophers. Aristotle's view of causation, and the major shift toward modern ways of regarding causation by the Stoics will be debated.

429 Toward a Theory of the Humanities: The Work of Jürgen Habermas (also Comparative Literature 496) Fall. 4 credits.

Th 12:20-2:30. P. Hohendahl.
The seminar will attempt to situate Jürgen Habermas in the context of contemporary philosophy and social theory vis à vis Western Marxism (Frankfurt School), hermeneutic and language theory (Gadamer, Apel), psychoanalysis, and contemporary social theory (Systemtheorie). The discussion will focus on the epistemological problems presented in Habermas' *Knowledge and Human Interests*. The readings will also draw on *Theory and Practice*, *Toward a Rational Society*, and *Legitimation Crisis*. Reading knowledge of German helpful but not required. Previous acquaintance with critical theory will be an advantage.

431 Dynastic Decline in Southeast Asia Fall. 4 credits.

Th 3:35-5:20. V. Lieberman.
The problem of political decline in precolonial mainland Southeast Asia will be examined to determine if there are regularly occurring patterns which would justify regarding Southeast Asia as a unit, not merely in terms of military interaction or cultural heritage, but in terms of political process. Each student will be responsible for examining the reasons for decline in an important Southeast Asian kingdom.

South Asia Program

The South Asia Program exists to encourage and correlate teaching and research in South Asian studies dealing with Bangladesh, India, Nepal, Pakistan, and Sri Lanka (Ceylon). The program faculty includes members from a number of disciplines. Undergraduates with a special interest in South Asia may major in Asian studies with a concentration in South Asia. Languages regularly offered are Hindi, Sinhalese, Tamil, Telugu, and Urdu. Cornell is a charter member of the American Institute of Indian Studies, and undergraduates, as well as graduate students, are eligible for AIIIS three-month summer or nine-month intensive language programs in India. For courses available in South Asia and details on the major, see Asian studies. Students wishing further information should see the Director, South Asia Program, 130 Uris Hall.

Southeast Asia Studies

See p. 54.

Undergraduate Research Program

The Undergraduate Research Program enables students to participate in research projects of faculty members and to earn credit for their work. Projects in the humanities, the social sciences, and the natural sciences are available. Students and the faculty members with whom they work agree on how much and what kind of work the student will be expected to do, and how much credit will be awarded. A limited amount of funding is available to help defray costs of equipment and computer time. The Office of Special Programs, 159 Goldwin Smith, has descriptions of current projects.

Women's Studies Program

E. Adkins, K. Brazell, P. Carden, J. Egner, L. Engelstein, J. Farley, H. Feldman, J. Gerner, E. Goldsmith, M. Katzenstein, S. McConnell-Ginet, L. Paltrow, B. Richardson, C. Straughan, P. Vogel, L. Waugh. Lecturers, Fall 1978: B. Buettner, R. Pössen, P. Vogel; Spring 1979: K. Beckwith, J. Bowers, E. Goldsmith, M. Jebb, R. Levin, J. Ormondroyd, L. Purdy, J. Winterkorn

Women's Studies, a University program in the College of Arts and Sciences, has three goals: to encourage the development of teaching about women for women and men; to examine assumptions about women in various disciplines and to develop, systematize, and integrate back into the disciplines new knowledge about women; and to cooperate in public service activities with the extension divisions of the University. Each term, the program offers undergraduate and graduate courses, both independently and in cooperation with other departments. Students in the College of Arts and Sciences wishing to major in women's studies can design their own major through the Independent Major Program.

Any graduate student in the University may elect a women's studies minor. The program sponsors a biweekly noncredit seminar for graduate students and faculty to facilitate sharing of knowledge across disciplinary lines.

The program is guided by a board composed of professors from three of the fourteen divisions at Cornell, Women's Studies Program lecturers, and elected representatives of the undergraduate and graduate students. The program serves as a clearinghouse for information about women's organizations on campus. Each Friday noon during the academic year, Women's Studies sponsors informal presentations, open to the public, about current research or a social issue affecting women.

Distribution Requirement

The following women's studies courses satisfy the distribution requirement in the social sciences: Women's Studies 101 and any one of the following: 244, 321, 366, 373, 422, 464, 466, 697.

100 Freshman Seminar: Women and Religion (also Religious Studies 100)

R. Possen.
A study of the use of the Bible in women's rights debates in the nineteenth century and today. Attention will also be given to a sampling of recent essays on related topics such as the extent to which the Bible dictates that women be subordinate to men. Included on the reading list are selections from the Old and New Testaments, Elizabeth Cady Stanton's *The Woman's Bible*, nineteenth century American woman's rights convention proceedings, Rosemary Ruether's *Religion and Sexism*, and Mary Daly's *Beyond God the Father*. We will try to assess current happenings through the historical perspective provided by these documents. Issues such as female clergy, divorce, birth control, and abortion will also be discussed in terms of religious law and changing perspectives.

101 Women in America

Fall. 3 credits; with an extra research paper, 4 credits.
J. Farley.
An analysis of the place of women in the social order in twentieth-century America; an introduction to women's studies. Topics include a historical perspective, the image of women reflected in literature and art, an analysis of the life cycle using evidence from the biological sciences, an analysis of the institutions in a male-oriented society that affect women and men and their lives together, and the prospects for change in the future.

108 Freshman Seminar: Women and Writing (also German 108)

Fall. 3 credits.
I. Ezergailis and staff.
A reading of texts by women writers (some English language ones, some German in translation); writing about them and the questions they raise.

The Family in Modern Society (Human Development and Family Studies 150)

Fall. 3 credits. Limited to freshmen and sophomores except by permission of instructor.

B. Richardson.

200 Resources in Women's Studies Research

Spring. 2 credits. Prerequisite: concurrent registration in one women's studies course.
M. Jebb, J. Ormondroyd, and J. Winterkorn.
An examination of the resources of the Cornell Libraries as they relate to women's studies. Each session is designed to cover the reference literature of a broad subject area (humanities, social sciences, physical sciences) or to outline opportunities for research in the libraries' major special collections. Individual sessions may be audited.

[244 Sex Roles and Linguistic Behavior (also Linguistics 244)] Spring. 4 credits. Prerequisite: Ling 101, Psych 215, or permission of the instructor. S. McConnell-Ginet. Not offered 1978-79.]

Dress: A Reflection of American Women's Roles (Design and Environmental Analysis 245)

Fall. 3 credits. Enrollment limited to 40.
A. Racine.

247 Women, Values, and Society (also Philosophy 247) Spring. 3 credits. Prerequisite: consent of instructor.

L. Purdy.
This course examines some of the moral issues raised by feminism. First, the debate about the proper position of women in society will be examined. Following this a number of moral problems in key areas will be discussed. Among them will be reverse discrimination in education and jobs, the right to control reproduction, and family roles. Rigorous evaluation of arguments will be emphasized.

306 Women in Western Music (also Music 306)

Spring. 4 credits. Prerequisites: one music history course or one music theory course or consent of instructor.
J. Bowers.
A study of women's role in to Western music, particularly Western art music from ancient times to the present.

Human Sexuality: A Psychosocial Perspective (Human Development and Family Studies 315)

Fall. 3 credits. Limited to 100 juniors and seniors. Prerequisite: Introductory course in HDFS, psychology, or sociology, or equivalent social science course.
Staff.

321 The Anthropology of Women (also Anthropology 321)

Fall. 4 credits.
Staff.
This course will explore insights anthropology can provide for the study of women. These fall into two general categories: (1) those from the data dealt with by anthropology, particularly from non-Western societies, and (2) those from the theoretical perspectives anthropologists bring to those data. The course focuses on a number of problems regarding the place of women in society and culture and will present a number of ways in which these problems can be approached.

324 Wives, Lovers, Cuckolds (also Theatre Arts 324)

Fall. 4 credits. Prerequisite: one literature course.
P. Vogel.
This course proposes to examine the relationship between comedy and adultery—the "external" (and hence formulaic) triangle between wife, lover, and cuckold. The seminar will read and discuss both comic theory and such representative plays as: *Amphitryon* (Plautus), *The Mandrake* (Machiavelli), *Othello*, *The Country Wife* (Wycherley), *Candida* (Shaw), *The Circle* (Maugham), and the 38th version of *Amphitryon* by Giraudoux.

340 Women in Hispanic Literature (also Spanish 340)

Spring. 4 credits.
E. Rudat. Prerequisite: some reading knowledge of Spanish.

Works of representative women writers in Spain and Spanish America will be studied within the context of the image of woman in the Hispanic literatures. The readings will include novels by María de Zayas y Sotomayor, Fernán Caballero, Emilia Pardo Bazán, Ana María Matute, Carmen Martín Gaité, and Beatriz Guido; a selection of poetry by Sor Juana Inés de la Cruz, Gertrudis Gómez de Avellaneda, Rosalía Castro, Juana de Ibarbourou, Gabriela Mistral, and Gloria Fuertes. The course is taught in English and several of the texts are available in English translation. However, a rudimentary reading knowledge of Spanish is required.

Contemporary Family Forms in the United States (Human Development and Family Studies 352)

Spring. 3 credits.
H. Feldman.

Theories of Adult Interpersonal Relationships (Human Development and Family Studies 358)

Fall. 3 credits.
H. Feldman.

363 Women in Classical Greece and Rome (also Classics 363)

Spring. 4 credits.
Staff.
Students will examine the evidence about the social and political position of women in ancient Greece and Rome to trace the origins of some Western attitudes about women and to address general historical questions about the nature of evidence, basic chronology, and the development of political systems.

364 Women in Medieval Literature (also Comparative Literature 349)

Fall. 4 credits.
B. Buettner.
A study of women and their roles in the social order as portrayed in the literature of the Middle Ages. Readings will illustrate the change and development of attitudes from asceticism and antifeminism to the development of "romantic" courtly love, both marital and adulterous, and the debates over the proper attitudes and roles in the later Middle Ages. Works to be studied in English translation will include a play of Hroswitha and Gandersheim, the *Nibelungenlied*, selected Mariological and mystical poems, courtly love lyric, *Parzival*, *Tristan and Isolde*, selections from the *Romance of the Rose*, and the "Marriage Group" in Chaucer's *Canterbury Tales*.

366 Women at Work (also Industrial and Labor Relations 366)

Fall. 4 credits. Prerequisite: Industrial and Labor Relations 260 or equivalent.
J. Farley.
This course examines various aspects of female occupational roles in twentieth-century America. Historical, social, and legal factors that influence women's choice of careers, work socialization and training, and subsequent labor market experience are considered. Women's entry-level jobs, opportunities for advancement, and income are also analyzed. Occupations in which women predominate are compared to occupations in which women are underrepresented.

373 Feminist Political Thought (also Government 373)

Spring. 4 credits. Prerequisite: Previous women's studies or government course, sophomore status, or permission of instructor.
K. Beckwith.
An upper-level seminar on the study of ideologies and theories used by feminists in support of their political goals, of the development and transformation of feminist political thought, and of the relationship between thought and action in the contemporary feminist movement. Among schools of feminist political thought to be studied are the feminist adaptations of natural rights theory, androgyny, socialist- and anarchist-feminism, and bourgeois feminist theory.

Time: Its Meaning and Use in Families (Consumer Economics and Housing 411) Fall. 3 credits. S-U grades optional. Prerequisites: one course in sociology and one course in microeconomics recommended. Enrollment limited to 20.

K. Walker.

422 Special Problems in the Anthropology of Women (also Anthropology 422) Spring. 4 credits. Prerequisite: Womns/Anthro 321 or permission of instructor.

Staff.

Each year this seminar will focus on a particular area of concern within the anthropology of women, building upon the work done in 321. The basic orientation of the course will be research and exploration.

426 Undergraduate Seminar in Early American History (also History 426) Spring. 4 credits.

Prerequisite: Consent of instructor.

M. B. Norton.

Topic for 1979: Women and the Family in Early America. An examination of the early history of the American family, with particular reference to the status of women in seventeenth- and eighteenth-century America.

465 Feminist Literary Criticism (also Comparative Literature 465) Spring. 4 credits.

Prerequisite: permission of instructors.

R. Levin.

An examination of recent feminist literary criticism and theory. The course will explore such categories as (1) "images of women" as they are *produced* in works by male writers; (2) criticism of female authors; (3) development of a feminist poetics: modes and methodologies. Discussion will focus on both primary and secondary texts with an eye toward student's own research interests. Readings will include works by Charlotte Brontë, Virginia Woolf, Kate Millett, Mary Ellmann, Elaine Showalter, and Tillie Olsen, among others.

466 Women in Blue-Collar Occupations (also Industrial and Labor Relations 466) Spring. 3 or 4 credits.

J. Farley.

This course will focus on women's participation in blue collar occupations in the U.S. Sources of evidence will include census data, evidence from social science surveys, and personal accounts. Students enrolled for 4 credits will participate in a class project.

499 Directed Study Fall or spring. Variable credit. Prerequisite: one course in women's studies and permission of a member of the Women's Studies Faculty Board.

Members of the Faculty Board, Women's Studies Program.

626-627 Seminar in the History of American Women (also History 626-627) 626, fall; 627, spring. 4 credits.

M. B. Norton.

Economics of Household Behavior I (Consumer Economics and Housing 626) Fall. 3 credits. S-U grades optional. Prerequisite: Econ 311 or concurrent enrollment in 311.

K. Bryant and J. Gerner.

Economics of Household Behavior II (Consumer Economics and Housing 627) Spring. 3 credits. S-U grades optional. Prerequisites: Econ 311 and CEH 626.

K. Bryant and J. Gerner.

Seminar in Family Studies (Human Development and Family Studies 655) Topics include the marital dyad, the family in poverty, and the single-parent family.

Seminar in Human Development and Family Studies (Human Development and Family Studies 685)

Topics include development of self-concept, sex-role identity, observational moods, and play interviews in developmental research.

697 Sex Roles and Career Patterns (also Industrial and Labor Relations 697) Spring.

3 credits; or with an extra research paper, 4 credits.

Prerequisite: graduate standing, or 6 credits of women's studies or manpower studies, or permission of instructor.

J. Farley.

The purpose of this course is to examine the extent to which sex-role expectations affect career patterns of women and men in the twentieth-century United States.

Division of Biological Sciences

H. T. Stinson, director; S. A. Zahler, associate director for academic affairs; E. K. Adkins, K. Adler, M. Alexander, J. M. Anderson, J. P. Barlow, D. M. Bates, A. Bensadoun, A. W. Blackler, S. E. Bloom, E. B. Brothers, W. L. Brown, P. J. Bruns, P. F. Brussard, R. E. Buskirk, T. J. Cade, J. M. Calvo, J. M. Camhi, N. A. Campbell, R. B. Campenot, R. R. Capranica, A. P. Casarett, B. F. Chabot, R. S. Chaleff, J. L. Cisne, R. K. Clayton, P. J. Davies, E. A. Delwiche, W. C. Dilger, W. L. Dills, W. J. Dress, S. J. Edelstein, T. Eisner, S. T. Emlen, H. E. Evans, H. L. Everrett, P. P. Feeny, G. W. Feigenson, J. M. Fessenden-Raden, G. R. Fink, R. H. Foote, E. L. Gasteiger, J. Gibson, Q. H. Gibson, J. H. Gillespie, C. A. S. Hall, R. L. Hallberg, B. P. Halpern, G. G. Hammes, W. Hansel, G. Hausfater, L. A. Heppel, G. P. Hess, P. C. Hinkle, K. A. Hought, T. R. Hought, H. C. Howland, R. R. Hoy, J. W. Ingram, A. T. Jagendorf, W. T. Keeton, E. B. Keller, K. A. R. Kennedy, J. M. Kingsbury, F. W. Lengemann, S. A. Levin, G. E. Likens, J. T. Lis, E. R. Loew, R. E. MacDonald, R. J. MacIntyre, J. T. Madison, P. L. Marks, R. E. McCarty, D. B. McCormick, W. N. McFarland, K. Moffat, H. E. Moore, K. J. Niklas, J. D. Novak, D. J. Paolillo, M. V. Parthasarathy, D. Pimentel, T. R. Podleski, F. H. Pough, W. B. Provine, E. Racker, M. E. Richmond, J. W. Roberts, R. B. Root, M. M. Salpeter, H. W. Seeley, R. M. Spanswick, A. M. Srb, D. N. Tapper, J. F. Thompson, B. K. Tye, C. H. Uhl, V. Utermohlen, P. J. VanDemark, A. van Tienhoven, V. M. Vogt, B. Wallace, R. H. Wasserman, M. D. Whalen, J. H. Whitlock, R. H. Whittaker, D. B. Wilson, W. A. Wimsatt, R. J. Wu, D. B. Zilversmit

Other Teaching Personnel

P. G. Aitken, R. R. Alexander, R. A. Calvo, R. A. Corradino, P. R. Ecklund, M. Ferger, J. C. Glase, J. B. Heiser, D. A. Kirchof-Glazier, T. J. McDonald, C. H. McFadden, B. McNab, C. Reiss, M. L. Wilkinson, N. B. Wurster, M. C. Zimmerman

Distribution Requirement

In the College of Agriculture and Life Sciences, the biological sciences distribution requirement is a minimum of nine credits, including at least six credits of introductory biology selected from either Bio S 109–110, or 105–106, or 101–102 and 103–104, or 101–102 and 103–208. Advanced placement in biology with a score of 4 or 5 (six or eight credits, respectively) will satisfy the requirement for introductory biology. The additional credits may be satisfied by any biological sciences courses except Bio S 108, 201, 202, 205, 206, 301 (401), or 302 (402); or by certain other non-biological sciences courses specified by the College.

In the College of Arts and Sciences, the biological sciences distribution requirement is at least six credits of introductory biology selected from either Bio S 109–110, or 105–106, or 101–102 and 103–104, or 101–102 and 103–208. Advanced placement in biology with a score of 4 or 5 (six or eight credits, respectively) also satisfies the distribution requirement in the biological sciences.

In the College of Human Ecology, the natural sciences distribution requirement is at least six credits selected from Bio S 109–110, 101–103, 102–104 or 102–208, 105–106, or any courses in chemistry or physics. Advanced placement in biology with a score of 4 or 5 (six or eight credits, respectively) also satisfies the distribution requirement in the natural sciences.

The Major

The Division of Biological Sciences offers a major in biological sciences to students enrolled in either the College of Agriculture and Life Sciences or the College of Arts and Sciences. Prior to course registration for the junior year, all students wishing to be admitted to the major should schedule an appointment with the associate director for academic affairs in Stimson 118. Freshmen and sophomores in the process of completing the required prerequisites may be admitted to the major on a provisional basis. Since modern biology has an increasing physical and quantitative orientation, students are advised to undertake basic science courses that stress this orientation; these courses are signified by the use of "(recommended)" in the listing of requirements below. A 2.75 Cornell cumulative grade point average is required for final admission to the major except for those students admitted directly to the major as freshmen (Agriculture and Life Sciences students only) or as transfers; in addition, satisfactory performance is required in the completion of the following:

- (1) One year of introductory biology for majors: Bio S 101–102 and 103–104, or 101–102 and 103–208, or 105–106. Advanced placement may be allowed at the student's choice on receipt of a score of 5 on the advanced placement examination of the College Entrance Examination Board. Students with a score of 4 must fulfill the introductory biology requirement by taking Bio S 103–104 or 103–208, or four credits of work in Bio S 105–106 selected with the advice and approval of the instructors. Freshmen who have not taken the CEEB examination may register for a biology advanced standing examination administered during Orientation Week.
- (2) One year of general chemistry: Chem 207–208 or 215–216 (recommended).
- (3) One year of college mathematics, including at least one semester of calculus: Math 111–112 (recommended) or 105–106.
- (4) One semester of organic chemistry lectures: Chem 253 or 357.

Whenever possible, students should include the first three subjects in their freshman schedule and complete the organic chemistry lecture course (see below) in their sophomore year. A student is not encouraged to undertake a major in biological sciences unless performance in the above four subjects gives evidence of capacity to do superior work at a more advanced level.

In addition to the introductory courses in biology, chemistry, and mathematics, each student majoring in biological sciences must complete the following:

- (1) Organic Chemistry 253 and 251, or 253 and 301, or 357–358 and 251, or 357–358 and 301.
- (2) Physics 207–208 (recommended), or 112–213–214, or 101–102.
- (3) Genetics (Bio S 281).
- (4) Biochemistry (Bio S 330 or 331).
- (5) One of the concentration areas outlined below.
- (6) The breadth requirement outlined below.
- (7) As an alternative to (5) and (6) above, the Program in General Biology.

(8) Qualification in a foreign language. Students may satisfy this requirement by (a) having studied a foreign language for three or more years in high school, or (b) attaining a score of 560 or more on the reading portion of the College Entrance Examination Board (CEEB) achievement test, or (c) successfully completing six college credits in a foreign language.

Concentration Areas and Requirements

Students accepted into the biological sciences major must choose a concentration area or the Program in General Biology. The concentration

requirements are designed to help students achieve depth in one area of biology while ensuring that the selection of advanced courses will form a coherent and meaningful unit. Due to the flexibility allowed in satisfying these requirements, students should consult their faculty advisers. No more than four credits of research courses may be used in completion of the requirements in the area of concentration. Special programs for students interested in biophysics, microbiology, or nutrition are available to students who qualify for them. The possible concentration areas are:

(1) *Animal Physiology and Anatomy*: The Vertebrates (Bio S 274), an introductory animal physiology course (Bio S 311 and 319 or Bio S 416 and 418), and at least four additional credits selected from the following courses: Invertebrate Zoology (Bio S 310); Histology: The Biology of the Tissues (Bio S 313); Ecological Animal Physiology (Bio S 315 and 317); Vertebrate Developmental Anatomy (Bio S 389); Vertebrate Morphology (Bio S 414); Survey of Cell Biology (Bio S 432); Mammalian Physiology (Bio S 654, 655, 656) with special permission; Fundamentals of Endocrinology (An S 427). Students electing to take one of the three-credit courses (Bio S 315, 389, 414, 432, 654, 655, or 656) may complete the four credits by taking the Seminar in Anatomy and Physiology (Bio S 410).

(2) *Neurobiology and Behavior*: The introductory course in Neurobiology and Behavior (Bio S 321), and twelve additional credits, including a second course from the neurobiology and behavior offerings. The remainder of the twelve credits may be in any course (e.g., physiology, developmental biology, cellular biology, ecology, vertebrate or invertebrate biology, etc.) approved by the adviser as appropriate preparation for work or advanced study in neurobiology and behavior or in related subjects.

(3) *Biochemistry*: Quantitative Chemistry (Chem 300 or Chem 215+216) must be taken. One of the following organic chemistry laboratory sequences must also be taken: Chem 301–302, or Chem 251–252–302, or Chem 301, or Chem 251–252. In addition, the student must take a physical chemistry sequence (Chem 389–390 or Chem 287–288) and a biochemistry laboratory course (Bio S 638, or Bio S 430, or Bio S 434). It is recommended that students take the more rigorous organic chemistry and physics sequences (Chem 357–358 and Phys 207–208), and a third semester of calculus.

(4) *Botany*: Five courses (including a plant physiology laboratory course) fulfill the concentration requirement, as follows: (a) Plant Physiology (Bio S 242 and 244 or Bio S 341 and 349); (b) Taxonomy of Vascular Plants (Bio S 346); (c) either Plant Anatomy or Cytology (Bio S 345 or 347); and (d) either Plant Biology (Bio S 241), Phycology (Bio S 348), Comparative and Developmental Morphology of the Embryophyta (Bio S 444), Plant Ecology (Bio S 463 and 465), or Introductory Mycology (PI Pa 309). A student may elect to complete the required five courses by taking both courses in group c rather than taking any in group d.

(5) *Ecology, Systematics, and Evolution*: General Ecology (Bio S 360), Organic Evolution (Bio S 477), a plant or animal physiology course, and at least one 400-level course with accompanying laboratory from within the concentration offerings. In addition to the latter course, students in this area must select at least two laboratory courses above and beyond those required of all biology majors (i.e., introductory biology, genetics, and organic chemistry). These two laboratory courses may include the physiology course, and/or courses counted toward fulfillment of the breadth requirement. It is strongly recommended that students planning graduate study take a course in statistics (ILR 210 or 311).

(6) *Genetics and Development*: Nine credits, usually selected from the following courses: Human Genetics (Bio S 282); Cytology (Bio S 347); Developmental Biology (Bio S 385); Vertebrate

Developmental Anatomy (Bio S 389); Cytogenetics (Bio S 446); Organic Evolution (Bio S 477); Population Genetics (Bio S 481); Plant Cell Genetics (Bio S 482); Molecular Aspects of Development (Bio S 483); Molecular Evolution (Bio S 484); Microbial Genetics (Bio S 485 and 487); Genetics of Lower Eucaryotes (Bio S 488); Undergraduate Research in Genetics and Development (Bio S 489); Plant Growth and Development (Bio S 644); Animal Cytogenetics (An S 419); Physiological Genetics of Crop Plants (PI Br 605).

(7) *Cell Biology*: Quantitative Chemistry (Chem 300 or Chem 215–216), a laboratory (Bio S 434 or Bio S 430), and one of the following two options:

Option 1: Survey of Cell Biology (Bio S 432) and eight additional credits selected from Groups A and B.

Option 2: Two courses selected from Group A and six additional credits selected from Groups A and B. Group A: Cell Structure and Physiology (Bio S 433); Cellular Growth Control and Oncogenic Viruses (Bio S 438); Molecular Aspects of Development (Bio S 483).

Group B: Basic Immunology, Lectures (Bio S 305); Basic Immunology, Laboratory (Bio S 307); Histology: The Biology of the Tissues (Bio S 313); Plant Anatomy (Bio S 345); Cytology (Bio S 347); Plant Cell Genetics (Bio S 482); Microbial Genetics, Lectures (Bio S 485); Genetics of Lower Eucaryotes (Bio S 488); Cellular Neurobiology (Bio S 496); Animal Cytogenetics (An S 419); General Microbiology Lectures (Micro 290); General Microbiology Laboratory (Micro 291). Students anticipating graduate work in cell biology should consider taking a physical chemistry sequence (Chem 389–390 or Chem 287–288).

(8) Students who, for good reason, wish to undertake a course of study not covered by the seven existing concentration areas or the Program in General Biology may petition the Division of Biological Sciences Curriculum Committee.

Breadth Requirement

To fulfill the breadth requirement in the biological sciences major, students must pass a total of two courses outside of their concentration area and selected from two of the categories listed below. Faculty advisers should be consulted when choosing the courses to meet this requirement.

(1) *Animal Physiology and Anatomy*: Bio S 274, 310, 311 (314), 313, 315, 389, 416.

(2) *Botany*: Bio S 242 and 244, 341 and 349, 345, 346, 348; PI Pa 309.

(3) *Cellular and Developmental Biology*: Bio S 305, 347, 385, 432, 483; Micro 290.

(4) *Ecology, Systematics, and Evolution*: Bio S 260, 360, 471*, 472*, 475*, 476*, 477; Entom 212.

(5) *Neurobiology and Behavior*: Bio S 321

*May not be used as a breadth course if Bio S 274 is counted as a breadth course.

Program in General Biology

Students choosing the general biology option must fulfill all the general requirements for the biology major (chemistry, genetics, biochemistry, etc.) *except* one of the concentration areas and the breadth requirement. The specific requirements for the program are:

(1) General Ecology (Bio S 360).

(2) Neurobiology and Behavior (Bio S 321).

(3) A physiology course from the following: Plant Physiology (Bio S 242 and 244 or Bio S 341 and 349); Introductory Animal Physiology, Lectures (Bio S 311); Ecological Animal Physiology, Lectures (Bio S 315); General Animal Physiology: A Quantitative Approach, Lectures (Bio S 416).

(4) One course from the following: Plant Biology (Bio S 241); The Vertebrates (Bio S 274); Invertebrate Zoology (Bio S 310); Taxonomy of Vascular Plants (Bio S 346); Phycology (Bio S 348); Insect Biology (Entom 212); General Microbiology (Micro 290 and 291).

(5) At least one course concentrating on plants. This may be satisfied by a course from (3) or (4).

(6) At least one course with a laboratory. This may be satisfied by a course from (3) or (4) or (5).

(7) A biological sciences course having as a prerequisite one of the following: Plant Physiology (Bio S 242 or 341); Plant Biology (Bio S 241); The Vertebrates (Bio S 274); Genetics (Bio S 281); Introductory Animal Physiology, Lectures (Bio S 311); Ecological Animal Physiology, Lectures (Bio S 315); Neurobiology and Behavior (Bio S 321); Principles of Biochemistry (Bio S 330 or 331); General Ecology (Bio S 360); General Animal Physiology: A Quantitative Approach, Lectures (Bio S 416).

Independent Research and Honors Program

Individual research projects under the direction of a faculty member are encouraged as part of the program of study within a concentration. Applicants for research projects are accepted by the individual faculty members, who take into account students' previous academic accomplishments, interests, and goals, and the availability of space and equipment suitable for the proposed project. Students accepted for independent research will enroll for credit in a research course with the written permission of the faculty supervisor. No more than four credits of research courses may be used in completion of the requirements in the area of concentration.

The honors program in biological sciences is designed to offer advanced training in laboratory or field research through the performance of an original research project under the direct guidance of a member of the faculty. Applications for the honors program are available in the Office for Academic Affairs (Stimson 118), and must be submitted to the Honors Program Committee by the first week of classes of the senior year. To qualify for the program, students enrolled in the College of Agriculture and Life Sciences must have at least a 3.0 cumulative grade average; those in the College of Arts and Sciences must have at least a 2.7 cumulative grade average. All students must have at least a 3.0 cumulative grade average in biology, chemistry, and mathematics, and should have completed at least thirty credits at Cornell. In addition, candidates must have a faculty member to supervise their research. Any faculty member in the Division of Biological Sciences may act as a supervisor. Faculty supervisors outside the division are acceptable only if a faculty member of the division agrees to take full responsibility for the quality of the work. In rare cases, research done elsewhere may be presented for honors, providing that *prior* approval of the Honors Program Committee has been given. An honors candidate usually enrolls for credit in a research course under the direction of the faculty member acting as honors supervisor. Participation in an honors research seminar is expected.

Recommendation to the faculty that a candidate graduate with honors will be the responsibility of the Honors Program Committee. Students interested in the honors program should consult with their faculty adviser early during their junior year. Students are encouraged to begin their research projects in the junior year. Details pertaining to thesis due dates, seminars, and other requirements may be obtained from the chairperson of the Honors Program Committee. Information on faculty research activities is available in the Behrman Biology Center (Stimson G-20).

Curriculum Committee

Many decisions pertaining to the curriculum, to division-wide requirements, and to concentration and breadth areas are made by the Curriculum Committee of the division. The committee has faculty and elected student members, and welcomes advice and suggestions from all interested persons.

Advising

Students in need of academic advising or counseling are encouraged to consult their advisers, come to the Behrman Biology Center (Stimson G-20), or contact the associate director for academic affairs (Stimson 118).

General Courses

101–102 Biological Sciences, Lectures 101, fall; 102, spring, 2 credits each term. Prerequisite: concurrent enrollment in 103, and 104 or 208. 101 is prerequisite to 102, unless written permission is obtained from instructor. May not be taken for credit after 105–106 or 109–110.

Lec, M W 9:05 or 10:10. Two lectures each week; in order to accommodate these lectures, students must reserve M W and F 9:05 or 10:10. Preliminary exams will be given at 7:30 p.m. on Oct. 12, Nov. 16, Feb. 27, and Apr. 5. C. H. McFadden.

Designed both for students who intend to specialize in biological sciences and for those specializing in other subjects, such as the social sciences or humanities, who want to obtain a thorough knowledge of biology as part of their general education. Plant and animal materials are considered together rather than in separate units. The fall semester covers the chemical and cellular basis of life, energy transformations, anatomy, and physiology. The spring semester covers genetics and development, evolution, ecology, behavior, the origin of life, and the diversity of living organisms. Each topic is considered in the light of modern evolutionary theory.

103–104 Biological Sciences, Laboratory 103, fall; 104, spring, 2 credits each term. Prerequisite: concurrent enrollment in 101 and 102, or written permission of instructor.

Lec, F 9:05 or 10:10; lab, M T W or Th 1:25–4:25, M or W 7:30–10:30 p.m., T Th or S 8–11, or F 10:10–1:10. One 3-hour lab each week and a weekly lecture section for discussions, special lectures, etc. In order to accommodate the weekly lecture section, students must reserve F and M W 9:05 or 10:10. J. C. Glase and staff.

This is a laboratory course with the main emphasis on student design and execution of investigations in biology. In preparation for performing research, students are exposed to basic biological concepts, research methods, relevant statistical ideas, instrumentation, and laboratory techniques. Research projects include investigative design, data analysis, and communication of results and conclusions. Each student-initiated investigation leads to the production of a written research report.

105–106 Introductory Biology 105, fall; 106, spring, 4 credits each term (or 2 credits for transfer or advanced placement students with permission of instructor. S-U grades optional with written permission of instructor). Prerequisite: 105 is prerequisite to 106, unless written permission is obtained from instructor. May not be taken for credit after 101–104 or 109–110.

Lec, M 12:20; 1 hour of discussion and 2 office hours each week to be arranged at the first lecture meeting; additional study and laboratory hours arranged at student's convenience each week. E. R. Loew.

Designed primarily for students who intend to specialize in the biological or other sciences; also open to nonmajors who want a more comprehensive biology course than the one for nonmajors (109–110). Recommended for students whose first

language is not English. The course is taught in an autotutorial format and students are expected to put in some time *each week* (students can seldom work ahead and there are severe penalties for falling behind). Laboratory work is an integral part of the course.

Course material is divided into compulsory units which must be completed by all students, and optional units which offer a choice of related topics for students who wish to improve their grade. Mastery of compulsory material is required and students are expected to achieve greater than 80% mastery. The final exam covers the entire semester's work.

The fall semester covers cellular structure and chemistry, plant structure and physiology, ecology, and the origin of life. The spring semester covers genetics and speciation; and evolution, taxonomy, anatomy, physiology, and behavior of animals.

108 Interactive Computing for Students of Biological Sciences Spring, 1 credit. Not open to students with prior courses in computing.

Lec, T 1:25; lecture every other week.
H. C. Howland.

An introduction to computing using the interactive language FOCAL with a discussion of other algebraic computing languages such as BASIC and elementary FORTRAN. Students will be issued tickets for 10 hours of computing time at the Division of Biological Sciences interactive computing facility. Applications to problems in the biological sciences will be emphasized.

109-110 Biology for Nonmajors 109, fall; 110, spring, 3 credits each term. S-U grades optional. Limited to 680 students. This course may be used to fulfill the distribution requirement in the Colleges of Agriculture and Life Sciences, Arts and Sciences, and Human Ecology, but may not be used as an introductory course for the major in biological sciences. Note that this course may not always satisfy as a prerequisite to second- and third-level courses in biology. Prerequisite: 109 is prerequisite to 110, unless written permission is obtained from instructor. May not be taken after 101-104 or 105-106.

Lec, M W F 9:05 or 11:15; lab, M T W Th or F 2-4:25 or T 10:10-12:35. Each student must attend a lab on alternate weeks. Preliminary exams will be given at 7:30 p.m. on Sept. 28, Oct. 31, Nov. 21, Feb. 23, Mar. 15, and Apr. 17.
N. A. Campbell, D. A. Kirchoff-Glazier.

Students who do not plan to major in biology have the opportunity of taking this broad introductory course in modern biology without the necessity of the more detailed study normally required. Nevertheless, it is not a course in social biology but addresses itself to biological principles with academic rigor. The content is designed to appeal to anyone who seeks a comprehensive knowledge of biology as part of a general education. Laboratory sections enable small groups of students to meet with the course staff, and will be used for problem-solving experiments, demonstrations, and discussions.

201-202 History of Biology (also History 287-288) 201, fall; 202, spring, 3 credits each term. S-U grades optional. Prerequisite: 1 year of college biology. 201 is not prerequisite to 202.

Lec, T Th 10:10-11:30. W. B. Provine.
An examination of the history of biology, emphasizing the interaction of biology and culture. Original writings of biologists will constitute the bulk of reading assignments. The fall semester covers the period from classical antiquity to 1900. The spring semester is devoted entirely to twentieth-century biology.

205 Biomedical Ethics (also Philosophy 245)

Fall, 3 credits. Primarily for sophomores, juniors, and seniors; permission of instructor required for graduate students.

Lec, M W F 1:25; disc to be arranged. S. M. Brown. Critical analysis of the conceptual framework in which ethical problems in biology and medicine are to be understood, debated, and solved. Problems include the right to health care, the allocation of scarce medical resources, the justification of killing (abortion, euthanasia), experimentation on humans (fetal research), genetic counseling, and genetic engineering.

206 Environmental Ethics (also Philosophy 246)

Spring, 3 credits. Open to sophomores, juniors, and seniors; permission of instructor required for graduate students. Prerequisite: 1 year of introductory biology.

Lec, M W F 1:25. S. M. Brown, M. Sagoff. Critical analysis of the conceptual framework in which environmental policies are formulated and judged. Problems include the relation of individual rights to the collective welfare in respect to property, compensation, regulation, and the exercise of eminent domain; the justice of need; moral obligations to the poor and to future generations; market and other economic models of the use of resources; private interest versus the public good; the concept of pollution; and the ideas of diversity, balance, and stability in the natural environment.

208 Biological Discovery Laboratory Spring,

2 credits. Limited to 40 students who apply for admission and are recommended by their instructors in 103. Prerequisite: 103.

Lab to be arranged. W. C. Dilger.
A more research-oriented alternative to course 104. Designed to instruct students in the ways that scientists ask questions about living things, and design and carry out observations or experiments to answer these questions. Students work in small groups on extended research problems which they help design. Instruction is highly individualized and aims at improving each student's ability to ask meaningful questions, organize and quantify observations, analyze research data, and relate results to previously reported biological findings. Specific research techniques will be introduced when need arises.

300 Laboratory Methods in Biology Summer,

3 credits. Prerequisite: 1 year of introductory college biology. Fee, \$5.

Lec and lab, M T W Th F 1:30-4 for 6 weeks.
L. D. Uhler.

For students who intend to teach or follow some phase of biology as a profession. Subjects covered: collection, preservation, and storage of materials; the preparation of bird and mammal study skins; injection of circulatory systems with latex; clearing and staining of small vertebrates; and the preparation and staining of squashes, smears, whole mounts, and sections. No formal exams. Grade is based on required work submitted at the end of the course.

301 (401) Biology and Society I: The Biocultural Perspective (also Anthropology 301) Fall, 3 or

4 credits (4 credits by arrangement with instructor). S-U grades optional. Prerequisite: 1 year of introductory biology. This is part of the two-semester core course for the Biology and Society major and is also available to other students who have fulfilled the necessary prerequisite.

Lec, M W F 10:10. D. J. Greenwood.
Viewing human biology, behavior, and institutions as the ongoing products of the interactions between human biological evolution and cultural change, this course documents these interactions with reference to the following topics: the evolution of the capacity for culture; human groups and institutions; language, meaning, and cultural "realities"; and major models of human nature and human institutions.

302 (402) Biology and Society II: Biology, Society, and Ethics (also Anthropology 302)

Spring, 3 or 4 credits (4 credits by arrangement with instructor). S-U grades optional. Prerequisite: 301 (401) or permission of instructor. This is the second semester of the two-semester core course for the Biology and Society major and is also available to other students who have taken 301 (401).

Lec, M W F 10:10. D. J. Greenwood, S. M. Brown. After documenting the history of the academic and nonacademic institutional contexts of the biological and social sciences, this course takes up the complex intellectual, practical, and ethical issues centering on the relationships between biological and social phenomena. Specific current problems such as pollution, genetic counseling, recombinant DNA research, and others will be taken up and an effort will be made to develop a viable biocultural ethics for dealing with such problems.

305 Basic Immunology, Lectures (also Veterinary Medicine 315) Fall, 2 credits.

Prerequisite: a course in basic microbiology or permission of instructor.

Lec, T Th 9:05. A. J. Winter.

Course material covers current concepts in immunology at an elementary level, with special emphasis on the biological functions of the immune response.

307 Basic Immunology, Laboratory (also Veterinary Medicine 316) Fall, 2 credits.

Prerequisite: a course in basic microbiology or permission of instructor; concurrent enrollment in 305 recommended.

Lab, T Th 1:25-4:25. N. L. Norcross.

Designed to illustrate immunological concepts presented in 305. Laboratory exercises are selected to familiarize students with basic humoral and cellular immune phenomena and to offer firsthand experience in immunological laboratory techniques.

309 Techniques in Animal Handling and Surgery

Intersession, 2 credits. Limited to 18 students, with preference given to students who are preregistered in an independent research course. Prerequisite: written permission of instructor.

M T W Th F 9-4:30. A. van Tienhoven.

Using audiovisual materials and actual experience, this minicourse is designed to teach students techniques needed for independent research and honors projects.

403-404 Teaching Experience 403, fall; 404,

spring, 1-4 credits. S-U grades optional with consent of instructor. Enrollment limited.

Prerequisites: previous enrollment in the course to be taught or equivalent, and written permission of instructor.

Hours to be arranged. Staff.

Designed to enable qualified undergraduate students to obtain teaching experience by actual involvement in the design and teaching of biology courses. This experience may include leading a discussion group; preparing, assisting, or teaching a biology laboratory; teaching field biology; or tutoring. Several biology courses currently offer such experience, including 103-104, 105-106, 109-110, 260, 274, 311 (314), 313, 319 (316), 324, 330, 360, 430, 464, 471 (471, 473), 475, 478, 487, and 491 (492).

409 Undergraduate Research in Biology Fall or

spring. Variable credit. S-U grades optional. Undergraduates must attach to their course registration material written permission from the staff member who will supervise the work and assign the grade.

Hours to be arranged. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

603 Electron Microscopy for Biologists Fall. 3 credits. S-U grades optional. Primarily for graduate students, but open to upperclass students. Limited to 12 students, with preference given to students with research projects requiring electron microscopy. Prerequisites: 300, 313, 345, or 347, or equivalent, and written permission of instructor. Preregistration recommended.

Lec, T 11:15; lab, M W 1:25-4:25, T Th 1:25-4:25, or W F 8-11. M. V. Parthasarathy.

Principles of electron microscopy; histological techniques for electron microscopy such as ultrathin sectioning, negative staining, and metal shadowing; and interpretation of results. A brief introduction to scanning electron microscopy is also included.

604 Advanced Electron Microscopy for Biologists Spring. 3 credits. S-U grades only. Primarily for graduate students with a major interest in ultrastructure. Limited to 6 students. Prerequisites: 603 and written permission of instructor.

Lec, T 11:15; lab, T Th 1:25-4:25.

M. V. Parthasarathy.
Selected topics in cell ultrastructure and interpretation, and introduction to special techniques such as freeze-etching, enzyme digestion techniques, visualization of DNA strands, and autoradiography are included. The student will also be required to do a project involving one of the specialized techniques.

See also:

Biology and Culture (Biology and Society 400-401)

Federal Regulation: Establishment and Enforcement (Biology and Society 402)

Students interested in training in **biophysics** may find the following courses of interest:

Bioelectric Systems (Biological Sciences 696)

Biological Phenomena and Processes (Engineering C&EE E716)

Biomechanical Systems—Analysis and Design (Engineering M&AE 565)

Biophysical Processes (Engineering A&EP 610)

Current Research Problems in Bionics and Robots (Engineering T&AM 682)

Functional Organization of the Mammalian Nervous System (Biological Sciences 697, 699)

General Animal Physiology (Biological Sciences 416, 418)

Introduction to Biomechanics, Bioengineering, Bionics, and Robots (Engineering T&AM 681 and Ele E 621)

Membrane Biophysics (Engineering A&EP 615)

Photosynthesis (Biological Sciences 445)

Physics of Macromolecules (Physics 464)

Physiological Optics (Biological Sciences 695)

The Physics of Life (Engineering A&EP 206)

Vision (Biological Sciences 395)

Animal Physiology and Anatomy

274 The Vertebrates Spring. 5 credits. Primarily for sophomores; this course is a prerequisite for many advanced courses in vertebrate biology, anatomy, and physiology. Lab limited to 21 students each section. Prerequisite: 1 year of introductory biology for majors.

Lec, T Th 10:10; lab, M W 1:25-5, M W 7-10 p.m., or T Th 1:25-5. 1 midterm exam given at 7:30 p.m. Staff.

An introduction to the evolution, classification, comparative anatomy, life history, and behavior of vertebrate animals. Laboratory dissection and demonstration are concerned with structure, classification, systematics, biology of species, and studies of selected aspects of vertebrate life.

310 Invertebrate Zoology Fall or spring. 4 credits. Enrollment limited, with preference given to upperclass students. Prerequisite: 1 year of introductory biology for majors.

Lec, W F 11:15; lab, W F 2-4:25. Each student will be expected to do a significant amount of independent work and a term paper may be required. J. M. Anderson.

Lectures on selected topics in the development, structure, function, and interrelations of invertebrate animals, with particular attention to phylogenetic aspects. Intensive laboratory work on representative invertebrates, utilizing living or fresh specimens wherever possible.

311 (314) Introductory Animal Physiology, Lectures (also Veterinary Medicine 346) Fall. 4 credits. Prerequisites: 1 year of college biology, chemistry, and mathematics.

Lec, M W F 11:15; disc to be arranged. 3 preliminary exams given at 7:30 p.m. D. N. Tapper.

A general course in vertebrate physiology emphasizing the basic characteristics of the circulatory, nervous, pulmonary, renal, and gastrointestinal systems; energy metabolism; endocrinology; and reproductive physiology. Neural and hormonal control of function is emphasized.

312 Anatomy of the Gull Summer. 1 credit. S-U grades only. Prerequisite: 1 year of introductory college biology.

Daily lectures, lecture-demonstrations, and laboratories for 1 week. Faculty of the Shoals Marine Laboratory.

The functional anatomy of all organ systems with emphasis on sensory, nervous, digestive, and respiratory systems.

A special course offered at the Shoals Marine Laboratory of Cornell University on an island off Portsmouth, N.H. For more details and applications, consult the Shoals Marine Laboratory Office, Stimson G-14. Estimated cost: \$210.

313 Histology: The Biology of the Tissues Fall. 4 credits. Prerequisite: 1 year of introductory biology; a background in vertebrate anatomy and organic chemistry or biochemistry strongly recommended.

Lec, T Th 11:15; lab, T Th 2-4:25. W. A. Wimsatt. Provides the student with a basis for understanding the microscopic, fine structural, and functional organization of vertebrates as well as the methods of analytic morphology at the cell and tissue levels. The dynamic interrelations of structure, composition, and function in cells and tissues are stressed.

[315 Ecological Animal Physiology, Lectures] Fall. 3 credits. Prerequisite: 1 year of introductory biology for majors. Offered in alternate years. Not offered 1978-79.

Lec, M W F 10:10. W. N. McFarland, F. H. Pough. An introductory course for students interested in ecology and physiology. The characteristics of the physical environment that are important to organisms are discussed; and representative physiological, behavioral, and morphological adaptations of vertebrate and invertebrate animals to their environments are analyzed.]

[317 Ecological Animal Physiology, Laboratory] Fall. 1 credit. Limited to 12 students. Prerequisite: concurrent enrollment in 315. Offered in alternate years. Not offered 1978-79.

Lab, W or Th 1:25-4:25. W. N. McFarland, F. H. Pough.

Exercises involve measurements of important environmental factors in local habitats, laboratory experiments to familiarize students with the use of physiological methods, and an individual student research project dealing with specific adaptations of organisms to environment.]

318 Cellular Physiology Summer. 3 credits. Prerequisites: 1 year of introductory biology and chemistry, or permission of instructor.

Lec, M T W Th F 9:30-12 for 3 weeks. M. V. Hinkle.

A basic course on physiological processes at the cellular level. Particular emphasis is placed on eucaryotic cells and on membrane-related phenomena. Topics include active, passive, and bulk transport across membranes; structure and function of cell organelles; cell growth and proliferation; intercellular communication; excitability; contractility; and specialized cells of the immune, endocrine, and neuromuscular systems. Course may be used as an introduction to organ or medical physiology.

319 (316) Introductory Animal Physiology, Laboratory (also Veterinary Medicine 348) Fall. 1 credit. Limited to 100 students, with preference given to students concentrating in animal physiology and anatomy. Prerequisite: concurrent or previous enrollment in 311 (314).

Lab, M T W or Th 1:25-4:25. Each student must attend a lab on alternate weeks. Lab limited to 25 students each section. D. N. Tapper.

Laboratory sessions will consist of demonstrations, instructor-assisted experiments, and student-run experiments covering the nervous, pulmonary, renal, circulatory, and gastrointestinal systems.

410 Seminar in Anatomy and Physiology Fall or spring. 1 credit. May be repeated for credit only once. S-U grades only. Limited to upperclass students.

Hours and topics to be arranged. Organizational meeting first Tuesday of each semester at 7:30 p.m. in Biology Center (Stimson G-20). Staff (Coordinator—W. Hansel).

[412 Special Histology: The Biology of the Organs] Spring. 4 credits. Limited to 12 students. Prerequisite: 313 or written permission of instructor. Offered in alternate years. Not offered 1978-79.

Lec, W F 9:05; lab, W F 2-4:25. W. A. Wimsatt. A continuation of 313. The microscopic and ultrastructural organization of the principal vertebrate organ systems are studied in relation to their development, functional interaction, and special physiological roles. Courses 313 and 412 together present the fundamental aspects of the microscopic and submicroscopic organization of the vertebrate. The organization of the course involves student participation in lecture-seminars, and the prosecution of independent project work supplementary to the regular work of the laboratory. The latter enables students to gain practical experience with histological and histochemical preparative techniques.]

414 Vertebrate Morphology (also Veterinary Medicine 700) Spring. 3 credits. S-U grades optional. Prerequisite: graduate standing, or 274 or equivalent. (Prerequisite waived for students concentrating in animal physiology and anatomy.)

Lab, T Th 2-4:25. H. E. Evans. Student dissections of the dog serve as the basis for a functional consideration of the major component parts of the body and its organ systems. This is followed by a dissection of the cow. Other species (fish to mammal) of interest to members of the class may also be dissected.

416 General Animal Physiology: A Quantitative Approach, Lectures Spring. 3 credits. S-U grades optional. Prerequisites: 1 year of biology and physics.

Lec, M W F 10:10. H. C. Howland.

The principles of animal physiology are developed through consideration of the functioning of cells, tissues, and organs. Specific topics discussed include respiration, metabolism, circulation, excretion, body mechanics, muscle contraction, nerve action, sensory reception, and central nervous system function. A quantitative, systems-theoretical approach is emphasized.

418 General Animal Physiology, Laboratory

Spring. 2 credits. Prerequisite: concurrent enrollment in 416 or equivalent.

Lec, 1 hour to be arranged; lab, M or T 1:25-4:25. H. C. Howland.

Students are introduced to basic techniques utilized in the study of the physiology of animal tissues. Experiments cover topics dealing with respiration, properties of muscle, circulation, activity of nerves, and osmotic phenomena.

419 Undergraduate Research in Animal Physiology and Anatomy

Fall or spring. Variable credit. S-U grades optional. Undergraduates must attach to their course registration material written permission from the staff member who will supervise the work and assign the grade.

Hours to be arranged. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

452 Comparative Physiology of Reproduction of Vertebrates, Lectures (also Animal Sciences 452)

Spring. 2 credits.* Prerequisite: An S 427 or permission of instructor.

Lec, W F 1:25. A. van Tienhoven.

Sex and its manifestations. Neuroendocrinology, endocrinology of reproduction, sexual behavior, gametogenesis, fertilization, embryonic development, oviparity, viviparity, environment and reproduction, and nutrition and reproduction.

454 Comparative Physiology of Reproduction of Vertebrates, Laboratory (also Animal Sciences 454)

Spring. 2 credits. Prerequisite: concurrent or previous enrollment in 452, or permission of instructor.

Lab to be arranged; organizational meeting, F 2:30. A. van Tienhoven.

The laboratory provides students with an opportunity to design and execute independently experiments with limited objectives.

[612 Comparative Physiology, Lectures Spring.

2 credits. Limited to 12 students. Prerequisites: concurrent enrollment in 614 and a background in chemistry (inorganic, organic, and biochemistry) and physics in addition to a course in physiology; 274 and 310 strongly recommended. Offered in alternate years. Not offered 1978-79.

Lec, W F 11:15. Staff.

Lectures emphasize the comparison of physiological processes of organs and organ systems in various invertebrate and vertebrate classes in relation to their evolution and environmental adaptation.]

[614 Comparative Physiology, Laboratory

Spring. 2 credits. Limited to 12 students. Prerequisites: concurrent enrollment in 612 and written permission of instructor. Offered in alternate years. Not offered 1978-79.

Lab, T Th 1:25-4:25. Staff.

Laboratories will involve measurements of cardiovascular, respiratory, muscular, excretory, endocrine, alimentary, thermoregulatory, and nervous system function in selected invertebrates and vertebrates.]

615 Nutrition and Physiology of Mineral Elements (also Veterinary Medicine 759 and Nutritional Sciences 659)

Fall. 2 credits. Prerequisites: courses in basic physiology, intermediate biochemistry, and general nutrition. Offered in alternate years.

Lec, T Th 8. R. H. Wasserman, R. Schwartz, D. R. VanCampen.

Lectures on nutritional aspects, and physiological, biochemical, and hormonal relationships of the prominent macroelements and microelements, with emphasis on recent developments. Included will be information on methodologies of mineral research and the chemistry of ions and complexes; and essentiality, requirements, transport, function, homeostasis, interrelationships, and toxicity of various mineral elements.

616 Radioisotopes in Biological Research (also Veterinary Medicine 750)

Spring. 4 credits. Prerequisites: courses in animal or plant physiology and quantitative chemistry, or permission of instructor.

Lec, T Th 11:15; lab, T 1:25-5. F. W. Lengemann and staff.

Lectures and laboratories will deal with the radioisotope as a tool in biological research. Among the topics considered will be the utilization and detection of beta-emitting isotopes, gamma spectrometry, Cerenkov counting, neutron activation, autoradiography, whole-body counting, and bone scanning. Particular emphasis is placed on liquid scintillation counting, double-label experiments, and on C¹⁴ and H³ as metabolic tracers. Experiments are designed to present basic principles while utilizing plants and/or animals as the subject material.

618 Biological Membranes and Nutrient Transfer (also Veterinary Medicine 752)

Spring. 2 credits. Prerequisites: courses in animal or plant physiology, quantitative and organic chemistry, and physics, and permission of instructor; courses in cellular physiology and elementary physical chemistry recommended. Offered in alternate years.

Lec, T Th 11:15. R. H. Wasserman.

An introduction to elementary biophysical properties of biological membranes; theoretical aspects of permeability and transport; and mechanism of transfer of inorganic and organic substances across intestine, placenta, kidney, erythrocytes, bacteria, and other biological systems.

619 Lipids (also Nutritional Sciences 602)

Fall. 2 credits. Lec, T Th 11:15. A. Bensadoun.

Advanced course on biochemical, metabolic, and nutritional aspects of lipids. Emphasis is placed on critical analysis of current topics on lipid methodology; lipid absorption; lipoprotein secretion, structure, and catabolism; mechanism of hormonal regulation of lipolysis and fatty acid synthesis; and cholesterol metabolism and atherosclerosis.

654 Mammalian Physiology, Lectures I

Spring. 3 credits. Primarily for graduate students; written permission of instructor required for undergraduates. Enrollment limited. Prerequisite: 311 (314) or equivalent. May be taken before or after 655.

Lec, M W F 8. Staff.

Lectures will include the cardiovascular system, the autonomic nervous system, respiration, kidney function, and acid-base balance.

655 Mammalian Physiology, Lectures II

Fall. 3 credits. Primarily for graduate students; written permission of instructor required for undergraduates. Enrollment limited. Prerequisite: 311 (314) or equivalent. May be taken before or after 654.

Lec, M W F 1:25. Staff.

Lectures will include the somatic nervous and sensory systems, endocrinology, skeletal muscle, digestion and metabolism, growth, and lactation.

656 Mammalian Physiology, Laboratory

Spring. 3 credits. Primarily for graduate students and advanced undergraduates. Enrollment limited. Prerequisites: 311 (314) or equivalent, and permission of instructor; some experience in experimental methods and concurrent enrollment in 654 strongly recommended.

Lab, M or W 1:25-4:25; disc, S 10:10.

T. J. McDonald.

Advanced experimental methods dealing with physiology of circulation, cardiac function, respiration, acid-base balance, endocrinology, the nervous system, muscle, and digestion. The laboratory exercises are designed to illustrate basic physiological principles in mammals.

[658 Molecular Mechanisms of Hormone Action (also Veterinary Medicine 758)]

Spring. 2 credits. Prerequisite: permission of instructor. Offered in alternate years. Not offered 1978-79.

Lec, T Th 8. R. A. Corradino.

An advanced course developed from the current literature on endocrine mechanisms.]

719 Graduate Research in Animal Physiology and Anatomy (also Veterinary Medicine 600)

Fall or spring. Variable credit. S-U grades optional. Prerequisite: written permission of section chairperson and staff member who will supervise the work and assign the grade.

Hours to be arranged. Staff.

Similar to 419, but intended for graduate students who are working with faculty members on an individual basis.

See also:

Advanced Work in Animal Parasitology (Veterinary Medicine 737)

Animal Reproduction and Development (Animal Sciences 220)

Cellular Neurobiology (Biological Sciences 496 [498])

Developmental and Microscopic Anatomy (Veterinary Medicine 502)

Fundamentals of Endocrinology (Animal Sciences 427)

Insect Morphology (Entomology 322)

Introductory Parasitology and Symbiology (Veterinary Medicine 330)

Neuroanatomy (Veterinary Medicine 504)

Parasitic Helminthology (Veterinary Medicine 440)

Sensory Function (Biological Sciences 495)

Teaching Experience (Biological Sciences 403-404)

Vertebrate Developmental Anatomy (Biological Sciences 389)

Vision (Biological Sciences 395)

Neurobiology and Behavior

321 Neurobiology and Behavior Fall. 3 credits. Prerequisite: 1 year of introductory biology.

Lec, M W F 12:20. J. M. Camhi, S. T. Emlen.

A general introduction to the field of neurobiology and behavior. Topics include evolution of behavior, cueing of behavior, animal orientation, social and nonsocial behavior, neuroanatomy, neurophysiology, neurochemistry, neural networks, and memory.

322 Hormones and Behavior (also Psychology)

322) Spring. 3 credits. Primarily for upperclass students; permission of instructor required for sophomores. Prerequisites: 1 year of introductory biology, and 321 or a course in psychology.

Lec, T Th 10:10–11:30. E. K. Adkins, R. E. Johnston.

The relationship between endocrine and neuroendocrine systems and the behavior of animals, including humans. Major emphasis will be on sexual, parental, and aggressive behavior.

324 Biopsychology Laboratory (also Psychology)

324) Spring. 3 credits. S-U grades optional. Limited to upperclass students. Limited to 25 students. Prerequisites: laboratory experience in biology or psychology, 321 or Psych 123, and permission of instructor.

Lab, T Th 1:25–4:25. E. K. Adkins and staff. Experiments designed to provide research experience in animal behavior (including learning) and its neural and hormonal mechanisms. A variety of techniques, species, and behavior patterns will be included.

[329 Behavioral Maturation (also Psychology)

329) Fall. 3 credits. Limited to 50 students. Prerequisites: 1 year of college biology, and 1 biopsychology course or equivalent. Not offered 1978–79.]

[395 Vision (also Engineering A&EP 611)

395) Fall. 3 credits. Prerequisites: Chem 104 or 208, Math 106 or 111, Phys 102 or 208, or permission of instructor. Offered in alternate years. Not offered 1978–79.

Lec, M 1:25 and T Th 10:10. R. K. Clayton. A study of the mechanism of seeing, embracing biological, physical, and chemical approaches to the subject.]

420 Seminar in Neurobiology and Behavior

Fall or spring. Variable credit. May be repeated for credit. S-U grades optional. Primarily for undergraduates.

Hours to be arranged. Organizational meetings first Monday of each semester at 8 p.m. in Caldwell 100. Staff.

In most semesters at least 3 seminars on different topics will be offered. Topics and instructors will be listed in the *Catalog Supplement* at beginning of semester.

421 Comparative Vertebrate Ethology

Fall. 3 credits. S-U grades optional. Prerequisites: 1 year of introductory biology for majors, 321, and permission of instructor.

Lec, T Th 9:05; lab to be arranged. Independent research project required. W. C. Dilger. A survey of the methods and principles of vertebrate ethology, including such topics as aggression, fear, sex, feeding, and other normal activities. Emphasis is placed on the causation, function, biological significance, and evolution of species-typical behavior. The laboratories are designed to give firsthand knowledge of the material covered in lectures.

This course will also be offered during the 3-week Summer Session. During the summer, field trips and field projects are substituted for many of the laboratories.

423 Animal Communication Fall. 4 credits. Limited to 32 students. Prerequisites: 321 and either Phys 102 or 208.

Lec, T Th 10:10; lab, T or Th 1:25–4:25; and other meetings to be arranged. R. R. Capranica, R. R. Hoy.

The functional aspects of biological signals, their physical properties, and the physiological mechanisms underlying their generation and reception. Lectures will examine in detail selected biological communication problems from each of the known sensory modalities. Discussion will cover signal analysis, transmission properties, and the

limitation of each type of communication. Laboratories will include behavioral observations under both field and captive conditions, and individual experience with the techniques of signal recording and analysis.

425 (326) Animal Social Behavior

Fall. 4 credits. May be repeated for credit with permission of instructor. S-U grades optional. Prerequisite: 321. Offered fall 1978; next offered spring 1980 and spring semesters thereafter.

Lec, M W F 8. G. Hausfater. This course examines animal social behavior and social organization in a phylogenetic perspective. Social behavior will be examined for selected taxonomic groups, with a different group serving as the focus of the course each year. In fall 1978 the course will focus on mammals, with later offerings tentatively scheduled to cover fishes, amphibians, reptiles, birds, and social insects.

[427 Vertebrate Social Behavior

Fall. 3 credits. Prerequisites: 321 and 360, or their equivalents, and written permission of instructor. Offered in alternate years. Not offered 1978–79.

Lec, M W F 10:10; disc to be arranged. S. T. Emlen. A discussion of vertebrate social behavior, with emphasis upon behavioral adaptations to the environment; ecological significance of diverse social systems; advantages of territoriality, coloniality, and nomadism; evolution of cooperative and communal social organizations; feeding and flocking strategies; ecological constraints on monogamous, polygamous, and promiscuous mating systems; and role of social behavior in population regulation.]

429 Undergraduate Research in Neurobiology and Behavior

Fall or spring. Variable credit. S-U grades optional. Undergraduates must attach to their course registration material written permission from the staff member who will supervise the work and assign the grade.

Hours to be arranged. Staff. Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

491 (492) Principles of Neurobiology, Laboratory (also Psychology 491)

Fall. 4 credits. Limited to 36 students. Prerequisite: 495 or 496 (498), or written permission of instructor.

Lab, M W or T Th 12:20–4:25. P. G. Aitken, B. P. Halpern, D. N. Tapper. Laboratory practice with neurobiological preparations and experiments, designed to teach the students the techniques, experimental designs, and research strategies used to study biophysical and biochemical properties of excitable membranes, sensory receptors, and the central nervous system transformation of afferent activity as well as the characteristic composition and metabolism of neural tissue. Theoretical content will be at the level of Junge's *Nerve and Muscle Excitation*.

[494 Neuropharmacology

Spring. 3 credits. Prerequisites: 321 and either 330 or 331, or written permission of instructor. Not offered 1978–79.

Lec, M W F 8. Deals with drugs that affect the nervous system, both central and peripheral. Emphasis will be on mechanisms of drug action whereby basic biochemical processes and neurophysiological and behavioral phenomena are bridged. Among the topics discussed are stimulants, anesthetics, hallucinogens, and neurotoxins. Topics covered will also include drug addiction, psychopharmacology, endocrine pharmacology, and the biochemical basis of the therapeutic uses of drugs in diseases of the nervous system.]

495 Sensory Function (also Psychology 495)

Fall. 3 credits. Prerequisites: 321 or equivalent; and either 496 (498), 692, 696, Psych 422, or Psych 425, or written permission of instructor. Offered in alternate years.

Lec, T Th 9:05. B. P. Halpern. An examination of the basic principles of sensory function, with emphasis on processes at the receptor level. Filtering, transduction, and the pattern of the initial neural response will be studied. One sensory system will be followed from environmental energy patterns through central nervous system responses, and will serve as a general model. The course will be taught using the Socratic method, in which the instructor asks questions of the students. Students should bring a recent photograph of themselves to the first class.

496 (498) Cellular Neurobiology

Spring. 4 credits. Prerequisite: 321. Lec, M W F 10:10; disc to be arranged. 2 preliminary exams given at 7:30 p.m. J. M. Camhi, T. R. Podleski, M. M. Salpeter.

A one-semester, intensive undergraduate course in neurobiology. The course will provide in-depth, current treatment of the basic principles of cellular, chemical, pharmacological, molecular, anatomical, and integrative aspects of neurobiology.

[497 Neurochemistry

Fall. 3 credits. Limited to 50–100 students. Prerequisites: 321 and either 330 or 331. Not offered 1978–79.

Lec and disc, M W F 9:05. Special features of the composition and metabolism of neural tissue will be discussed. The identification of synaptic transmitters in the nervous system, including their specific localization, biosynthesis and metabolism, release, inactivation, and action on postsynaptic receptors, will be considered in detail.]

[622 Chemical Communication (also Chemistry

622) Spring. 3 credits. Primarily for research-oriented students; seniors and graduate students only. Limited to 30 students. Prerequisites: 1 year of introductory biology for majors or equivalent, course work in biochemistry, and Chem 357–358 or equivalent. Offered in alternate years. Not offered 1978–79.

Lec, M W F 1:25. T. Eisner, J. Meinwald, W. L. Roelofs, and guest speakers. The production, transmission, and reception of chemical signals in communicative interactions of animals, plants, and microorganisms. Specific topics will be treated with varying emphasis on chemical, biochemical, neurobiological, ecological, and evolutionary principles.]

624 Behavioral Neurogenetics

Fall. 3 credits. S-U grades optional. Primarily for research-oriented students. Prerequisites: 321 and 281; course work in developmental biology recommended. Offered in alternate years.

Lec, T Th 9:05; disc and demo to be arranged. R. R. Hoy. The neurogenetic basis of behavior in animals. The study of "simple" behaviors that can be analyzed genetically and neurobiologically. Both vertebrate and invertebrate animals will be discussed, although emphasis will be on the invertebrates. Lectures and assigned readings will draw heavily from journal articles.

[628 Field Methods in Animal Behavior

Spring. 4 credits. Limited to 20 students. Prerequisites: 321 and either 421 or 427, or their equivalents, and written permission of instructor. Not offered 1978–79.

Lec and disc, T Th 10:10; lab, T 1:25–4:25. Independent project required. It will be mandatory for enrolled students to participate in all of these aspects of the course and no partial credit will be given. R. E. Buskirk. A practically oriented course for seniors and first-year graduate students who will be pursuing field studies. Lecture-discussion areas include the scope

and design of field behavior projects, sources of variability, and evaluation of relevant publications. Laboratory periods are devoted to introduction, demonstration, and practice of techniques, and to individual fieldwork.]

[692 Behavioral Neurophysiology, Lectures Spring. 3 credits. Prerequisite: 496 (498) or permission of instructor. Offered in alternate years. Not offered 1978-79.

Lec, T 10:10; disc, 2 hours each week to be arranged. J. M. Camhi.

The course will treat those aspects of the organization of the nervous system which are important in determining the forms of behavior observed. Most nervous systems considered will be those of invertebrates, which serve as models for the more complex organization of vertebrates. Readings will be original papers in the field.]

[694 Behavioral Neurophysiology, Laboratory Spring. 2 credits. Limited to 10 students. Prerequisite: concurrent enrollment in 692. Offered in alternate years. Not offered 1978-79.

Lab to be arranged. J. M. Camhi.

After learning basic techniques, students will work on extended research projects under direction of the staff.]

[695 Physiological Optics Fall. 3 credits. Limited to 24 students. Prerequisites: courses in elementary biology or psychology, and physics recommended, and courses appropriate to particular track (see below). Offered in alternate years. Not offered 1978-79.

Lec, T Th 9:05; lab, 3 hours each week to be arranged. H. C. Howland.

The course is intended primarily for upperclass students who intend to pursue research or conduct clinical work in vision. Topics covered include geometrical optics, clinical refraction, measurement of MTF and contrast sensitivity, and the vegetative physiology of the eye relevant to optical quality of the optical image.

Laboratory work will be divided into 3 tracks: (1) *Clinical Track*: for students intending to work in optometry or medicine; (2) *Psychophysical Track*: for students intending to conduct research in human or animal vision; and (3) *Engineering Track*: for students intending to use or design optical devices for which the human eye is a component in the system.

Grades in the course will be based on the student's accomplishments within the chosen track in view of the prerequisites brought to it.]

696 Bioelectric Systems (also Electrical Engineering 620) Spring. 3 or 4 credits (4 credits with laboratory). Prerequisite: 423 or 496 (498) or Ele E 301; written permission of instructor required for laboratory.

Lec, M W 9:05; disc and demo, Th 2-4:25; lab to be arranged. R. R. Capranica, M. Kim.

Application of electrical systems techniques to biological problems. Electrical activity of nerve cells; generation and propagation of nerve impulse; voltage clamp technique and its phase-plane analysis; neuromuscular systems; synaptic transmission; models of nerve cells, sensory receptors, and encoding in the nervous system; analysis of electrophysiological data; and electrodes and instrumentation techniques.

697 Functional Organization of the Mammalian Nervous System, Lectures (also Veterinary Medicine 753) Fall. 3 credits. Prerequisite: 2 years of college biology; courses in biochemistry, physics, and neural anatomy recommended. Offered in alternate years.

Lec, M W F 10:10. E. L. Gasteiger.

Cellular, sensory, central integrative, and motor aspects of the nervous system will be considered with an emphasis on the electrophysiological approach.

699 Functional Organization of the Mammalian Nervous System, Laboratory (also Veterinary Medicine 753) Fall. 3 credits. Prerequisite: concurrent enrollment in 697. Offered in alternate years.

Lab, W 1:25-4:25. E. L. Gasteiger.

Studies will include electrical activity of cells, reflexes, decerebrate rigidity, acoustic microphonic response, subcortical stimulation, and evoked and spontaneous cortical activity.

720 Seminar in Advanced Topics in Neurobiology and Behavior Fall or spring. Variable credit. May be repeated for credit. S-U grades only. Primarily for graduate students; written permission of instructor required for undergraduates.

Hours to be arranged. Staff and students. Designed to provide several study groups each semester on specialized topics. A group may meet for whatever period is judged adequate to enable coverage of the selected topics. Ordinarily, topics will be selected and circulated during the preceding semester. Suggestions for topics should be submitted by faculty or students to the chairperson of the Section of Neurobiology and Behavior.

723 Graduate Seminar in Vertebrate Social Behavior Fall. 2 credits. May be repeated for credit. S-U grades only. Enrollment limited. Prerequisites: 321, 360, 477, or their equivalents, and written permission of instructor.

Hours to be arranged. S. T. Emlen, G. Hausfater. Intended as a graduate-level follow-up to 427. An advanced, participation-format seminar dealing with various aspects of the evolution of social organization in vertebrates.

See also:

Teaching Experience (Biological Sciences 403-404)

Biochemistry and Cell Biology

132 Orientation Lectures in Biochemistry Spring. Noncredit. S-U grades only (registered students will receive an unsatisfactory grade for nonattendance). Primarily for freshmen, sophomores, and transfer students.

Lec and demo, S 10:10-11:30; first 3 Saturdays of term. Section chairperson and staff.

Lectures and demonstrations covering modern research and training in biochemistry and molecular and cell biology.

231 Some Applications of Biochemistry to Medicine and Agriculture Fall. 3 credits. S-U grades optional. Intended for students who have not previously studied biochemistry and who do not expect to pursue it further. Not recommended for students who have taken organic chemistry. Prerequisite: Chem 104 or 208, or equivalent.

Lec, M W F 12:20. R. A. Calvo, J. M. Calvo, J. M. Fessenden-Raden, M. L. Wilkinson. An attempt will be made to cover much of the material that is presented in a standard one-semester survey course. However, the presentation will focus on topics of general interest such as nutrition, cancer, hormones, genetic diseases, and viruses.

330-331 Principles of Biochemistry Introductory biochemistry is offered in two formats: individualized instruction (330) and lectures (331). *Individualized instruction will be offered to a maximum of 150 students each semester. Lectures will be given fall semester only.*

330 Principles of Biochemistry, Individualized Instruction Fall or spring. 4 credits. Prerequisite: Chem 253 or equivalent.

Disc, M W F 8 or 10:10; additional hours to be arranged. There are no formal lectures. Midterm and final exams may be scheduled in the evening. Fall: M. Ferger, R. J. Wu, and staff; spring: J. M. Calvo, M. Ferger, and staff.

The focal point for this course is a study center where students find materials, get help, participate in discussions, and take exams. The study center will be open mornings, afternoons, and some evenings. Students are required to master a minimum body of core material. The pace at which this material is assimilated, to a large extent, will be self-determined. Students who wish to go beyond core material will have available a wide range of electives, including discussions of research papers, independent study of a variety of problems, *Scientific-American* articles, and original research literature. Grades will be determined primarily by the amount of elective work satisfactorily completed and by a final exam.

331 Principles of Biochemistry, Lectures Fall. 4 credits. Prerequisite: Chem 253 or equivalent.

Lec, M W F S 10:10. G. W. Feigenson, R. E. McCarty.

The chemistry of biological substances is presented in a lecture format. The course content is similar to that of 330.

430 Basic Biochemical Methods Fall or spring. 4 credits. Prerequisites: 330 or 331, a laboratory course in organic chemistry, and permission of instructor.

Lec and disc, F 1:25; lab, M W or T Th 12:20-4:25. R. R. Alexander, M. L. Wilkinson, N. B. Wurster.

A modular course designed to introduce the student to the biochemical techniques most commonly used in various biological fields. Students may select 2 of the following modules: clinical and nutritional biochemistry, lipids, isolation and characterization of cell components, or nucleic acids. An enzymology module is taken by all students.

432 Survey of Cell Biology Spring. 3 credits. Prerequisite: 330 or 331, or equivalent.

Lec, M W F 11:15. J. T. Lis.

This course surveys the material that is covered in depth in 433, 438, and 483. A comparative survey of the structure and functional organization of prokaryotic and eukaryotic cells, and of the essential properties of cells living singly and in communities. Such topics as the integration of growth processes, membrane transport and permeability, gene structure and expression, and cell-cell interactions will be discussed.

433 Cell Structure and Physiology Fall. 2 credits. Prerequisite: 330 or 331, or permission of instructor.

Lec, T Th 12:20. R. E. MacDonald.

The functional aspects of cells and their organelles: bioenergetics, transport, movement, growth, nutrition, and structure will be examined in detail in free-living cells, differentiated cells, and highly specialized cells. The course will attempt to integrate current knowledge about cell biochemistry, structure, and function with the role of the cell in its environment and in its interrelationship with other cells.

434 Laboratory in Cell Biology Spring. 4 credits. Enrollment limited. Prerequisite: written permission of instructor; some previous laboratory experience helpful, and concurrent enrollment in 432 recommended.

Lab, M W 1:25-4:25 or Th 9:05-4:25; disc to be arranged. J. Gibson.

The course provides experience in experimental design, and stresses techniques for handling and experimentation with cells of different kinds.

435-436 Undergraduate Biochemistry Seminar 435, fall; 436, spring. 1 credit each term. May be repeated for credit. S-U grades optional with consent of instructor. Limited to upperclass students. Enrollment limited. Prerequisite: 330 or 331, or written permission of instructor.

Hours to be arranged. Organizational meeting first Tuesday of each semester at 4 p.m. Fall: V. Utermohlen; spring: G. P. Hess.

A group of selected papers from the literature will be critically evaluated during 6 or 7 two-hour meetings. Fall: nutrition, biochemistry, and immunity; spring: communication between cells.

438 Cellular Growth Control and Oncogenic

Viruses Spring. 2 credits. Prerequisite: 330 or 331; 281 recommended.

Lec, T Th 12:20. V. M. Vogt.

A description of the growth properties of animal cells in culture followed by discussions of the changes in cells that are induced by tumor viruses and carcinogens. Topics will include macromolecular growth factors, contact inhibition, cell surface properties, cell cytoskeleton, transcription and translation of viral and host genes, and integration of viral DNA into host chromosomes.

439 Undergraduate Research in Biochemistry

Fall or spring. Variable credit. Primarily for undergraduate students concentrating in biochemistry. Prerequisite: adequate ability and training for the work proposed. Undergraduates must attach to their course registration material written permission from the staff member who will supervise the work and assign the grade.

Hours to be arranged. Staff.

Special work in any branch of biochemistry on problems under investigation by individual members of the staff of the section. Arranged jointly by the section chairperson and the research adviser.

631 Protein Structure and Function

Fall. 2 credits. Prerequisites: 330 or 331, Chem 287-288 (may be taken concurrently), and Chem 357-358, or written permission of instructor.

Lec, M W 9:05. S. J. Edelstein, Q. H. Gibson, and staff.

Lectures on protein structure and the nature of enzymatic catalysis.

632 Bioenergetics and Membranes

Spring. 3 credits. Prerequisites: 330 or 331, and Chem 357-358, or written permission of instructor; physical chemistry recommended.

Lec, M W F 9:05. P. C. Hinkle and staff.

Oxidative phosphorylation, photophosphorylation, active transport, muscle contraction, and the structure of biological membranes.

633 Biosynthesis of Macromolecules

Fall. 2 credits. Prerequisites: 330 or 331 and Chem 357-358, or written permission of instructor.

Lec, T Th 9:05. L. A. Heppel and staff. DNA, RNA, and protein synthesis; regulation of gene expression; and other topics.

[634 Biochemistry of the Vitamins and Coenzymes (also Nutritional Sciences 634)]

Spring. 2 credits. Prerequisites: 330 or 331 or equivalent, and Chem 357-358. Offered in alternate years. Not offered 1978-79.

Lec, T Th 10:10. D. B. McCormick.

The chemical, biochemical, and nutritional aspects of the vitamins and coenzymes.]

635 Metabolism and Enzyme Mechanisms (also Nutritional Sciences 635)

Spring. 2 credits. Prerequisites: 330 or 331 and Chem 357-358, or written permission of instructor; physical chemistry recommended.

Lec, T Th 9:05. W. L. Dills and staff.

Molecular mechanisms of metabolic regulation and mechanisms of enzyme-catalyzed reactions, including explicit coenzyme function.

638 Intermediate Biochemical Methods

Spring. 4 credits. Primarily for undergraduates majoring in biochemistry and for graduate students with a minor in biochemistry. Prerequisites: 330 or 331, and permission of instructor. Preregistration must be

made with instructor by the last day of the preregistration period.

Lab, T or Th 9:05-4:25; disc to be arranged.

D. B. Wilson and staff.

Selected experiments on proteins, DNA, and bioenergetics (cellular particulates, kinetics, and general enzymology) will illustrate basic biochemical principles. The course will emphasize quantitative aspects rather than qualitative identifications.

732-738 (733-734) Advanced Biochemistry

Fall or spring. ½ or 1 credit for each topic. May be repeated for credit. S-U grades only. (Students registering for ½ credit should *not* fill in the credit hour column on the optical mark registration form; the computer will be programmed to automatically register students for ½ credit.) Prerequisite: 330 or 331, or equivalent.

Lectures and seminars on specialized topics.

Fall 1978: 3 topics will be offered:

733 Chemiosmotic Theory of Oxidative and Photosynthetic Phosphorylation

1 credit (12 lectures).

T Th 12:20; Sept. 5-Oct. 12. P. C. Hinkle,

R. E. McCarty.

735 Energy-Generating Biological Systems: Evolution, Biosynthesis, and Ecological Aspects

½ credit (6 lectures).

M W F 12:20; Oct. 2-13. G. Schatz.

737 Insertion Sequences in DNA

1 credit (12 lectures).

T Th 12:20; Oct. 17-Nov. 28. B. K. Tye,

J. M. Calvo.

Spring 1979: 4 topics will be offered.

732 Lysogenic Induction

½ credit (6 lectures).

T Th 12:20; Jan. 23-Feb. 8. J. W. Roberts.

734 Genetic Engineering Applied to Plant Cells

½ credit (6 lectures).

W F 12:20; Jan. 24-Feb. 9. A. Szalay.

736 X-Ray Crystallography of Macromolecules

1 credit (12 lectures).

T Th 12:20; Feb. 13-Mar. 29. K. Moffat.

738 Biochemistry of Procarotyl Photosynthesis

½ credit (6 lectures).

T Th 12:20; Apr. 3-19. J. Gibson.

830 (730) Biochemistry Seminar

Fall or spring. Noncredit.

F 4:15. Staff.

Lectures on current research in biochemistry presented by distinguished visitors and staff.

831 (739) Advanced Biochemical Methods I

Fall, 6 credits. Limited to graduate students majoring in biochemistry.

Lab, 12 hours each week to be arranged; disc to be arranged. Organizational meeting first Tuesday at 10:10. E. B. Keller and staff.

Each student will carry out a research project to learn the basic techniques of biochemical research.

832 Advanced Biochemical Methods II

Spring. 6 credits. S-U grades only. Limited to graduate students in the Field of Biochemistry.

Hours to be arranged. Staff (Coordinator—D. B. Wilson).

Students will do research in the laboratories of 3 different professors chosen by the student.

Arrangements are made jointly between the field representative and the research adviser.

833 (731) Research Seminar in Biochemistry

Fall and spring. 1 credit each term. (Students must register for 2 credits each term since an "R" grade is given at the end of the fall term.) May be repeated for

credit. S-U grades only. Required of all graduate students (first-year students excepted) majoring in biochemistry.

M 7:30-9 p.m. E. Racker.

See also:

Lipids (Biological Sciences 619)

Molecular Aspects of Development (Biological Sciences 483)

Molecular Mechanisms of Hormone Action (Biological Sciences 658)

Plant Biochemistry (Biological Sciences 648)

Teaching Experience (Biological Sciences 403-404)

Vertebrate Biochemistry (Veterinary Medicine 525)

Botany

241 (245) Plant Biology

Fall. 3 credits. Enrollment may be limited, with preference given to majors in agronomy, botany, environmental education, floriculture, horticulture, natural resources, plant sciences, vegetable crops, and wildlife. Prerequisite: 1 year of introductory biology for majors or equivalent.

Lec, T Th 9:05; lab, M T W Th or F 1:25-4:25, or

M or W 7:30-10:30 p.m. K. J. Niklas.

Introductory botany for those who plan to specialize in some aspect of, or to make some utilization of, the plant sciences. Emphasizes structure, reproduction, and classification of angiosperms, and the history of life on earth. Emphasis in laboratory is placed on the development of skills in handling plant materials, including identification. First three weeks of laboratory are field trips, starting with the first day of classes.

242 Plant Physiology, Lectures

Spring. 3 credits. Primarily for undergraduates in agricultural sciences. Prerequisites: 1 year of introductory biology and introductory chemistry; concurrent enrollment in 244 or written permission of instructor required for undergraduates.

Lec, M W F 10:10. P. J. Davies.

Plant physiology as applied to plants growing in communities. Examples will deal with crop plants or higher plants where possible, though not exclusively. Topics will include cell structure and function; plant metabolism, including photosynthesis; soil-plant-water relations; water uptake, transport, and transpiration; irrigation of crops; sugar transport; mineral nutrition of crops; respiration and photosynthesis; light relations in crops; growth and development—hormones, flowering, fruiting, dormancy, and abscission; and chemical control of plant growth.

244 Plant Physiology, Laboratory

Spring. 2 credits. Prerequisite: concurrent enrollment in 242.

Lab, M T W or Th 1:25-4:25; disc, M T W or

Th 12:20. Lab and discussion must be on same

day. C. Reiss.

246 Plants and Man

Spring. 3 credits. S-U grades optional. Intended for students in all colleges.

Lec and disc, M W F 8. D. M. Bates.

A consideration of the role of plants in the human environment and in the evolution of civilizations. Emphasis is on ethnobotanical considerations and on historical to present-day utilization of plants in nutrition, housing, clothing, medicine, religion, and the arts.

341 Plant Physiology, Lectures

Fall. 3 credits. Prerequisites: 1 year of introductory biology, organic chemistry, and either concurrent enrollment in 349 or written permission of instructor.

Lec, T Th 10:10 and M 7:30 p.m. A. T. Jagendorf. The behavior, growth, transport processes, and environmental response of plants. Topics will include membrane properties, solute and water transport, and function of osmotic forces; mineral and organic nutrition; stress resistance; growth and hormonal action; metabolism, including photosynthesis and respiration; and responses to gravity, light, photoperiod, and temperature.

343 Field Phycology Summer. 4 credits. S-U grades optional. Prerequisite: 364 or general familiarity with marine algae.

Daily lectures, laboratories, and fieldwork for 3 weeks. Faculty of the Shoals Marine Laboratory. An overview of the major marine algal groups, including aspects of anatomy, morphology, development, life histories, physiology, and utilization. Laboratories and fieldwork will emphasize relationships between distribution and major environmental parameters, and will involve student projects.

A special course offered at the Shoals Marine Laboratory of Cornell University on an island off Portsmouth, N.H. For more details and applications, consult the Shoals Marine Laboratory Office, Stimson G-14. Estimated cost: \$620.

345 Plant Anatomy Fall. 4 credits. Limited to 48 students. Prerequisite: 1 year of introductory biology or a semester of botany. This course is not intended for general education. Students who are in doubt about the level of their preparedness or the role of this course in their curricula are encouraged to consult the instructor before registering.

Lec, T Th 8; lab, M W 2-4:25 or T Th 10:10-12:35. D. J. Paolillo.

A descriptive course with equal emphasis on development and mature structure. Lecture, laboratory, and reading are integrated in a study guide. The laboratory offers the opportunity to develop the practical skills required to make anatomical diagnoses and to write anatomical descriptions.

346 Taxonomy of Vascular Plants Fall. 4 credits. Prerequisites: introductory biology and written permission of instructor.

Lec and disc, T Th 9:05; lab, T Th 2-4:25. M. D. Whalen.

An introduction to the classification of ferns and flowering plants, with attention to principles, methods of identification, and literature. Field trips are held during laboratory periods in the first half of the term.

347 Cytology Fall. 4 credits. Prerequisite: 1 year of introductory biology for majors; 281 recommended.

Lec, M W 9:05; lab, M W or T Th 10:10-12:35. C. H. Uhl.

A study primarily of the structure of cells and their components, and the relation of these to function and heredity. Special attention is given to chromosomes. Both plant and animal materials are used.

348 Phycology Spring. 4 credits.

Lec, M W F 10:10; lab, M W or F 2-4:25. J. M. Kingsbury.

An introduction to freshwater and marine algae, including consideration of their ecology as members of the plankton and benthos and their importance to man. The laboratory, utilizing field material and cultures from an extensive living collection, is designed to illustrate lecture topics, provide familiarity with algae in the field, and introduce the student to techniques used in isolating, culturing, and studying algae in the laboratory.

349 Plant Physiology, Laboratory Fall.

2 credits. Prerequisite: concurrent enrollment in 341. Lab, T W or Th 1:25-4:25; disc, T W or Th 12:20. Lab and discussion must be on same day. C. Reiss.

442 Taxonomy and Evolution of Vascular Plants Spring. 4 credits. Prerequisites: 346 and written permission of instructor.

Lec and disc, T Th 9:05; lab, T Th 2-4:25. M. D. Whalen.

An interdisciplinary view of broad-scale and species-level evolution in vascular plants, with consideration of morphological, ecological, biogeographic, cytogenetic, and biochemical aspects.

444 Comparative and Developmental Morphology of the Embryophyta Spring. 4 credits. Prerequisite: 345. Offered in alternate years.

Lec, T Th 8; lab, T Th 2-4:25. D. J. Paolillo. The life histories of bryophytes, vascular cryptogams, and seed plants are explored for their developmental attributes and for their bearing on concepts of evolution and group relationships. The course content is presented so that an awareness of the integration between morphology and other disciplines in biology can be developed.

445 Photosynthesis (also Engineering A&EP 601) Fall. 3 credits. Prerequisites: Chem 104 or 208, Math 106 or 111, and Phys 102 or 208, or permission of instructor. Offered in alternate years.

Lec, M 1:25 and T Th 10:10. R. K. Clayton. A detailed study of the process by which plants use light in order to grow, emphasizing physical and physicochemical aspects of the problem.

[446 Cytogenetics Spring. 3 credits.

Prerequisites: 281 and 347, or their equivalents. Offered in alternate years. Not offered 1978-79.

Lec, M W 9:05; lab, M or W 10:10-12:35. C. H. Uhl.

Deals mainly with the cellular mechanisms of heredity, including recent research in cytology, cytogenetics, and cytotoxicology.]

[448 Plants and Time (Paleobotany) Spring.

3 credits. Prerequisites: 345 and 444 recommended (may be taken concurrently), or written permission of instructor. Offered in alternate years. Not offered 1978-79.

Lec and disc, M W F 11:15. K. J. Niklas.

A survey of the evolutionary history of the major groups of plants. Emphasis will be placed on a consideration of the geologic time of appearance of major innovations in the plant kingdom and their subsequent adaptive radiations.]

449 Undergraduate Research in Botany Fall or spring.

Variable credit. Undergraduates must attach to their course registration material written permission from the staff member who will supervise the work and assign the grade.

Hours to be arranged. Staff. Students engaged in special problems or making special studies may register in this course. They must satisfy the instructor under whom the work is to be taken that their preparation warrants their choice of problem.

640 Special Topics in Plant Taxonomy Fall or spring. 1 credit for each topic. S-U grades optional.

Prerequisite: written permission of instructor.

Lec and disc to be arranged. D. M. Bates, W. J. Dress, J. W. Ingram, H. E. Moore. A series of 4 topics, 1 presented each term, designed to provide professional background in nomenclature, biosystematics, families of tropical phanerogams, and literature of taxonomic botany. (1) Fall. *Nomenclature*. An analysis of the International Code of Botanical Nomenclature and its application to various plant groups. Lectures, discussions, and problems. W. J. Dress. May be taken concurrently with 641. Offered in alternate years.

(2) Spring. *Biosystematics*. A consideration of biosystematic approaches to taxonomy, including chemical, numerical, cytological, and statistical methodologies as well as a review of classic studies,

D. M. Bates. Offered in alternate years.

[(3) Fall. *Families of Tropical Phanerogams*. The families of flowering plants encountered solely or chiefly in tropical regions will be considered in lectures, discussions, and demonstrations, with the aim of providing basic points of recognition for and an understanding of diversity and relationships in these families for the student venturing into the tropics. H. E. Moore. Offered in alternate years. Not offered 1978-79.]

[(4) Spring. *Literature of Taxonomic Botany*. A survey of the basic reference works in taxonomy from the pre-Linnaean literature drawn on by Linnaeus to contemporary publications, with comments on the peculiarities of the books (when appropriate), on publication dates, typographic devices, and intricacies of bibliographic citation. Lectures, discussions, demonstrations, and problems. J. W. Ingram. Offered in alternate years. Not offered 1978-79.]

641 Botanical Latin Fall. 1 credit. S-U grades optional. Prerequisite: written permission of instructor. Offered in alternate years.

Lec and disc to be arranged. W. J. Dress. Basic grammar and vocabulary, and exercises in writing and reading the Latin of plant taxonomy as well as applications to botanical nomenclature.

642 Topics in Ultrastructure of Plant Cells

Spring. 3 credits. Primarily for graduate students, although upperclass students with adequate background will be allowed to enroll. No auditors. Prerequisites: 345 or 347, and written permission of course coordinator. Offered in alternate years.

Lec, M W F 9:05; disc, F 1:25 or to be arranged. Staff (Coordinator—M. V. Parthasarathy).

An advanced course dealing with organelles in depth, and in breadth where necessary. Topics will include salient ultrastructural features of some plant groups, and certain specialized cells and processes. Content of the course and staff direction will vary to some extent from year to year.

643 Plant Physiology, Advanced Laboratory Techniques Fall. 4 credits. S-U grades only.

Primarily for graduate students doing work in plant physiology, but open to others if space permits. Prerequisites: organic chemistry, biochemistry, and a course in plant physiology.

Lab, T or W 8-5; disc, M 4:30-5:30. A. T. Jagendorf and staff.

An introduction to some modern methods in experimental plant biology.

[644 Plant Growth and Development Spring. 3 credits. Prerequisites: 345 and either 242 or 341, or their equivalents, or written permission of instructor. Offered in alternate years. Not offered 1978-79.

Lec, M W F 9:05. P. J. Davies, D. J. Paolillo. This course explores the changes that occur during growth and development of plants and their control: morphological and anatomical changes in apices, tissue differentiation, organ formation, embryo development, gene regulation, hormone action and interaction, the influence of light in development, flowering, fruiting, dormancy, abscission, and senescence.]

[646 Families of Tropical Flowering Plants: Field Laboratory Intersession. 3 credits. S-U grades only.

Limited to 20 students, with preference given to seniors and graduate students from member institutions of the Organization for Tropical Studies. Prerequisite: 346 or equivalent; 640(3) recommended. Offered in alternate years. Not offered 1978-79.

H. E. Moore.

An intensive orientation to families of tropical flowering plants as represented in Atlantic lowland rain forest and Pacific mid-elevation premontane rain forest in Costa Rica. Emphasis will be on field identification combined with laboratory analysis of available materials in a "whole-biology" context.

The course will be conducted at two field stations of the Organization for Tropical Studies—La Selva (100–200 m elevation) and Las Cruces (1,200 m elevation), where collections of a tropical botanical garden are also available. For more details and applications, consult Dr. H. E. Moore, Jr., L. H. Bailey Hortorium, 467 Mann Library Building. Estimated cost: \$900.]

647 Seminar in Systematic Botany Fall. 1 credit. May be repeated for credit. S-U grades optional. Prerequisite: written permission of course coordinator required for undergraduates. Lec and disc to be arranged; organizational meeting F 1:25. Staff (Coordinator—D. M. Bates). Lectures and discussions led by staff, visitors, and students on topics of current importance to systematic botany.

648 Plant Biochemistry Spring. 3 credits. Prerequisites: organic chemistry, biochemistry, and a course in plant physiology. Offered in alternate years.

Lec, M W F 9:05. A. T. Jagendorf, R. E. McCarty, J. F. Thompson. Selected areas of plant biochemistry will be reviewed in the context of the plant life cycle and responses to the environment. Topics include: metabolism of lipids, carbohydrates, organic acids, proteins, and pigments; nitrogen and sulfur assimilation; hormone metabolism; respiration; photosynthesis; development and replication of chloroplasts; and cell wall composition and properties. Attention will be paid to operation of control mechanisms.

649 Transport of Solutes and Water in Plants Fall. 3 credits. Prerequisite: 341 or equivalent. Offered in alternate years.

Lec, M W F 10:10. R. M. Spanswick. Transport of ions, water, and organic materials in plants; mechanisms of ion transport; relationships between ion transport and metabolism; ion uptake and transport in higher plants; phloem transport; and water relations of single cells and whole plants.

[651 Quantitative Whole-Plant Physiology Fall. 3 credits. S-U grades only. Prerequisites: introductory physics, calculus, and plant physiology. Offered in alternate years. Not offered 1978–79.

Lec, T Th 10:10–11:30. R. M. Spanswick. An exploration of the extent to which physiological processes and their interactions can be formulated in a quantitative manner and integrated to describe various aspects of plant behavior, including growth and yield. Consideration will be given to characterization of the plant environment, energy balance, gas exchange, water relations, photosynthesis, respiration, translocation, nutrient supply, and the timing of developmental events.]

740 Plant Physiology Seminar Fall and spring. Noncredit (no official registration). Required of graduate students doing work in plant physiology. F 11:15. Staff.

Lectures on current research in plant physiology presented by visitors and staff.

749 Graduate Research in Botany Fall or spring. Variable credit. May be repeated for credit. S-U grades optional.

Hours to be arranged. Staff. Similar to 449, but intended for graduate students who are working with faculty members on an individual basis.

840 Current Topics in Plant Physiology Fall or spring. 2 credits. May be repeated for credit. S-U grades only.

Hours to be arranged. Staff. Seminar reports by graduate students on current literature in experimental plant physiology or related areas.

See also:

Advanced Mycology (Plant Pathology 579)

Current Topics in Mycology (Plant Pathology 649)

Introductory Mycology (Plant Pathology 309)

Plant Ecology (Biological Sciences 463, 465)

Plant Ecology Seminar (Biological Sciences 669)

Taxonomy of Fungi (Plant Pathology 599)

Teaching Experience (Biological Sciences 403–404)

Ecology, Systematics, and Evolution

260 Introductory Ecology Fall or spring. 3 credits. Prerequisite: 1 year of introductory biology or written permission of instructor.

Lec, T Th 11:15; disc, T or Th 1:25, 2:30, or 3:35. Fall: C. A. S. Hall; spring: P. F. Brussard.

This course will give students an introduction to biological phenomena that occur at the population, community, and ecosystem levels of organization. The relevance of ecological principles to current environmental problems will be examined.

274 The Vertebrates Spring. 5 credits. Primarily for sophomores; this course is a prerequisite for many advanced courses in vertebrate biology, anatomy, and physiology. Lab limited to 21 students each section. Prerequisite: 1 year of introductory biology for majors.

Lec, T Th 10:10; lab, M W 1:25–5, M W 7–10 p.m., or T Th 1:25–5. 1 midterm exam given at 7:30 p.m. Staff.

An introduction to the evolution, classification, comparative anatomy, life history, and behavior of vertebrate animals. Laboratory dissection and demonstration are concerned with structure, classification, systematics, biology of species, and studies of selected aspects of vertebrate life.

360 General Ecology Fall or spring. 3 credits. For students concentrating in ecology or a related subject. Not open to freshmen in fall semester. Prerequisite: 1 year of introductory biology for majors.

Lec, T Th 9:05; disc, W or Th 1:25, 2:30, or 3:35. Fall: P. P. Feeny, P. L. Marks; spring: B. F. Chabot, R. B. Root.

Principles concerning the interactions between organisms and their environment; influence of competition, predation, and other factors on population size and dispersion; analysis of population structure and growth; processes of speciation; interspecific competition and the niche concept; succession and community concepts; influence of climate and past events on the diversity and stability of communities in different regions of the world; and role of energy flow and biogeochemical cycling in determining the structure and productivity of ecosystems. Modern evolutionary theory will be stressed throughout and attention given to conflicting ecological hypotheses.

363 Introductory Marine Science for Teachers Summer. 1 credit. S-U grades optional. Primarily for teachers grades 6 through 12, but open to others. Prerequisite: 1 year of introductory college biology.

Daily lectures, laboratories, and fieldwork for 1 week. Faculty of the Shoals Marine Laboratory. Designed to give an overview of living marine organisms (algae, invertebrates, fishes, marine mammals, and shore birds) and of the environment they inhabit. Fieldwork will be emphasized. Occasional lectures and films will deal with additional topics, such as coastal zone problems, marine fisheries, economics of marine organisms, and educational resources of the marine

environment. The core faculty of marine biologists will be augmented by specialists in science and environmental education.

A special course offered three times each summer at the Shoals Marine Laboratory of Cornell University on an island off Portsmouth, N.H. For more details and applications, consult the Shoals Marine Laboratory Office, Stimson G-14. Estimated cost: \$210.

364 Introduction to Marine Science Summer. 5 credits. S-U grades only. Prerequisite: 1 year of college biology or other supporting subject.

Daily lectures, laboratories, and fieldwork for 4 weeks. The course is taught by 3 core faculty assisted by approximately 25 visiting lecturers including representatives of governmental agencies and commercial fishermen. Faculty of the Shoals Marine Laboratory.

Designed for the student who desires an initial overview of the marine sciences, this course emphasizes living material in natural habitats. Most of the course work is concerned with the biology of intertidal plants and animals, biological oceanography, ichthyology, and fisheries. Attention also is given to introductory physical and chemical oceanography and marine geology. Marine ecology and the effects of human activity on the marine environment are included.

A special course offered twice each summer at the Shoals Marine Laboratory of Cornell University on an island off Portsmouth, N.H. For more details and applications, consult the Shoals Marine Laboratory Office, Stimson G-14. Estimated cost: \$820.

365 Underwater Research Summer. 1 credit. S-U grades only. Prerequisites: recognized certification and a medical examination.

Daily lectures and practice for 1 week. The course will be team-taught by a diving safety officer, a faculty member, plus guest lecturers.

For competent divers only, this course will cover the special problems of research underwater, including random sampling, use of dive tables, underwater instrumentation, special diving equipment, photographic techniques, integration with boat and shore facilities, and emergency procedures. Practice in use of equipment underwater will be emphasized and at least 1 demonstration project will be undertaken.

A special course offered at the Shoals Marine Laboratory of Cornell University on an island off Portsmouth, N.H. For more details and applications, consult the Shoals Marine Laboratory Office, Stimson G-14. Estimated cost: \$230.

366–370 (366–369) SEA Semester

In cooperation with the Sea Education Association (SEA), the Shoals Marine Laboratory offers a semester-length sequence of courses designed to provide college undergraduates with a thorough academic, scientific, and practical understanding of the sea. This sequence is repeated approximately every 2 months throughout the year. The first half of SEA Semester (the 6-week basic shore component) is spent in Woods Hole, Massachusetts, receiving instruction in the marine and nautical sciences and studying man's relationship with the sea. The second half of SEA Semester (the 6-week sea component) is spent at sea aboard R/V *Westward*. Enrollment is open to men and women judged capable of benefiting from SEA Semester. No specific prior training or study is required.

Instructors for the SEA Semester include faculty of the Sea Education Association (D. M. Drost, Dean, SEA Semester Program), Cornell, Woods Hole Oceanographic Institution, Boston University, and others.

Cornell students enrolled in the SEA Semester must take the entire sequence. Credit will *not* be awarded for both SEA Introduction to Marine Science (366)

and Introduction to Marine Science (364) offered each summer at the Shoals Marine Laboratory of Cornell University.

For more details and applications, consult the Shoals Marine Laboratory Office, Stimson G-14. Program costs to be paid in lieu of regular Cornell tuition and fees: tuition for basic shore component, about \$950; tuition plus room and board for sea component, about \$2,050.

Basic Shore Component (6 weeks)

366 SEA Introduction to Marine Science

3 credits. Prerequisite: a laboratory course in physical or biological science, or equivalent.

A survey of the characteristics and processes of the global ocean. Oceanographic concepts are introduced and developed from their bases in biology, physics, chemistry, and geology. The course provides a broad background in oceanography with special attention to areas pertinent to the subsequent *Westward* cruise. Guest lecturers drawn from the Woods Hole research community provide insight into current trends and activities in this rapidly-evolving field. Students are encouraged to develop individual projects to be carried out at sea.

367 SEA Man and the Sea 2 credits.

An interdisciplinary consideration of man's relationship with his marine environment. Included are the political, economic, social, and cultural results of man's use of the sea for recreation, scientific research, food, fuel, minerals, and energy-efficient transportation. The course provides the elements of maritime history, law, literature, and art which are necessary to appreciate our marine heritage and to understand contemporary maritime affairs. Examples of mariner's journals are studied in preparation for the diary required of each student at sea.

368 SEA Introduction to Nautical Science

3 credits. Prerequisite: college algebra or equivalent.

An introduction to the technologies of operation at sea. The concepts of navigation (piloting, celestial, and electronic), naval architecture, ship construction, marine engineering systems, and ship management are taught from their bases in physics and astronomy. The course provides the theoretical foundation for the navigation, seamanship, and engineering which the student will employ at sea.

Sea Component (6 weeks)

Courses 369 and 370 take place aboard the R/V *Westward*, a 250-ton steel auxiliary powered staysail schooner built in 1961. *Westward* normally puts to sea with a ship's company of 34. The professional staff of 9 includes the captain, 3 science watch officers, 3 deck watch officers, an engineer, and a steward. In addition, one or more visiting investigators are frequently aboard. Up to 25 students round out the complement.

369 SEA Marine Science Laboratory 4 credits.

Prerequisite: 366.

The practice of oceanography at sea. The student is introduced to the oceanic environment, including its biological, physical, chemical, and geological aspects. Students are instructed in the operation of oceanographic equipment through its use in sampling and conducting measurements. They practice the reduction and analysis of data and the process of solving simple problems relating to the surrounding oceanic environment. Topics vary with the cruise track but include attention to all of the major subdisciplines of oceanography.

370 (369) SEA Nautical Science Laboratory

4 credits. Prerequisite: 368.

The practice of nautical science at sea. The student is introduced to the technical and psychological problems of operation and existence in the physical

environment of the ocean. Instruction and practice are provided in the areas of navigation, seamanship, marine engineering, and shipboard operations. Daily lectures build on the theoretical foundation established by the shore course and deal with the practical problems and applications presented by ship operation. During the final 2 weeks at sea, each student is expected to demonstrate, in succession, competence as navigator, deck watch officer, and engineering watch officer.

[460 Insect Ecology (also Entomology 400)]

Fall. 4 credits. Lab limited to 16 students each section. Prerequisites: 360 and Entom 212, or their equivalents. Not offered 1978-79.

Lec, W F 11:15; lab, W F 1:25-4:25, or W 1:25-4:25 and S 8-11. R. B. Root.

Ecological principles are integrated through the detailed analysis of insect life systems. Topics discussed include the role of physical factors in population regulation, adaptive syndromes and the functional role of insects in terrestrial ecosystems, natural history of arthropod guilds, and contrast between natural and managed ecosystems. Field exercises demonstrate techniques for measuring population size and dispersion, life-table parameters, and community structure.]

461 Oceanography Fall. 3 credits. Prerequisites: college physics and either 260 or 360, or written permission of instructor.

Lec, T Th 10:10; additional lecture Th 12:20 alternating with discussion, T W or Th 1:25. J. P. Barlow.

A general introduction to the oceans, with some emphasis on physical and chemical processes that interact with marine communities. Discussions will include demonstrations of field techniques as well as discussions of methods of analysis and interpretation of oceanographic data.

462 Limnology, Lectures Spring. 3 credits.

Prerequisite: 260 or 360, or written permission of instructor.

Lec, M W F 11:15. Staff.

A study of the interaction of biological communities and their aquatic environment. Lectures deal with the physical, chemical, and biological dynamics of freshwater ecosystems.

463 Plant Ecology, Lectures Fall. 3 credits.

Prerequisites: 2 advanced-level courses in biology including 360, or written permission of instructor; some taxonomic familiarity with vascular plants helpful, and concurrent enrollment in 465 strongly recommended.

Lec, M W F 11:15. P. L. Marks.

Principles of plant-environment interactions in relation to the evolution, distribution, structure, and functioning of plant communities.

464 Limnology, Laboratory Spring. 2 credits.

Prerequisite: concurrent or previous enrollment in 462.

Lab, T W Th or F 1:25-4:25; 1 all-day field trip. Staff.

Field trips and laboratories devoted to studies of aquatic ecosystems.

465 Plant Ecology, Laboratory Fall. 1 credit.

Prerequisite: concurrent enrollment in 463 or an equivalent background in plant ecology.

Lab, F 12:05-5. P. L. Marks.

Laboratory and field exercises in plant ecology. Field study of plant communities, and techniques for the analysis of community data, are emphasized.

466 Chemical Ecology Fall. 2 credits. S-U

grades optional. Prerequisites: 1 year of introductory biology for majors and either Chem 253 or 357-358; or written permission of instructor. Offered in alternate years.

Lec, M W 8; occasional lecture F 8. I. Eisner, P. P. Feeny, J. Meinwald, W. L. Roelofs, R. H. Whittaker.

Ecological and evolutionary significance of chemical interactions of organisms; summary of key processes in regulation of natural populations; survey of major classes of natural products with emphasis on appropriate analytical techniques; chemical adaptations for reproduction, defense, habitat selection, dispersal, feeding efficiency, and competition in animals, plants, and microorganisms; choice of adaptive strategy in relation to energy flow; and practical applications of chemical ecology.

[467 Species Distribution and Abundance Fall.

3 credits. Prerequisite: 360; introductory statistics strongly recommended. Not offered 1978-79.

Lec, T Th 1:25; field projects by arrangement.

P. F. Brussard.

An advanced course emphasizing the unifying principles of ecology, biogeography, and population biology. Topics include the distribution of organisms in time and space, biogeographic regions, continental and island patterns of distribution, ecology of dispersal and colonization, ecological and genetic considerations of population structure, and factors determining population size. Includes projects and exercises designed to give students firsthand contact with field techniques and data analysis.]

468 Systems Ecology Spring. 4 credits. S-U grades optional. Limited to 30 students.

Prerequisites: 360 and calculus; Com S 102 may be helpful.

Lec, M W F 10:10; disc, T or Th 2:30-4:05.

C. A. S. Hall.

An introduction to the quantitative study of populations, communities, and ecosystems. The emphasis will be on the development and validation of computer models based on component interactions and entire systems. Topics covered will include relevant ecological principles, system diagramming, rudimentary mathematical techniques, simulation modeling, and the use of analog and digital computers. The format will include student presentations and guest lectures describing individual case histories in which a variety of methods were used for ecological analysis, simulation, or prediction.

469 Undergraduate Research in Ecology, Systematics, and Evolution Fall or spring.

Variable credit. Undergraduates must attach to their course registration material written permission from the section chairperson and staff member who will supervise the work and assign the grade.

Hours to be arranged. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

[470 Undergraduate Ecology Seminar Fall or

spring. 1 or 2 credits. May be repeated for credit. From time to time different seminars will be offered. Not offered 1978-79.]

471 (471, 473) Mammalogy Fall. 4 credits. S-U grades optional with consent of instructor.

Prerequisite: 274 or written permission of instructor.

Lec, W F 10:10; lab, M W or T Th 1:25-4:25;

1 weekend field trip required. B. McNab.

Lectures on the evolution, classification, distribution, and adaptations, both physiological and morphological, of mammals. Laboratory and fieldwork on systematics, physiological ecology, and natural history of mammals of the world, with primary emphasis on the North American fauna. Systematics laboratories to be held in the museum at Research Park.

472 Herpetology, Lectures Fall. 3 credits.

Prerequisite: 274 or equivalent experience in vertebrate zoology. Offered in alternate years.

Lec, M W F 12:20. F. H. Pough.

The evolution, distribution, and adaptations of amphibians and reptiles. Emphasis on ecology, behavior, physiology, and zoogeography.

474 Herpetology, Laboratory Fall. 2 credits.

Enrollment limited. Prerequisite: concurrent enrollment in 472. Offered in alternate years.

Lab, W F 1:25-4:25; several required field trips and at least 1 Saturday field project. Some of the lab work requires measurements to be made at intervals during the day and evening. F. H. Pough. Laboratory and fieldwork on systematics, ecology, behavior, and physiology.

475 Ornithology Fall. 4 credits. Prerequisites:

274 or equivalent, and written permission of instructor.

Lec and lab, T Th 12:20-4:25; occasional field trips and special projects. T. J. Cade. Lectures cover various aspects of the biology of birds, including anatomy, physiology, classification, evolution, migration and orientation, behavior, ecology, and distribution, and are fully integrated with laboratory studies. Laboratory includes studies of external and internal morphology, pterylosis, molts and plumages, specimen identification of birds of New York, and families of birds of the world. Several demonstration periods emphasize hybridization, evolution, adaptive radiation, mimicry, and geographic variation.

476 Biology of Fishes Fall. 4 credits.

Prerequisite: 274 or equivalent experience in vertebrate zoology with written permission of instructor. Offered in alternate years.

Lec, M W F 9:05; lab to be arranged.

E. B. Brothers. An introduction to the study of fishes: their structure, classification, evolution, distribution, ecology, physiology, and behavior.

477 Organic Evolution Fall. 4 credits.

Prerequisites: 281 and a working knowledge of elementary algebra and logarithms; a course with some taxonomic content, or experience in making a collection of some plant or animal group, recommended.

Lec, T Th 11:15; lec or disc, Th 12:20; optional sessions to be arranged. W. L. Brown.

Lectures and class discussions on organic evolution, with primary emphasis on the mechanisms of animal speciation and adaptation.

478 Biology of Fishes, Laboratory Fall. 1 credit.

Limited to 15 students. Prerequisite: concurrent enrollment in 476. Offered in alternate years.

Lab, M 1:25-4:25; plus irregular hours as required for experiments and some required field trips.

E. B. Brothers, J. B. Heiser. Laboratory and fieldwork on structure, identification, ecology, physiology, and behavior of fishes, with emphasis on local species.

[479 Ichthyology Fall. 5 credits. Prerequisites:

274, 476, 478, or written permission of instructor. Offered in alternate years. Not offered 1978-79.

Lec, M W 9:05; lab, T Th 1:25-5; plus irregular hours as required for experiments and some required field trips. Independent research project or term paper required. E. B. Brothers, J. B. Heiser.

Lectures on advanced aspects of the biology of fishes, including systematics, ecology, life history, and literature. Laboratory studies of the orders, major families, and principal genera, and of systematic procedures. Field studies of the ecology and life history of local species.]

662 Mathematical Ecology (also Statistics and

Biometry 662) Spring. 3 credits. Prerequisites: 1 year of calculus and a course in statistics; a general ecology course recommended. Offered in alternate years.

Lec, M W F 1:25. S. A. Levin, D. L. Solomon. Mathematical and statistical analysis of populations and communities; theory and methods. Spatial and temporal pattern analysis, deterministic and stochastic models of population dynamics. Model

formulation, parameter estimation, simulation, and analytical techniques. Diversity measures, life tables, ordination, and gradient techniques.

664 Seminar in Coevolution between Insects and Plants (also Entomology 664) Spring.

2 credits. S-U grades optional. Intended for seniors and graduate students. Limited to 15 students.

Prerequisites: courses in entomology, ecology, evolution, and organic chemistry, and written permission of instructor. Offered in alternate years.

Hours to be arranged (1 evening each week).

P. P. Feeny. Presentations and discussions by students on the evolution of patterns of interaction between plants and insects, emphasizing critical evaluation of concepts and evidence.

665 Limnology Seminar Fall. 1 credit. May be

repeated for credit. S-U grades optional. Primarily for graduate students; written permission of instructor required for undergraduates.

Hours to be arranged. Staff. A seminar course on advanced limnological topics.

666 (666, 668) Marine and Estuarine Ecology

Spring. 4 credits. Prerequisites: 360 and 461, or written permission of instructor.

Lec, T Th 10:10-11:30; disc to be arranged.

J. P. Barlow, C. A. S. Hall. An introduction to biological oceanography with some emphasis on coastal and estuarine ecosystems. Lectures will consider the way organisms adapt to physical, chemical, and geological features of marine environments. Organization and dynamics of communities of the deep sea, both pelagic and benthic, as well as of coastal and estuarine regions will be described and compared. Coastal and estuarine circulation patterns and their importance to organisms will be given special consideration. Discussion will deal with current research in basic and applied marine and estuarine ecology.

669 Plant Ecology Seminar Fall. 1 credit. May be

repeated for credit. S-U grades optional. Suggested for students majoring or minoring in plant ecology.

Hours to be arranged. B. F. Chabot. A seminar course including review of current literature, student research, and selected topics of interest to participants.

670 Graduate Seminar in Vertebrate Biology

Fall or spring. 1 credit. May be repeated for credit. Primarily for graduate students; written permission of instructor required for undergraduates.

Hours to be arranged. Vertebrate biology staff. Seminar presentations and discussions by students on areas of current research in vertebrate biology. Topics vary from semester to semester.

760 Special Topics in Evolution and Ecology

Fall or spring. 1-3 credits. May be repeated for credit. S-U grades optional with consent of instructor. Enrollment limited.

Hours to be arranged. Staff. Independent or group intensive study of special topics of current interest. Content of course will vary and will be arranged between student and staff member.

761 (762) Seminar in Population and Community

Ecology Fall. 1 credit. May be repeated for credit. Prerequisite: permission of instructor.

Lec, T 4:25. R. B. Root.

[765 Autecology Fall. 3 or 4 credits (4 credits with term paper). Offered in alternate years. Not offered 1978-79.

Lec, W F 8-9:55. B. F. Chabot and staff. Comparison of the responses and adaptations of organisms to environment in selected ecosystems.

Emphasis on similarities and differences in molecular and organismal mechanisms by which plants and animals cope with their environments.]

[766 Population Ecology Spring. 3 or 4 credits

(4 credits with term paper). Prerequisite: graduate standing with some background in calculus, statistics, ecology, and evolutionary theory, or written permission of instructor. Offered in alternate years. Not offered 1978-79.

Lec and disc, W F 8-9:55. P. F. Brussard, S. A. Levin.

Critical examination of the properties and dynamics of populations. Emphasis on theories of population structure, dynamics, and regulation. Discussion of experimental approaches to analyses of natural populations.]

767 Community Ecology Fall. 3 or 4 credits

(4 credits with term paper). Prerequisite: 360 or equivalent, or written permission of instructor. Offered in alternate years.

Lec, T Th 10:10-12:05. R. H. Whittaker and staff. The structure and dynamics of natural communities; patterning and sampling problems; species diversity; niches and gradient relations; and ordination, classification, succession, climax, and disturbance. Comparative aspects of terrestrial, marine, and freshwater communities will be stressed.

768 Ecosystems Spring. 3 or 4 credits (4 credits

with term paper). Prerequisite: 360 or equivalent, or written permission of instructor. Offered in alternate years.

Lec, T Th 10:10-12:05. R. H. Whittaker and staff. Analysis of ecosystems in terms of energy flow, materials circulation, and model systems. Emphasis on the functional properties of ecosystems considered from simple systems to the biosphere as a whole.

Introductory Parasitology and Symbiology

(Veterinary Medicine 330) Spring. 3 credits. Prerequisite: 1 year of introductory biology.

Lec, T Th 11:15; lab, T 2-4:25. J. H. Whitlock, J. R. Georgi.

A study of unrelated species living together in intimate physiological association. Parasitoses that result in disease in the host are presented as important and special cases of the symbiotic spectrum. Emphasis is placed on an integrative study of the causation of disease in human beings and in cultivated and natural populations of plants and animals. The biological functions of disease and the impact of human activities on the disease structure of populations are examined. Laboratory exercises will involve a broad range of symbiotes and pathogens from viruses to nemas and arthropods.

See also:

Advanced Insect Taxonomy (Entomology 631, 632, 633, 634)

Advanced Soil Microbiology (Agronomy 606).

Advanced Work in Animal Parasitology (Veterinary Medicine 737)

Bionomics of Fresh-Water Invertebrates (Entomology 471)

Ecological Animal Physiology (Biological Sciences 315, 317)

Environmental Biology (Entomology 695)

Insect Biology (Entomology 212)

Insect Ecology Field Course (Entomology 660)

Insect Pathology (Entomology 453)

Introductory Insect Taxonomy (Entomology 331)**Invertebrate Zoology (Biological Sciences 310)****Microbial Ecology (Agronomy 410)****Parasitic Helminthology (Veterinary Medicine 440)****Phycology (Biological Sciences 348)****Soil Microbiology (Agronomy 406, 407)****Taxonomy and Evolution of Vascular Plants (Biological Sciences 346, 442)****Teaching Experience (Biological Sciences 403-404)****Vertebrate Social Behavior (Biological Sciences 427)****Genetics and Development**

281 Genetics Fall or spring. 5 credits. Not open to freshmen in fall semester. Prerequisite: 1 year of introductory biology or equivalent. Students who have taken 282 may register only with written permission of instructor.

Lec, T Th 10:10-11:30; lab, M T W or Th 2:30-4:25. Lab sections may also be scheduled T or Th 8-9:55, W or F 10:10-12:05, F 2:30-4:25, or S 10:10-12:05, if enrollment requires it. Students do not preregister for lab sections; lab assignments will be made at the end of the first lecture period. Preliminary exams may be scheduled in the evening. Fall: P. J. Bruns; spring: G. R. Fink; lab: R. J. MacIntyre and H. T. Stinson.

A general study of the fundamental principles of genetics in eucaryotes and procaryotes. Discussions of gene transmission, gene action and interaction, gene linkage and recombination, gene structure, gene and chromosome mutations, genetic aspects of differentiation, genes in populations, breeding systems, and extrachromosomal inheritance. In the laboratory students perform experiments with microorganisms and conduct an independent study of inheritance in *Drosophila*.

282 Human Genetics Spring. 3 credits.

Discussion limited to 25 students each section. Prerequisite: 1 year of introductory biology or equivalent. Students who have taken 281 may register only with written permission of instructor.

Lec, M W 10:10; disc, Th or F 10:10 or 11:15 (1 discussion section Th 10:10, 2 sections Th 11:15, 4 sections F 10:10, and 1 section F 11:15). A. M. Srb.

An introduction to biological heredity through consideration of the genetics of man. Advances in the science of genetics are having a profound effect on man's understanding of himself and on his potential for influencing his present and future well-being. The course is intended primarily to contribute to the student's general education in these matters. Although certain aspects of genetics will be considered with some rigor, the course is not designed to serve as a prerequisite to advanced courses in genetics.

384 Invertebrate Embryology Summer.

4 credits. S-U grades optional. Prerequisite: 364 or a course in invertebrate zoology.

Daily lectures, laboratories, and fieldwork for 3 weeks. Faculty of the Shoals Marine Laboratory. A comparative study of aspects of reproduction and early development in selected invertebrates, providing a classical approach to the morphology of the gonads, fertilization, various kinds of cleavage and gastrulation, and the formation of larvae. For each group, students will first consider gametes during formation in the gonads, then development of a new individual through fertilization and the formation of the early larval structure.

A special course offered at the Shoals Marine Laboratory of Cornell University on an island off Portsmouth, N.H. For more details and applications, consult the Shoals Marine Laboratory Office, Stimson G-14. Estimated cost: \$620.

385 Developmental Biology Fall. 3 credits. Prerequisite: 281.

Lec, M W F 11:15. A. W. Blackler. Morphogenetic, cellular, and genetic aspects of the developmental biology of animals.

389 Vertebrate Developmental Anatomy Fall. 3 credits. Limited to 40 students, with preference given to seniors. Prerequisite: elementary knowledge of mammalian anatomy.

Lec, M 10:10; lab, W or F 1:25-4:25. A. W. Blackler.

Lecture will serve as introduction to the laboratory session. Laboratory has a strong morphogenetic theme.

481 Population Genetics Fall. 3 credits. S-U grades optional. Prerequisite: 281 or equivalent.

Lec, M W 10:10. B. Wallace. A study of factors that influence the genetic structure of Mendelian populations and that are involved in race formation and speciation. Four quizzes (on the mathematical aspects of population genetics) and an optional term paper will determine the final grade.

482 Plant Cell Genetics (also Plant Breeding and Biometry 482) Spring. 2 credits. S-U grades optional. Prerequisites: 281 or PI Br 225 or equivalent, and 242 or equivalent.

Lec and demo, T Th 10:10. R. S. Chaleff. General principles and techniques of plant cell and tissue culture and of their application in genetic studies of higher plants. Discussions of the culture of cells, protoplasts, microspores, and callus; the isolation and characterization of mutant clones; and the regeneration and genetical analysis of plants from such clones.

483 Molecular Aspects of Development Fall. 3 credits. Prerequisite: 330 or 331.

Lec, M W F 11:15. R. L. Hallberg. An examination of the molecular biology of developing systems. The emphasis in the course will be directed at understanding the mechanisms involved in gene expression in developing systems both at the transcriptional and translational levels. Specific topics will include regulation of RNA synthesis and utilization, nucleo-cytoplasmic interactions, and induction of cell-specific protein synthesis. Examples will be discussed from both higher and lower eucaryotic systems.

[484 Molecular Evolution Spring. 3 credits. Prerequisites: 281 and organic chemistry. Offered in alternate years. Not offered 1978-79.

Lec, T Th 11:15. R. J. MacIntyre. An analysis of evolutionary changes in proteins and nucleic acids, and gene-enzyme variability in natural populations. The role of natural selection in effecting these changes and maintaining genetic variation at the molecular level will be critically examined. Theories on the evolution of the genetic code and the construction of phylogenetic trees from biochemical data will be discussed.]

485 Microbial Genetics, Lectures Fall. 2 credits. S-U grades optional. Limited to upperclass and graduate students. Prerequisites: 281 and Micro 290, or written permission of instructor.

Lec, W 7:30-9:25 p.m. S. A. Zahler. Genetics of bacteria and their viruses, with emphasis on the mechanisms of genetic phenomena.

487 Microbial Genetics, Laboratory Fall. 3 credits. Primarily for upperclass students. Limited to 20 students. Prerequisites: 485 (may be taken concurrently), Micro 291 or equivalent, and written permission of instructor.

Lab, T 1:25-4:25; additional hours to be arranged. S. A. Zahler. Problem solving in bacterial genetics.

488 Genetics of Lower Eucaryotes Spring. 3 credits. S-U grades optional. Prerequisites: 281 and a course in organic chemistry.

Lec, M W 9:05. P. J. Bruns, G. R. Fink, A. M. Srb. Genetic aspects of the biology of a few eucaryotic microorganisms, primarily yeast, *Neurospora*, and ciliated protozoa, with emphasis on the use of these organisms as experimental tools. Major topics to be covered include gene action, control mechanisms, cytoplasmic genetic systems, recombination and conversion, morphogenetic systems, and evolutionary aspects of physiological systems. Extensive appropriate reading in the original literature of genetics is a primary component of the course.

489 Undergraduate Research in Genetics and Development Fall or spring. Variable credit.

Undergraduates must attach to their course registration material written permission from the staff member who will supervise the work and assign the grade.

Hours to be arranged. Staff. Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

780 Current Topics in Genetics Fall or spring. 2 credits. May be repeated for credit. S-U grades optional with consent of instructor. Primarily for graduate students, with preference given to majors in the Field of Genetics; written permission of instructor required for undergraduates. Limited to 20 students. No auditors.

Hours to be arranged. Staff. A seminar course with critical presentation and discussion by students of original research papers in a particular area of current interest. Content of the course and staff direction will vary from term to term, and will be announced a semester in advance.

See also:

Animal Cytogenetics (Animal Sciences 419)**Behavioral Neurogenetics (Biological Sciences 624)****Cytogenetics (Biological Sciences 446)****Cytology (Biological Sciences 347)****Organic Evolution (Biological Sciences 477)****Physiological Genetics of Crop Plants (Plant Breeding and Biometry 605)****Plant Growth and Development (Biological Sciences 644)****Teaching Experience (Biological Sciences 403-404)**

Note: the middle digits of Biological Sciences course numbers are used to denote courses in specific areas: 0, general; 1 and 5, animal physiology and anatomy; 2 and 9, neurobiology and behavior; 3, biochemistry and cell biology; 4 and 5, botany; 6 and 7, ecology, systematics, and evolution; 8, genetics and development.

Graduate School of Business and Public Administration

NCC Common Core Courses

- NCC 500 Managerial Accounting
NCC 501 Quantitative Methods for Management
NCC 502 Economic Principles for Management
NCC 503 Computers and Decision Making

NBP Business Administration Program Core Courses

- NBP 500 Marketing Management
NBP 501 Operations Management
NBP 502 Corporate Financial Management
NBP 503 Business Policy
NBP 504 Interaction of the Economic, Social,
and Legal Environments with Organizations

NBA Business Administration Elective Courses

- NBA 500 Intermediate Accounting
NBA 501 Advanced Accounting
NBA 502 Cost Accounting
NBA 503 Financial Policy Decisions and
Accounting
NBA 504 Introduction to Taxation Affecting
Business and Personal Decision Making
NBA 505 Auditing
NBA 506 Financial Information Evaluation
NBA 507 Federal Income Tax
NBA 508 Advanced Cost Accounting
NBA 510 Law of Business Associations
NBA 511 Advanced Business Law
NBA 513 An Introduction to Estate Planning
NBA 515 Short-Term Financial Management
NBA 516 Investment Management
NBA 517 Economics of Securities Markets
NBA 518 Financial Markets and Institutions
NBA 519 Seminar in Bank Management
NBA 521 Seminar in Finance Theory
NBA 523 Topics in International Financial
Management
NBA 524 Options, Bonds, and Commodities
NBA 525 Financial Management
NBA 540 Sales Management
NBA 541 Marketing Research

- NBA 542 Advertising Management
NBA 543 Marketing Strategy
NBA 545 Management of Marketing
Intermediaries
NBA 546 Marketing Decision Models
NBA 547 Marketing Segmentation
NBA 548 Industrial Marketing
NBA 549 Consumer Behavior
NBA 550 Special Topics in Marketing
Management
NBA 552 Seminar in Current Marketing
Research
NBA 560 Problems and Techniques in
Production Management
NBA 561 Case Studies in Production and
Operations Management
NBA 562 Business Logistics Management
NBA 565 Small Business and the Entrepreneur

NPP Public Administration Program Core Course

- NPP 500 The Conduct of Public Affairs

NPA Public Administration Elective Courses

- NPA 500 Urban Government Operations
NPA 502-503 Economics and Public Policy
Workshop
NPA 504 Science, Technology, and Public
Policy
NPA 505 Public Financial Management
NPA 506 Politics of Decentralization and Local
Reform
NPA 507 Integrative Seminar: Education for
Public Management Program (Part I)
NPA 508 Integrative Seminar: Education for
Public Management Program (Part II)
NPA 509-510 Democracy at Bay: Politics of
Policymaking in Britain and France
NPA 511 Business Management and
Government Regulation
NPA 512 Seminar in Public Systems Analysis
NPA 514 Economic Foundations of Public Policy
NPA 515 The Politics of Technical Decisions I
NPA 516 The Politics of Technical Decisions II
NPA 518 Public Administration Colloquium
NPA 521 Energy and Public Policy
NPA 524 Public Applications and Extensions of
Corporate Financial Management
NPA 525 Urban Service Systems
NPA 526-527 Energy Conservation Policy
Workshop

NHP Hospital and Health Services Administration Program Core Course

- NHP 500 Introduction to Hospital and Medical
Care Organization

NHA Hospital and Health Services Administration Program Elective Courses

- NHA 500 Social Psychology of Health
Organizations
NHA 501 Hospital Corporate Planning
NHA 502 Psychiatric Institutions: Administration
and Practice
NHA 503 Sociopolitical Aspects of Community
Health Services and Delivery
NHA 504 Legal Aspects of Hospital
Administration
NHA 505 Health Services Research and
Evaluation
NHA 506 Health Economics
NHA 507 Health and Welfare Policy
NHA 509 Health Operations Management and
Planning
NHA 510 Seminar in Hospital Governance and
Decision Making
NHA 511 Field Studies in Health Administration
and Planning
NHA 513 Health and Social Services
Organization and Planning
NHA 514 Washington Health Policy Field
Seminar
NHA 515 Orientation to Tertiary Hospital
Services
NHA 516 Selected Topics in the Administration
of Teaching Hospitals
NHA 517 Introduction to Clinical Medicine: The
Physician, the Hospital, and the Medical Care
Delivery System
NHA 518 Financial Management of Hospitals
- ### NCE Common Course Electives
- NCE 500 Fund Accounting
NCE 505 International Trade and Finance
NCE 507 American Business Operations
Abroad
NCE 508 Administration of Public Operations
Abroad
NCE 510 Seminar on Development
Administration
NCE 514 Administration of Agricultural and
Rural Development
NCE 524 Economic Evaluation of Capital
Investment Projects
NCE 525 Intermediate Microeconomic Theory
NCE 527 American Industry: Economic Analysis
and Public Policy
NCE 528 Topics in Managerial Economics

- NCE 540 Organization Theory and Behavior
- NCE 541 Personnel Administration and Human Relations
- NCE 542 Processes and Techniques in Organizational Development
- NCE 543 Organizational Behavior and Administration
- NCE 545 Seminar in Organization Theory
- NCE 546 Behavioral Skills for Managers
- NCE 548 Behavioral Science and Managing
- NCE 549 Sociotechnical Issues in Office Automation
- NCE 550 Presentation of the Self
- NCE 551 Behavioral Decision Theory
- NCE 560 Applied Probability
- NCE 561 Applied Statistics
- NCE 562 Operations Research I
- NCE 563 Operations Research II
- NCE 564 Applied Multivariate Analysis
- NCE 566 Management Science
- NCE 567 Analysis of Management Decisions
- NCE 570 Data Base Systems
- NCE 571 Computer Systems Analysis
- NCE 580 Seminar in University Administration
- NCE 581 Management Writing

NMI and NRE Research

- NMI 500-502 Directed Reading and Research
- NMI 510 Investment Analysis: Language Model Building Lab
- NRE 503 Doctoral Seminar in Finance
- NRE 504 Doctoral Seminar in Accounting and Finance
- NRE 505 Finance Workshop
- NRE 506 Doctoral Seminar in Monetary Economics
- NRE 942 Social Psychology of Organizing

College of Engineering

Engineering programs offered at Cornell lead to the degrees of Bachelor of Science, Master of Engineering, Master of Science, and Doctor of Philosophy. Descriptions of courses, including both undergraduate and graduate offerings, are given under the appropriate academic areas. Information about academic programs, admissions and financial aid, and special opportunities for engineering students is given in the *Announcement of General Information*, the *Announcement of the Graduate School*, and two special Announcements prepared by the College of Engineering: *Engineering at Cornell*, for prospective undergraduates, and *Graduate Study in Engineering and Applied Science*.

Degree Programs

Bachelor of Science Degree

Undergraduate engineering curricula all begin with a basic two-year program administered by the Division of Basic Studies of the College of Engineering (an exception is the program in agricultural engineering, discussed below). This provides a foundation in mathematics, science, and engineering fundamentals in addition to elective course work in engineering core sciences, liberal studies, and natural or social sciences. Specialization begins in the junior year with one of nine field programs or an individually arranged curriculum under the College Program.

The general requirement for the B.S. degree is forty courses (a minimum of 127 credits), normally taken in four years of study. The distribution of courses during the freshman and sophomore years is described in the section on Division of Basic Studies. Upperclass programs include the following course requirements:

	<i>Minimum credits</i>
Twelve field-designated courses (or the equivalent in the College Program)	36
Four liberal studies electives, two of which must be at an upper-division level (300- or 400-level courses)	12
Two free elective courses	6
Two technical elective courses	6

Field Programs

In the junior year most students enter field programs, which are offered in the following areas:

Agricultural Engineering*

Chemical Engineering

*To major in agricultural engineering, students enroll in the College of Agriculture and Life Sciences for the first three years and in the College of Engineering for the fourth year.

These programs are described under the appropriate academic schools or departments.

Students interested in bioengineering may arrange suitable curricula within most of the field programs, or may take individually planned curricula under the College Program. Before preregistering for the sophomore year, bioengineering students should obtain from the Engineering Advising and Counseling Center a copy of *Bioengineering at Cornell*, which provides the information necessary for planning a suitable curriculum.

Civil and Environmental Engineering

Electrical Engineering

Engineering Physics (see Applied and Engineering Physics)

Geological Sciences

Materials Science and Engineering

Mechanical Engineering (see Mechanical and Aerospace Engineering)

Operations Research and Industrial Engineering

College Program

Individually arranged courses of study under the College Program are possible for those whose educational objectives cannot be met by one of the regular field programs. Often the desired curriculum is in an interdisciplinary area. Each program is developed by the student in consultation with faculty advisers and must be approved by the College Program Committee, which is responsible for supervising the student's work.

Students apply to enter the College Program early in the second term of the sophomore year. A student may receive assistance in developing a coherent program from professors in the proposed major and minor subject areas who may be recommended by the College Program Committee or suggested by the student. If approved, the program is the curricular contract to which the student must adhere.

Every curriculum in the College Program, with the exception of certain faculty-sponsored programs, must comprise an engineering major and a minor. The major may be in any subject area offered by schools or departments of the College; the minor may be in a second engineering subject area or in a logically connected nonengineering area. The combinations must clearly form, in scope and in substance, an engineering education, and should include engineering design and synthesis as well as engineering sciences. In addition to fourteen courses in the major and minor subjects, including at least seven engineering courses, each program includes four liberal electives and two free electives.

A number of curricula in the College Program have been developed and are sponsored by groups of faculty members; these are described below.

Further information about the College Program, including the special sponsored curricula, may be obtained from the College Program Office, 170 Olin Hall.

Sponsored Programs and Sponsored Majors

Computer Science. Students wishing to concentrate in computer science develop a college program major in consultation with a faculty member of the Department of Computer Science. A minimum grade-point average of 2.5 is required. This major must be combined with a suitable supporting minor.

Energy Conversion. The College Program in Energy Conversion combines elements of three conventional disciplines—nuclear, thermal, and electrical engineering—in a broadly based curriculum aimed at meeting the accelerating energy needs of society.

Engineering Science. The College Program in Engineering Science, sponsored by faculty members of the Department of Theoretical and Applied Mechanics, requires additional mathematics, physics, mechanics, and engineering analysis courses beyond those in the underclass program.

Environmental and Public Systems. Systems analysis is widely used in the planning and management of environmental-quality and public systems, and students can specialize in this area with a sponsored college program. These students will generally

concentrate in *water resources, ecosystems management, transportation, or other studies of public systems.*

Regional Science. This interdisciplinary course of study embraces economics, statistics, planning, and engineering in the planning of engineering works and the assessment of environmental impacts.

Survey Engineering. The College Program in Survey Engineering is sponsored by faculty members of the School of Civil and Environmental Engineering and of the Department of Agricultural Engineering. It is designed to develop competence in modern sensing and measurement principles and techniques that are appropriate for determining the geometrical characteristics of physical features on, in, or near the earth. The extent to which this program meets the professional licensing requirements of various states should be discussed with the sponsoring faculty members.

Dual Degree Option

A special academic option, intended for superior students, is the dual degree program in which both B.S. and A.B. degrees can be earned in five years. Students may register in either the College of Engineering or the College of Arts and Sciences as freshmen and begin the dual program in their second or third year. Those interested should contact Associate Dean M. S. Burton, 170 Olin Hall.

Master of Engineering Degrees

The one-year M.Eng. programs prepare students for professional employment or for more advanced graduate study in Ph.D. programs. The curricula for the eleven field-designated degrees are described in indicated sections under College of Engineering:

M.Eng. (Aerospace): Mechanical and Aerospace Engineering

M.Eng. (Agricultural): Agricultural Engineering

M.Eng. (Chemical): Chemical Engineering

M.Eng. (Civil): Civil and Environmental Engineering

M.Eng. (Electrical): Electrical Engineering

M.Eng. (Engineering Mechanics): Theoretical and Applied Mechanics

M.Eng. (Engineering Physics): Applied and Engineering Physics

M.Eng. (OR&IE): Operations Research and Industrial Engineering

M.Eng. (Materials): Materials Science and Engineering

M.Eng. (Mechanical): Mechanical and Aerospace Engineering

M.Eng. (Nuclear): Applied and Engineering Physics

The M.Eng. curricula are integrated with undergraduate field programs in the Cornell College of Engineering, but are open also to qualified graduates of other schools. Cornell baccalaureate engineering graduates will generally be admitted if they have cumulative grade-point averages of at least 2.5 and/or if they have demonstrated by their performances in their major fields that they have the ability to be successful in graduate study; a petition is required if the grade-point average is below 2.5. Other applicants must have a baccalaureate degree from an engineering program accredited by the

Engineers Council for Professional Development, or the equivalent, in an area of engineering or science that is judged appropriate for the proposed field of study. They must also present evidence of undergraduate preparation equivalent to that provided by a Cornell undergraduate engineering education: a transcript, two letters of recommendation, and a statement of academic purpose. A candidate who is admitted with an undergraduate background that is judged inadequate must make up the deficiencies in addition to fulfilling the regular course requirements for the degree.

Application forms and further information are available from the chairperson of the Graduate Professional Programs Committee, 319 Upson Hall.

Master of Science and Doctor of Philosophy Degrees

This research-oriented branch of graduate study in engineering and applied science at Cornell is organized under graduate fields, which generally coincide with the respective schools or departments of the College of Engineering. Courses offered by these units are described in the following sections. Prospective students should also consult the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Division of Basic Studies

F. J. Ahimaz, director; R. H. Lieberman

Students in the College of Engineering are enrolled for the first two years of their undergraduate education in the Division of Basic Studies.

The normal academic load is five courses each term. Many of these are elective, but the underclass program must satisfy certain requirements:

- (1) A sequence of four courses in mathematics and a three-term sequence in physics are required of all undergraduates. Freshmen enroll in chemistry during the first term and should elect a second term of chemistry if they plan a chemistry-related upperclass program.
- (2) A two-term sequence in basic engineering subjects, DBS 105 and 106, is required of freshmen. Students who intend to specialize in bioengineering or premedicine may substitute Bio S 102 plus 104 or Bio S 106 for DBS 106.
- (3) One natural science or social science course is required in each term of the freshman year. Students interested in bioengineering or premedicine should take biology and chemistry as freshmen. Students who elect to begin physics in term 1 may postpone the natural or social science elective to term 4.
- (4) During the sophomore year students take four engineering core science courses, selected in consultation with a faculty adviser.
- (5) All engineering students are required to complete eight liberal studies courses (twenty-four credits) before graduation. Freshmen must select their liberal electives from the Freshman Seminar courses. Two liberal studies electives are normally completed during the sophomore year. However, students whose career goals require them to do so, may substitute introductory courses in the natural sciences (e.g., biology or organic chemistry) for their liberal studies electives during the sophomore year, and defer these electives until the junior and senior years. The liberal studies electives may include courses in the humanities, social sciences, modern foreign languages, and expressive arts. At least two of the liberal studies elective courses (six credits minimum) must be at the upperclass level (300- or 400-level courses).
- (6) All undergraduate students who matriculate prior to the 1978 fall term are required by the University to complete four terms of physical education. For those

who matriculate in the fall of 1978 or later, the requirement is to complete two terms of physical education.

Freshman and Sophomore Curricula

Typical programs for the freshman and sophomore years are given as examples. It should be noted that there are many variations, depending on students' individual backgrounds and educational and career plans.

Term 1	Credits
Math 191 or 193, Calculus for Engineers	4
Chem 207, General Chemistry	4
Freshman engineering course, DBS 105 or 106	3
Natural or social science elective	3
Freshman Seminar	3
Term 2	
Math 192 or 194, Calculus for Engineers	4
Phys 112, Physics I	4
Freshmen engineering course, DBS 105 or 106	3
Natural or social science elective*	3
Freshman Seminar	3
Term 3	
Math 293, Engineering Mathematics	4
Phys 213, Physics II	4
Engineering core science elective	3
Engineering core science elective	3
Liberal studies elective	3
Term 4	
Math 294, Engineering Mathematics	3
Phys 214, Physics III	4
Engineering core science elective	3
Engineering core science elective	3
Liberal studies elective	3

*Students who wish to major in chemical engineering and students who are interested primarily in bioengineering-premedicine must take Chem 208 during the freshman year. Chemical engineering students will select a considerably different program in the sophomore year (see discussion under Engineering Core Sciences).

Engineering Core Sciences

The four engineering core science courses required in the sophomore year are selected from the four groups listed below under Description of Courses, with at least three of the four groups represented in the choices.

An important consideration in the choice of these courses is that each upperclass field may specify a particular engineering core science as a prerequisite for enrollment in the junior year. The courses required for entry into the different field programs are:

Applied and Engineering Physics: M&AE 221
 Chemical Engineering: Chem E 110 or 111*
 Civil and Environmental Engineering: T&AM 202
 Electrical Engineering: Ele E 210
 Geological Sciences: no requirement
 Materials Science and Engineering: no requirement
 Mechanical and Aerospace Engineering: T&AM 202
 Operations Research and Industrial Engineering: OR&IE 260

*Students intending to enter Chemical Engineering must also take Chem 287, 289, and Chem 288, 290 during the sophomore year. Only two of the Group IV courses may be counted toward the four engineering core sciences required of all sophomores. Students who take the three courses from Group IV during the sophomore year may be unable to complete the engineering core science requirements that year, and may defer the fourth engineering core science until the junior year.

Description of Courses

The courses offered through the Division of Basic Studies include certain engineering courses offered by the various schools and departments of the College of Engineering primarily for underclass

students; these courses are described below. Additional engineering courses that may be taken during the freshman and sophomore years in the Division of Basic Studies are described under the appropriate subject areas. Courses in mathematics, physics, and chemistry are described under the appropriate departments of the College of Arts and Sciences.

Engineering Basic Studies

DBS 105 Introduction to Computer Programming Fall or spring. 3 credits. 2 lec, 1 rec (optional); 4 evening tests.
 An introduction to elementary computer programming concepts. Emphasis is on techniques of problem analysis, algorithm and program development, and program testing. The principal programming language for the course is PL/I; FORTRAN is also introduced and is used for final problems on the mathematical applications of computers. Normally, the IT batch system is used for computer processing, but students can elect to use interactive terminals under the SCMS-PL/CT system. The course does not presume any previous programming experience, but a special elective section during the first three weeks accommodates students who have had some previous exposure to computing. (DBS 105 is the same as the mathematical section of Com S 100.)

DBS 106 Engineering Perspectives Fall or spring. 3 credits.
 Weekly lecture series for one credit plus a supplemental course program for two credits. For the course program, each student chooses either (1) two sequential short courses, called mini-courses, for one credit each, or (2) a two-credit full-semester research option under which freshmen work closely with faculty members in ongoing research projects.

Engineering Core Sciences

Group I

OR&IE 213 Systems Analysis and Design Fall. 3 credits. 2 lec, 1 rec.
 A general introduction to the problems and techniques of systems engineering and operations research. Includes formation and solutions of problems that can be modeled as networks (shortest path, project scheduling, maximum flow), dynamic programs (inventory and distribution), linear resource allocation problems, and games (conflict resolution and voting). Effects of uncertainty on decision making.

OR&IE 260 Introductory Engineering Probability Fall or spring. 3 credits. 3 lec. Prerequisite: first-year calculus.
 In this course a student should acquire a knowledge of the basic tools of probability and their use in engineering. 260 may be the last course in probability for some students, or it may be followed by OR&IE 361, Stochastic Processes I, or by OR&IE 370, Statistics. Definition of probability; random variables; probability distributions, density functions, expected values; jointly distributed random variables; distributions such as the binomial, Poisson, and exponential that are important in engineering, and how they arise in practice; limit theorems.

OR&IE 270 Basic Engineering Statistics Fall or spring. 3 credits. 2 lec, 1 rec. Students who intend to enter the upperclass Field Program in Operations Research and Industrial Engineering should take OR&IE 260 instead of this course. Prerequisite: first-year calculus.
 At the end of this course a student should command a working knowledge of basic statistics as it applies to engineering work. For many students this will be the only course in statistics. For students who wish to

learn more about statistics, a course in probability (e.g., OR&IE 260) followed by a course in statistics (e.g., OR&IE 370) is recommended.

Com S 211 Computers and Programming Fall or spring. 3 credits. 2 lec, 1 lab. 2 evening quizzes. Prerequisite: Com S 100 or equivalent programming experience. Intermediate programming in PL/I: procedures, block structures, on conditions, recursion. Introduction to basic data structures and program analysis. Programming assignments for a variety of applications.

Com S 321 Introduction to Numerical Analysis Fall. 4 credits. 3 lec. Prerequisites: Math 293 or 221 and knowledge of PL/I, ALGOL, or FORTRAN. This course aims to acquaint prospective users of numerical subroutines with the use, availability, and algorithmic composition of good mathematical software. Students write FORTRAN drivers to use a library of FORTRAN subroutines to solve exercises in linear algebra, spline interpolation, and numerical integration. Stress is given to determining whether a problem is numerically well posed.

Group II

Ele E 210 Introduction to Electrical Systems Fall or spring. 3 credits. 3 lec-rec. Prerequisites: Math 192 and Phys 112. Electrical circuit elements; circuit equations and methods of solutions; time functions and their representation; response of simple networks; impedance concept; pole-zero concept; modeling of electronic devices; elementary amplifiers; transfer function and frequency response.

Ele E 230 Introduction to Digital Systems Fall or spring. 3 credits. 2 lec, 5 lab experiments. Introduction to basic analysis and design techniques and methodology of digital and computer systems. Boolean algebra; integrated circuit components used in digital system implementation; codes and number systems; logic design of combinational circuits; logic design of sequential circuits.

MS&E 262 Introduction to Electrical Properties of Materials Spring. 3 credits. 2 lec, 1 rec or lab. Electronic structure of atoms, molecules, and crystalline solids. Electrical conductivity and other electrical properties of metals, semiconductors, and insulators. Semiconductors and their applications in electronic devices. Magnetism and magnetic materials. Introduction to lasers.

A&E 206 The Physics of Life Fall. 3 credits. 2 lec. Prerequisite: concurrent registration in Phys 213 or permission of instructor.

A. Lewis.
An in-depth study of four biological topics from a physical point of view. Topics covered are photosynthetic conversion of light into chemical energy, proteins as transport and production machines, membranes, and biophysical aspects of replication. Topics are chosen to illustrate the unity and interdependence of living matter.

A&E 217 Contemporary Topics in Applied Physics Spring. 3 credits. 2 lec, 1 rec-lab. Prerequisite: Phys 213.

R. A. Buhrman.
An introduction to selected applications of modern physics to advanced technology. Beginning this year, this course will deal with both present and potential approaches to large-scale energy conversion. In particular, the basic physical principles and fundamental limitations of nuclear energy (in terms of both fission and fusion) and of solar energy utilization will be presented. One objective of the course will be to give a current view of the present status and future directions of research and development in energy-related fields.

Group III

T&AM 202 Mechanics of Solids Fall or spring. 3 credits. 2 lec, 1 rec, 1 lab. Evening exams. Prerequisite: coregistration in Math 293. Principles of statics, force systems, and equilibrium. Mechanics of deformable solids, stress, strain, statically indeterminate problems. Properties of engineering materials. Axial force, shearing force, bending moment, singularity functions. Plane stress, Mohr's circle. Bending and torsion of slender bars; buckling and plastic behavior.

T&AM 203 Dynamics Fall or spring. 3 credits. 2 lec, 1 rec, 1 lab. Evening exams. Prerequisite: coregistration in Math 294. Newtonian dynamics of a particle, systems of particles, and a rigid body. Kinematics, motion relative to a moving frame. Impulse, momentum, angular momentum energy. Rigid body kinematics, angular velocity, moment of momentum and the inertia tensor. Euler equations, the gyroscope. Advanced methods in dynamics.

MS&E 261 Introduction to Mechanical Properties of Materials Fall or spring. 3 credits. 2 lec, 1 rec or lab. The relation of mechanical properties to microscopic structures and defects inside metals and other materials. Deformation of rubber-like polymers. Permanent changes in the shape of crystals caused by the action of stresses. Effect of movement of atoms on the strength of solids at high temperatures. Manipulation of microscopic structure for high strength. Fracture and fatigue failure.

Group IV

Chem 287, 289 Introductory Physical Chemistry and Laboratory Fall. 5 credits. 2 or 3 lec, 1 rec in 287; 1 lec, 2 labs in 289. Prerequisites: Chem 208 or 216 and Math 191-192. A systematic treatment of the fundamental principles of physical chemistry. The development of needed experimental skills.

Chem 288, 290 Introductory Physical Chemistry and Laboratory Spring. 5 credits. 2 or 3 lec, 1 rec in 288; 1 lec, 2 labs in 290. Prerequisite: Chem 287, 289. A continuation of Chem 287, 289.

Chem 357* Introductory Organic Chemistry Fall. 3 credits. 3 lec, optional rec may be offered. Prerequisite: Chem 208 or 216. A systematic study of the more important classes of carbon compounds, reactions of their functional groups, methods of synthesis, relations, and uses.

Chem 358* Introductory Organic Chemistry Spring. 3 credits. 3 lec, optional rec may be offered. Prerequisite: Chem 357. A continuation of Chem 357.

M&AE 221 Thermodynamics Fall or spring. 3 credits. 3 rec. Prerequisites: Math 191-192 and Phys 112. The definitions, concepts, and laws of thermodynamics. Applications to ideal and real gases, multiphase pure substances, gaseous mixtures, and gaseous reactions. Heat-engine and heat-pump cycles. An introduction to statistical thermodynamics.

Chem E 110 or 111 Mass and Energy Balances Fall or spring. 3 credits. Prerequisite: one year of freshman chemistry or permission of instructor.

R. G. Thorpe.
*Premedical and bioengineering students may substitute Organic Chemistry 253-251 for Organic Chemistry 357-358 as an engineering core science course. The Chem 253-251 sequence will be counted as two engineering core sciences from Group IV.

Engineering problems involving material and energy balances. Batch and continuous reactive systems in the steady and unsteady states. Humidification processes. The course 110 differs from 111 in that it uses *only self-paced audiovisual instruction at the convenience of the student*. A minimum of 70 clock hours of audiovisual instruction is required to master the subject matter. Student performance in 110 is evaluated by nine tests, two preliminary examinations, and a final examination; superior students may earn exemption from the final examination.

Aerospace Engineering

See Mechanical and Aerospace Engineering

Agricultural Engineering

N. R. Scott, director; L. D. Albright, R. D. Black, J. R. Cooke, R. B. Furry, W. W. Gunkel, D. A. Haith, L. H. Irwin, W. J. Jewell, G. Levine, R. C. Loehr, H. A. Longhouse, R. T. Lorenzen, D. C. Ludington, W. F. Millier, G. E. Rehkugler, M. F. Walter

Bachelor of Science

Students who plan to enter the Field Program of Agricultural Engineering must apply for admission to the College of Agriculture and Life Sciences for the first three years of college work, and then transfer to the College of Engineering for the fourth year. The curriculum is summarized as follows:

Term 1	Credits
Math 191, Calculus for Engineers	4
Chem 103 or 207	3
Ag En 151, Introduction to Agricultural Engineering and Computing	3
Bio S 101 and 103 or 109	4
Liberal studies elective (Freshman Seminar)	3
Term 2	
Math 192, Calculus for Engineers	4
Phys 112, Physics I	4
Ag En 152, Engineering Graphics	3
Bio S 102 and 104 or 110	4
Liberal studies elective (Freshman Seminar)	3
Term 3	
Math 293, Engineering Mathematics	4
Phys 213, Physics II	4
Engineering core science*	3
Engineering core science*	3
Liberal studies elective	3
Term 4	
Math 294, Engineering Mathematics	4
Phys 214, Physics III	4
Engineering core science*	3
Engineering core science*	3
Liberal studies elective	3

*The engineering core science courses must include T&AM 202 Mechanics of Solids, T&AM 203 Dynamics, and M&AE 221 Thermodynamics.

In addition to these courses, all freshmen and sophomores must satisfy the University's requirement in physical education.

The curriculum for terms 5 through 8 must include:

- Engineering: minimum of thirty credits
 - Agricultural engineering: minimum of twelve credits at the 450 level or higher
 - Engineering sciences
- Biological sciences or agricultural electives: minimum of twelve credits
- Liberal studies electives: minimum of twelve credits
- Free electives: minimum of six credits

Master of Engineering (Agricultural)

The program for the M.Eng (Agricultural) degree is intended primarily for those students who plan to enter engineering practice rather than for those who expect to study for the doctorate. The curriculum is planned as an extension of the Cornell undergraduate program in agricultural engineering, but can accommodate graduates of other engineering programs. General admission and degree requirements are described in the introductory section under College of Engineering.

A candidate for the M.Eng (Agricultural) degree may choose to concentrate in one of the subareas of agricultural engineering or take a broad program without specialization. The subareas are: (a) power and machinery, (b) soils and water engineering, (c) agricultural structures and associated systems, (d) electric power and processing, (e) energy management, and (f) agricultural waste management. Engineering electives are chosen from among subject areas relevant to agricultural engineering, such as thermal engineering, mechanical design and analysis, theoretical and applied mechanics, structural engineering, hydraulics, environmental engineering, soil engineering, and waste management.

Master of Science and Doctor of Philosophy

Programs offered by the graduate Field of Agricultural Engineering are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

See section on Agricultural Engineering under College of Agriculture and Life Sciences.

Applied and Engineering Physics

B. W. Batterman, director; P. L. Hartman, associate director; R. A. Buhman, K. B. Cady, D. D. Clark, R. K. Clayton, T. A. Cool, T. R. Cuykendall, H. H. Fleischmann, V. O. Kostroun, J. A. Krumhansl, A. Kuckes, B. R. Kusse, A. Lewis, R. L. Liboff, R. V. Lovelace, M. S. Nelkin, E. L. Resler, Jr., T. N. Rhodin, M. M. Salpeter, B. M. Siegel, J. Silcox, R. N. Sudan, W. W. Webb, G. J. Wolga

Bachelor of Science

At the upperclass level students may enroll in the Field Program in Engineering Physics, which is designed to develop proficiency in physics and applied mathematics. Its distinguishing feature is a focus on fundamental knowledge that has broad applicability to engineering and to other sciences. The program allows students to choose areas of concentration within and outside of physics during the undergraduate years.

Most applied and engineering physics graduates go on to advanced study in a wide variety of fields, including astrophysics, atmospheric sciences, biophysics, energy conversion, environmental science, geophysics, materials science and engineering, nuclear engineering, nuclear physics, oceanography, plasma physics, quantum optics, and solid-state electronics. In addition to M.S. and Ph.D. programs in these areas, the possibilities include professional Master of Engineering programs in engineering physics, nuclear engineering, or aerospace engineering. Further study in other professional fields for which a background in applied science is less directly applicable is also a possibility. Baccalaureate graduates also go directly to industrial positions.

Underclass students who are planning to enter the Field Program in Engineering Physics are encouraged to register in honors sections of physics and mathematics during the first two years. Those who have advanced standing in mathematics when they matriculate in the College are advised of the possibility of taking Phys 112 in the fall term of the freshman year and Applied Math I in the spring term of the sophomore year. Of the core engineering sciences studied in the first two years, a course in thermodynamics (M&AE 221 or Chem 287) is required. The courses A&EP 217 Contemporary Topics in Applied Physics and A&EP 206 The Physics of Life are strongly recommended for the sophomore year, the latter particularly for students with an interest in biophysics-engineering.

The following curriculum, or its equivalent, constitutes the upperclass field program.

Term 5	Credits
A&EP 333, Mechanics of Particles and Solid Bodies	4
A&EP 355, Intermediate Electromagnetism	4
Applied Mathematics I*	4
Free elective	3 or 4
Liberal studies elective	3 or 4
Term 6	
A&EP 361, Introductory Quantum Mechanics	4
A&EP 356, Intermediate Electrodynamics	4
Applied Mathematics II*	4
Electronic Circuits†	3 or 4
Liberal studies elective	3 or 4
Term 7	
A&EP 423, Statistical Thermodynamics	4
Phys 410, Advanced Experimental Physics	4
Applied Mathematics III*	4
Technical elective	3 or 4
Liberal studies elective	3 or 4
Term 8	
A&EP 434, Continuum Physics	4
Applications of Quantum Mechanics‡	3 or 4
Free elective	3 or 4
Technical elective	3 or 4
Liberal studies elective	3 or 4

*Applied Mathematics I and II may be either Math 421-422 or T&AM 610-611. Applied Mathematics III may be Math 423, T&AM 613-614, or another mathematics course such as Math 411, 427, or 371. Alternate courses will be considered upon petition.

†Electronic Circuits may be A&EP 363 or an equivalent junior-level electronics course.

‡A choice of the following courses may be made: Phys 454, Introductory Solid-State Physics; Phys 444, Nuclear and High-Energy Particle Physics; A&EP 609, Low-Energy Nuclear Physics (fall); A&EP 401, Physics of Atomic and Molecular Processes (fall); Ele E 731, Quantum Electronics I (fall).

Considerable flexibility is possible in the scheduling of these courses. For example, Phys 410 may be taken in term 7 or in term 8. Quantum mechanics can be studied in term 6 as A&EP 361 or in term 7 as Phys 443. The course in applications of quantum mechanics can be taken whenever the appropriate prerequisite has been met. If scheduling conflicts arise, the school may allow substitutions of courses nearly equivalent to the listed required courses: Phys 325-326 and Ele E 303-304 are similar to A&EP 355-356; Phys 318 (offered in the spring) and T&AM 670 are similar to A&EP 333; and a number of advanced courses in fluid mechanics or elasticity are similar to A&EP 434.

Free and technical electives need not be all formal course work; qualified students may undertake informal study under the direction of a member of the faculty. This may include research projects in areas in which faculty members are active. These areas include electron microscopy and diffraction, quantum electronics, solid-state and surface physics, atomic physics, geophysics, biophysics, nuclear structure physics, nuclear engineering, and plasma physics. While free electives may be selected (with the consent of the faculty adviser)

from among almost all the courses offered at the University, the student is encouraged to select those that will provide further preparation in the area of technical interest. The minimum requirement is two courses or six hours of credit.

The engineering physics student is expected to pass every course for which he or she is registered, to earn a grade of C or better in specific required courses, and to attain each term an overall grade-point average of at least 2.3.

Areas of Concentration

An area of concentration in an interdisciplinary study, such as biophysics, geophysics, nuclear engineering, lasers and quantum electronics, or plasma physics and materials science, may be arranged through a judicious choice of electives in the freshman and sophomore as well as the upperclass years. Examples of many such programs are described in a special brochure available from the School of Applied and Engineering Physics, Clark Hall. Students interested in this kind of program are advised to consult as early as possible with a professor active in the field of interest or with the associate director of the school, P. L. Hartman.

Master of Engineering (Engineering Physics)

In addition to preparing students for professional employment, the M.Eng (Engineering Physics) degree program serves as a basis for doctoral study in applied physics or in certain areas that involve a combination of engineering or applied physics with another professional but nontechnical discipline. Specific requirements for the degree are the following:

1. The required thirty credits must include (a) a minimum of six in related graduate-level courses; (b) a graduate-level course that provides a good background in quantum mechanics; and (c) a fourth-year or graduate-level course in statistical mechanics or the equivalent. If the student's undergraduate program included courses that satisfy these requirements, he or she may substitute other graduate courses. Undergraduate courses that permit exploratory work in a special field of interest may be allowed, on approval of the program chairman. A further program requirement is attendance at approximately fifteen University seminars or colloquia chosen in consultation with the program chairman.
2. An informal design study or project giving at least six credits is required. It may be experimental or analytical, but must represent individual effort and include a formal report. If the project is experimental, one graduate-level course in mathematics or applied mathematics is required; students whose mathematical background is not equivalent to that of graduates of the Cornell engineering physics undergraduate program may satisfy this requirement by taking one of the upperclass mathematics courses included in the Field Program in Engineering Physics. If the project is analytical, one graduate-level course in experimental laboratory physics, or its equivalent, is required.

Master of Science and Doctor of Philosophy

Programs offered by the graduate Field of Applied Physics are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

206 The Physics of Life Fall, 3 credits, 2 lec. Prerequisite: concurrent registration in Phys 213 or permission of instructor.

A. Lewis.
See description under Division of Basic Studies.

217 Contemporary Topics in Applied Physics

Spring. 3 credits. 2 lec, 1 rec-lab. Prerequisite: Phys 213.

R. A. Buhman.
See description under Division of Basic Studies.

303 Introduction to Nuclear Science and Engineering I

Fall. 3 credits. Designed for junior or senior engineering students, but a reasonably self-contained unit that may also serve as a terminal introductory course in the subject. Prerequisites: Phys 214 and Math 294.

Staff.
An overview of nuclear science and engineering; atomic and nuclear physics: nuclear structure, radioactivity, nuclear reactions, interaction of radiation with matter; reactor theory; neutron moderation, neutron diffusion, the steady-state chain reaction.

304 Introduction to Nuclear Science and Engineering II

Spring. 3 credits. Prerequisite: 303. Staff.

A continuation of 303 to prepare students for graduate-level nuclear science and engineering courses at Cornell or elsewhere. Reactor engineering: reactor and plant dynamics, reactor types and fuel cycles, fluid flow and heat transfer, licensing, safety and siting, radiation effects on materials; radiation protection and shielding; biological effects of radiation, radiation shielding. At the level of *Introduction to Nuclear Engineering* by Lamarsh.

333 Mechanics of Particles and Solid Bodies

Fall. 4 credits. 3 lec, 1 rec.

Newton's laws; coordinate transformations; generalized coordinates and momenta. Lagrangian and Hamiltonian formulation; applications to oscillator, restrained motion, central forces, small vibrations of multiparticle systems, motion of rigid body.

355 Intermediate Electromagnetism

Fall. 4 credits. Prerequisites: Phys 214 and 216 and coregistration in Math 421 or T&M 610, or permission of instructor.

A. Kuckes.
Topics: vector calculus; electrostatics, magnetostatics, and induction phenomena; Laplace's equation solutions in Cartesian, cylindrical, and spherical systems; dielectrics, paramagnetic and diamagnetic materials, electric and magnetic forces, energy storage, skin effect, quasistatics. Emphasis on physical concepts and applications.

356 Intermediate Electrodynamics

Spring. 4 credits. Prerequisite: 355, coregistration in Math 422 or T&M 611, or permission of instructor.

Development of electromagnetic wave phenomena and radiation. Topics include transmission lines, waveguides, wave properties of dispersive media, radiation and scattering phenomena, reciprocity, physical optics, and special relativity.

361 Introductory Quantum Mechanics

Spring. 4 credits. 3 lec, 1 rec. Prerequisites: 333 or Phys 318; coregistration in Math 422 or T&M 611 and in 356 or Phys 326.

J. Silcox.
A first course in the systematic theory of quantum phenomena. Topics include the square well, harmonic oscillator, hydrogen atom, and perturbation theory. At the level of Chapters 4 through 9 of *Modern Physics and Quantum Mechanics* by Anderson.

363 Electronic Circuits (also Phys 360)

Fall or spring. 4 credits. Prerequisite: Phys 208 or 213 or permission of instructor; no previous experience with electronics is assumed. 1 lec, 2 labs.

A. Kuckes, spring.
Basic analysis and design of semiconductor circuits useful in electronic instrumentation such as

amplifiers; oscillators and waveform generators; switching, digital, and timing circuits; and power supplies. At level of *Introductory Electronics for Scientists and Engineers* by Simpson.

401 Physics of Atomic and Molecular Processes

Fall. 3 credits. Prerequisite: 361, Phys 443, or permission of instructor.

T. Cool.
An introduction to the basics of contemporary problems in the physics of atomic and molecular processes, including atomic structure, chemical bonding, polarization, radiation resonance processes, and atomic and molecular spectroscopy.

423 Statistical Thermodynamics

Fall. 4 credits. 3 lec, 1 rec. For engineering physics seniors; others by permission of instructor.

M. Nelkin.
Quantum statistical basis for equilibrium thermodynamics, canonical and grand canonical ensembles, and partition functions. Quantum and classical ideal gases and paramagnetic systems. Fermi-Dirac, Bose-Einstein, and Maxwell-Boltzmann statistics. Introduction to systems of interacting particles. At the level of *Thermal Physics* by Kittel and *Statistical and Thermal Physics* by Reif.

424 Statistical Physics

Spring. 4 credits.

M. Nelkin.
Kinetic theory of gases in terms of the single-particle distribution function; the Boltzmann equation and transport processes. Fluctuations and irreversible processes: Brownian motion and electromagnetic noise.

434 Continuum Physics

Spring. 4 credits.

Prerequisite: 333 or equivalent.
Linear elasticity theory; tensor and vector formalisms; elementary engineering applications, crystal anisotropy, dislocations. Elastic and inelastic waves. Hydrodynamics; Navier-Stokes equations, ideal and viscous fluids, compressible and incompressible flows; elementary applications, lift, drag, convection, surface waves, simple shocks, sound, introduction to linear response theory, dimensional analysis, instabilities and turbulence, subcritical and supercritical flows.

490 Informal Study in Engineering Physics

Credit to be arranged.

Laboratory or theoretical work in any branch of engineering physics under the direction of a member of the staff.

601 Photosynthesis (also Bio S 445)

Fall. 3 credits. Prerequisites: Chem 104 or 208, Math 106 or 111, and Phys 102 or 208, or permission of instructor. Offered in alternate years.

R. K. Clayton.
A detailed study of the process by which plants use light in order to grow, emphasizing physical and physicochemical aspects.

606 Introduction to Plasma Physics (also Ele E 681)

Fall. 3 credits. 3 lec. Prerequisite: 355, 356, or equivalent. Open to fourth-year students at discretion of instructor.

R. N. Sudan.
Plasma state; motion of charged particles in fields; collisions, coulomb scattering; transport coefficients, ambipolar diffusion, plasma oscillations and waves; hydromagnetic equations; hydromagnetic stability and microscopic instabilities; test particle in a plasma; elementary applications.

607 Advanced Plasma Physics (also Ele E 682)

Spring. 3 credits. 3 lec. Prerequisite: 606.

R. N. Sudan.
Boltzmann and Vlasov equations; Chew-Goldberger-Low theory; waves in hot plasmas; Landau damping. Micro-instabilities; effects of collisions and Fokker-Planck terms; method of dressed test particles; high-frequency conductivity and fluctuations; neoclassical toroidal diffusion, relativistic beams.

608 Plasma Astrophysics (also Astro 660)

Spring. 2 credits.

R. V. Lovelace.
Selected topics discussed in detail: (a) the solar corona and the solar wind; (b) the propagation of cosmic rays in interplanetary and interstellar space; and (c) the theory of aligned rotating magnetospheres.

609 Low-Energy Nuclear Physics

Fall. 4 credits. 3 lec. Prerequisite: an introductory course in modern physics, including quantum mechanics. The nuclear interaction. Properties of ground and excited states of nuclei; models of nuclear structures; alpha, beta, gamma radioactivity, low-energy nuclear reactions—resonant and nonresonant scattering, absorption, and fission. At the level of *Introduction to Nuclear Physics* by Enge.

[610 Biophysical Processes

Fall. 3 credits. Prerequisites: basic courses in biology, physics, physical chemistry, and mathematics, such as Math 422 or 433, Phys 315 or 341, Chem 390, or permission of instructor. Not offered 1978–79.

W. W. Webb.
Statistical thermodynamics of biomolecules and electrolytes; dissipative processes; diffusive, electrochemical, coupled and convective transport; fluctuations and kinetics; cell membranes; biological macrostructures; physical probes.]

[611 Vision (also Bio S 395)

Fall. 3 credits. Prerequisites: Chem 104 or 208, Math 106 or 111, Phys 102 or 208, or permission of instructor. Offered in alternate years. Not offered 1978–79.

R. K. Clayton.
Study of the mechanisms of seeing, embracing biological, physical, and chemical approaches to the subject.]

612 Nuclear Reactor Theory I

Fall. 4 credits. 3 lec. Prerequisites: a year of advanced calculus and some nuclear physics. Physical theory of fission reactors. Fission and neutron interactions with matter; theory of neutron diffusion, slowing down, and thermalization; calculations of criticality and neutron flux distribution in nuclear reactors. Reactor kinetics. At level of *Nuclear Reactor Theory* by Lamarsh.

613 Nuclear Reactor Theory II

Spring. 3 credits. A continuation of 612, primarily intended for students planning research in nuclear reactor physics and engineering. 3 lec. Prerequisite: 612.

K. B. Cady.
The Boltzmann linear transport equation, its adjoint, and their approximate solutions are developed and applied to the heterogeneous neutron chain reactor.

615 Membrane Biophysics

Spring. 2 credits. W. W. Webb.
Molecular structure and supramolecular organization of cell membranes. Model membranes and membrane models. Molecular mechanisms of membrane transport, electrophysiology and cell-cell interaction. Physical probes of membrane processes. Dynamics of membrane processes, lateral mobility, diffusion, and flow. Some current problems in cell surface function and organization of specialized membrane macrostructures.

619 Molecular Energy Transfer

Spring. 3 credits. T. A. Cool.
Fundamentals of energy transfer by molecular collisions in gases. Energy transfer mechanisms in molecular and chemical lasers. Processes for interconversion of electronic, vibrational, rotational, and translational energy. Intermolecular potential, dispersion forces, multipole moment interactions, repulsive forces.

622 Electron Optical Instrumentation: Electron and Ion Beam Microprobes and Microscopes Spring, 3 credits.

B. Siegel.
Basic electron optics with emphasis on the principles, design, and characteristics of the components used in probe-forming systems. Special consideration will be given to microfabrication by direct electron-beam lithography. The principles and application of analytical electron and ion probe instruments, as well as scanning and fixed-beam electron microscopes, will be discussed. Text: Grivet, *Electron Optics*, Vol. 1.

633 Nuclear Reactor Engineering Fall, 4 credits. Prerequisite: introductory course in nuclear engineering.
K. B. Cady.

The fundamentals of nuclear reactor engineering; reactor siting and safety, fluid flow and heat transfer, control, and radiation protection.

634 Nuclear Engineering Design Seminar Spring, 4 credits. Prerequisite: 633.
K. B. Cady.

A group design study of a selected nuclear system. Emphasis is on safety, siting, and radiation protection in the design of nuclear systems.

636 Seminar on Thermonuclear Fusion Reactors Fall, 3 credits. Prerequisite: basic course in plasma physics or nuclear reactor engineering, or permission of instructor.

Analysis of various technological and engineering problems in design and construction of fusion reactors. Topics include basic reactor schemes, materials, mechanical and heat transfer problems, radiation and safety, superconducting magnets, energy conversion, plasma impurities, and economics.

638 Intense Pulsed Electron and Ion Beams: Physics and Technology Fall, 2 credits. Prerequisites: Ele E 681, 682, and A&EP 606, 607; or equivalent; or permission of instructor.
D. A. Hammer.

Topics include: (1) theoretical aspects of intense electron and ion beams, such as equilibria and stability; (2) technology of intense beam production, such as pulsed-power generator principles, and electron and ion diode operation; and (3) applications of intense beams, such as controlled fusion, microwave generation, and laser pumping. Extensive discussion of experimental results.

651 Nuclear Measurements Laboratory Spring, 4 credits. Two 2½-hour afternoon periods. Prerequisite: some nuclear physics.

Laboratory plus lectures on interaction of radiation with matter and its detection, including electronic circuits. Twenty experiments available in nuclear and reactor physics and radiation protection; for example, radiation and detection, emission, absorption, neutrons, moderation, activation analysis of sub-critical assembly. Use of TRIGA Reactor. Student performs 8–10 selected experiments. At the level of *Nuclear Radiation Detection* by Price.

652 Advanced Nuclear and Reactor Laboratory Spring, 3 credits. Two 2½-hour afternoon periods. Prerequisites: 651 and 609 or 612. Offered on independent study basis or, if sufficient demand, as a formal course.

Laboratory experiments and experimental methods in nuclear physics and reactor physics. Ten experiments available, some using the Zero Power Reactor critical facility.

705 Topics in Statistical Physics 3 credits. Prerequisite: general familiarity with statistical mechanics.

M. S. Nelkin.
Selected topics of current interest in statistical physics. For example, in 1976–77 the subject was the variety of anti-intuitive behavior exhibited by

nonlinear macroscopic systems driven far from equilibrium; examples were taken primarily from turbulent fluid flow.

711 Principles of Diffraction (also MS&E 610) Fall, 3 credits. Offered in alternate years.

B. Batterman.
Introduction to diffraction phenomena as applied to solid-state problems. Scattering and absorption of neutrons, electrons, and X-ray beams. Diffraction from two- and three-dimensional periodic lattices. Fourier representation of scattering centers, and the effect of thermal vibrations. Phonon information from diffuse X-ray and neutron scattering and Bragg reflections. Diffraction from almost-periodic structures, surface layers, gases, and amorphous materials. Survey of dynamical diffraction from perfect and imperfect lattices.

751, 752 Project 751, fall; 752, spring. Credit to be arranged.
Informal study under direction of a member of the University staff. The objective is to offer some research experience, in work on a special problem related to the student's field of interest.

753 Seminar Topics in Applied Physics Fall or spring, 1 credit. Primarily for candidates for the M.Eng (Engineering Physics) degree.
The student attends and writes brief summaries on a minimum of thirteen scheduled University seminars and/or colloquia in technical areas close to the student's main interest.

761 Kinetic Theory (also Ele E 781) Fall, 3 credits. Prerequisite: Phys 561, 562 or permission of instructor. Offered in alternate years.
R. L. Liboff.
See Ele E 781 for course description.

762 Physics of Solid Surfaces (also MS&E 703) Spring, 3 credits. Lecture course primarily for graduate and qualified upperclass students. Prerequisite: MS&E 601 or some knowledge of solid-state physics.

An approach to the physics and chemistry of phenomena in metals, semiconductors, and ionic solids related particularly to surface and interfacial effects. Quantum mechanical and kinetic analyses of the interaction of electrons, ions, and molecules with condensed matter. Application and theory of experimental methods in ultrahigh vacuum physics. Materials drawn from research papers and review articles.

Chemical Engineering

J. C. Smith, director; G. G. Cocks, C. Cohen, R. K. Finn, K. E. Gubbins, P. Harriott, R. P. Merrill, F. Rodriguez, G. F. Scheele, M. L. Shuler, R. G. Thorpe, R. L. Von Berg, H. F. Wiegandt

Bachelor of Science

The undergraduate Field Program in Chemical Engineering comprises a coordinated sequence of courses beginning in the sophomore year and extending through the fourth year. Special programs in biological engineering, polymeric materials, and chemical microscopy are available. Underclass students who plan to enter the Field Program in Chemical Engineering register for Chem 287–288, Chem 289–290, and Chem E 110 or 111 during the sophomore year. The program for the upperclass years is as follows:

Term 5	Credits
Chem 357, Organic Chemistry*	3
Chem 251, Organic Chemistry Laboratory	2
Chem E 311, Equilibria and Staged Operations	3
Chem E 430, Introduction to Rate Processes	3
Elective†	3
Liberal studies elective	3

Term 6	
Chem 358, Organic Chemistry*	3
Chem E 312, Chemical Engineering Thermodynamics	3
Chem E 321, Materials‡	4
Chem E 431, Analysis of Separation Processes	3
Liberal studies elective	3

Term 7	
Chem E 410, Reaction Kinetics and Reactor Design	3
Chem E 432, Chemical Engineering Laboratory	3
Chem E 461, Chemical Process Evaluation	3
Elective†	3
Liberal studies elective	3

Term 8	
Chem E 101, Nonresident Lectures	0
Chem E 462, Chemical Process Synthesis	4
Electives†	9
Liberal studies elective	3

*Students in the Engineering Cooperative Program substitute Chem 253 Organic Chemistry, a 4-credit course, for Chem 357; and Chem E 421 Industrial Organic Processes, a 2-credit course, for Chem 358.

†The electives in Terms 5 to 8 must comprise three credits of the postponed engineering core science course (see the section on Basic Studies); six credits of technical electives; and at least six credits of free electives. One of the electives in term 8 should be in a chemical engineering subject.

‡Students who have an approved plan for concentration in a minor topical area and who require more elective courses than the number scheduled to accomplish their goals may substitute additional electives for Chem E 321, Materials (provided that MS&E 261, Introduction to Mechanical Properties of Materials, has been chosen as an engineering core science during the sophomore year). This option could be of interest to students planning concentrations in such areas as biological engineering, environmental studies, advanced chemistry, and systems and operations research.

Master of Engineering (Chemical)

The professional master's degree, M.Eng. (Chemical), is awarded at the end of one year of graduate study with successful completion of thirty credits of required and elective courses in technical fields including engineering, mathematics, chemistry, physics, and biology. Courses emphasize design and optimization based on the economic factors that affect process, equipment, and plant design alternatives. A design project is involved in the required courses. General admission and degree requirements are described in the introductory section under College of Engineering.

Master of Science and Doctor of Philosophy

Details of the programs for the M.S. and Ph.D. degrees with major or minor fields of study in chemical engineering are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

101 Nonresident Lectures Fall, Noncredit, 1 lec. Given by lecturers invited from industry and from selected departments of the University for the purpose of assisting students in their transition from college to industrial life.

110 Mass and Energy Balances Spring, 3 credits. Prerequisite: one year of freshman chemistry or permission of instructor.
R. G. Thorpe.
Self-paced audiovisual instruction in the material of Chem E 111. See description under Division of Basic Studies.

111 Mass and Energy Balances Fall. 3 credits. 3 lec, 1 computing session. Prerequisite: one year of freshman chemistry or permission of instructor. R. G. Thorpe.
See description under Division of Basic Studies.

311 Equilibria and Staged Operations Fall. 3 credits. 3 lec, 1 computing session. K. E. Gubbins.
Phase equilibria and phase diagrams. The equilibrium stage, mathematical description of single-stage operations, analytical and graphical solutions.

312 Chemical Engineering Thermodynamics Spring. 3 credits. 3 lec. Prerequisites: 311; Chem 287, 288.
A study of the first and second laws with application to batch and flow processes. Physical and thermodynamic properties, availability, free energy, chemical equilibrium. Applications to gas compression, refrigeration, power generation, adiabatic reactors, and chemical process development.

321 Materials Spring. 4 credits. 3 lec, 1 lab. G. G. Cocks.
An introduction to the structure and properties of solid materials. The polarizing microscope is used for examining materials in the laboratory. Topics include: testing of materials, bonding of atoms, crystal structure, phase transformation, forming and fabrication, production of materials, selection of materials, and behavior under service conditions. Laboratory topics include: optics of the microscope, geometrical and optical crystallography, and the physical chemical behavior of materials.

410 Reaction Kinetics and Reactor Design Fall. 3 credits. 3 lec. Prerequisite: 430. R. P. Merrill.
A study of chemical reaction kinetics and principles of reactor design for chemical processes.

421 Industrial Organic Chemical Processes Spring. 2 credits. 2 lec. Prerequisite: Chem 253 or 357. J. C. Smith.
Study of commercial manufacturing processes for important organic chemicals.

430 Introduction to Rate Processes Fall. 3 credits. 3 lec, 1 computing session. Prerequisites: 111 and engineering mathematics sequence. G. F. Scheele, C. Cohen.
Fundamentals of fluid mechanics and heat transfer; solutions to problems involving viscous flow, heat conduction and convection, friction factors and heat transfer coefficients, macroscopic balances, elementary applications.

431 Analysis of Separation Processes Spring. 3 credits. 3 lec, 1 computing session. Prerequisites: 430 and familiarity with FORTRAN or PL/I. R. G. Thorpe.
Analysis of separation processes involving phase equilibria and rate of mass transfer; some use of the digital computer. Phase equilibria; binary, multicomponent, and extractive distillation; liquid-liquid extraction; gas absorption; crystallization.

432 Chemical Engineering Laboratory Fall. 3 credits. 2 lec, 1 lab. Prerequisites: 430, 431. R. L. Von Berg and staff.
Laboratory experiments in fluid dynamics, heat and mass transfer, other operations. Correlation and interpretation of data. Technical report writing.

433 Project Laboratory Fall or spring. Credit variable. Prerequisite: 432.
Special laboratory projects involving bench-scale or pilot-plant equipment.

434 Transport Phenomena Spring. 3 credits. 3 lec. Prerequisites: 430 and concurrent registration in 431. G. F. Scheele.
An introductory treatment of momentum, energy, and mass transport.

461 Chemical Process Evaluation Fall. 3 credits. P. Harriott.
A study of the important chemical processes.

462 Chemical Process Synthesis Spring. 4 credits. Prerequisite: 432. R. L. Von Berg and staff.
A consideration of process and economic alternatives in selected chemical processes; design and assessment.

563 Process Equipment Design and Selection Fall. 3 credits. 3 lec. Prerequisite: 430 and 431 or equivalent. J. C. Smith.
Performance, selection, and design of process equipment; storing, transporting, mixing, heating, and separating fluids and solids. Process development and design.

564 Design of Chemical Reactors and Multiphase Contacting Systems Spring. 3 credits. 3 lec. P. Harriott.
Design, scale-up, and optimization of chemical reactors with allowance for heat and mass transfer, nonideal flow, and catalyst aging. Selection of systems for gas-liquid-solid contacting, including stirred tanks and fluidized beds.

565 Design Project Spring. 3 or 6 credits. Prerequisites: 563, 564. Staff.
Design study and economic evaluation of a chemical processing facility, alternative methods of manufacture, raw material preparation, food processing, waste disposal, or some other aspect of chemical processing.

595, 596 Special Projects in Chemical Engineering Fall or spring. Credit variable. Research or studies on special problems in chemical engineering.

611 Phase Equilibria Fall. 3 credits. 3 lec. Prerequisite: physical chemistry. R. G. Thorpe.
A detailed study of the pressure-temperature-composition relations in binary and multicomponent heterogeneous systems where several phases are of variable composition. Prediction of phase data.

621 Petroleum Refining Spring. 3 credits. 3 lec. Prerequisite: 430. H. F. Wiegandt.
A critical analysis of the processes employed in petroleum refining.

623 Synthetic Fuels Spring. 3 credits. P. Harriott.
Energy resources and projected consumption. Gasification and liquefaction of coal and oil shale. Synthesis of methane, methanol, and hydrogen. Efficiency and economics of fuel production and use.

627 Nuclear and Reactor Engineering Spring. 2 credits. 2 lec. Prerequisite: permission of instructor. R. L. Von Berg.
Fuel processing, isotope separation, radioactive waste disposal, radiation damage, shielding, radiation chemistry.

630 Transport Phenomena and Living Systems (also M&AE 560) Spring. 3 credits. Prerequisites: M&AE 221, 323, 324, or equivalent. R. L. Levin.
See M&AE 560 for course description.

[640 Polymeric Materials Fall. 3 credits. 3 lec. Not offered 1978-79. F. Rodriguez.
Chemistry and physics of the formation and characterization of polymers. Principles of fabrication.]

641 Physical Polymer Science Spring. 3 credits. 3 lec. Prerequisite: 311, 430, physical chemistry or equivalent. C. Cohen.
Thermodynamic and hydrodynamic properties of polymer solutions. Phase separation in binary and ternary mixtures. Principal characterization techniques. Viscoelastic and transport properties of bulk polymers. Models of the glass transition. Applications to selected polymer processes.

[642 Polymeric Materials Laboratory Spring. 2 or 3 credits. 1 or 2 labs. Prerequisite: 640. Not offered in 1978-79. F. Rodriguez.
Experiments in the formation, characterization, fabrication, and testing of polymers.]

644 Microbial Engineering Spring. 3 credits. 2 lec, 1 rec. Prerequisites or corequisites: Chem 288 and any course in microbiology. R. K. Finn.
An advanced discussion of fermentation as a unit process. Topics include sterilization, aeration, agitation, and continuous fermentation.

646 Controlled Cultivation of Microbial Cells Spring. 3 credits. 2 labs. Prerequisites: 645 or equivalent and a laboratory course in microbiology. Enrollment limited to chemical engineering students. R. K. Finn.
Experiments with batch and continuous stirred tanks to explore the physiology of yeasts, molds, and bacteria under conditions simulating industrial practice.

647 Wastewater Engineering in the Process Industries Fall. 3 credits. Prerequisites: organic and physical chemistry; 430 or equivalent. M. L. Shuler.
Introduction to general and legal problems of pollution control, including some descriptive technology. Major emphasis, however, is on the quantitative engineering aspects of design and operation. Both biological and physical chemical methods, as they apply to the treatment of strong and special wastes from the chemical and allied industries, are discussed.

[648 Polymer Processes Spring. 3 credits. 3 lec. Prerequisite: 640 or permission of instructor. Not offered 1978-79. F. Rodriguez.
Production and applications of polymers. Discussion of stabilization and degradation, including processes for recycling and disposal of plastics and related products.]

651 Numerical Methods in Chemical Engineering Fall. 3 credits. 3 lec. Solution of single and sets of algebraic equations, polynomial approximations, integration, initial and boundary valued ordinary differential equations, optimization, statistical design of experiments, steady-state chemical process simulation by computer.

[661 Air Pollution Control Fall. 3 credits. Not offered 1978-79. P. Harriott.

Origin of air pollutants, photochemical reactions in the atmosphere, diffusion in the atmosphere. Design of equipment for removal of particulate and gaseous pollutants formed in combustion and chemical processing.]

671 Process Control Spring. 2 credits. 1 lec. Prerequisite: 430.
M. L. Shuler.

Dynamic responses of processes and design of control schemes that will maintain output specifications in spite of input disturbances.

672 Process Control Laboratory Spring. 1 credit. 1 lab. Prerequisite: concurrent registration in 671.

M. L. Shuler.
Experiments on controller calibration, dynamics of pneumatic and electronic analogs of process systems, dynamic responses of first and second order open-loop systems, and control of a heat exchanger.

[673 Applied Surface Chemistry and Physics Spring. 2 credits. Not offered 1978-79.

R. P. Merrill.
Topics in the chemistry and physics of solid surfaces and their applications to applied problems such as catalysis and corrosion. Specific topics differ each year and students may, upon consent of the instructor, take more than one offering of the course.]

680 Chemical Microscopy Fall. 3 credits. 1 lec, 2 labs.

G. G. Cocks.
The use of the light microscope to investigate chemical problems in biological or nonbiological systems. Topics include: the optics of the microscope, types of microscopes (transmission, reflection, polarizing, interference, phase and dark field), the preparation of specimens, qualitative and quantitative analysis, crystallography, and photomicrography.

681 Electron Microscopy Fall. 3 credits. 1 lec, 2 labs. Prerequisite: 680 or special permission.

G. G. Cocks.
An introductory course designed to teach the student how to use the electron microscope. Topics include: optics of the microscope, the use and maintenance of the microscope, specimen preparative techniques (substrates, particulates, replication, microtomy, electron diffraction, and thinning of metals), photomicrographic techniques, and the interpretation of micrographs.

682 Advanced Chemical Microscopy Offered on demand either term. Credit variable. Prerequisite: 680 and/or special permission.

G. G. Cocks.
This is primarily a projects course and offers the student the opportunity either to learn more about microscopes and their use or to apply the techniques of microscopy to the investigation of topics or problems of special interest.

683 Laboratory in Optical Crystallography Fall. Credit variable. 2 labs; lec as part of 1 lab. This is the laboratory for Geol 355, but is open to students who want to take the laboratory only.

G. G. Cocks.
An introduction to geometrical and optical crystallography for mineralogists, with instruction in the use of the polarizing microscope. Topics include the optics of the polarizing microscope, and geometrical and optical crystallography.

692, 693, 694 Research Project Fall or spring. 3 credits; additional credit by special permission. Prerequisite: 430.
Research on an original problem in chemical engineering.

711 Advanced Chemical Engineering Thermodynamics Spring. 3 credits. 3 lec. Prerequisite: 312 or equivalent.

K. E. Gubbins.
Application of general thermodynamic methods to advanced problems in chemical engineering. Evaluation, estimation, and correlation of properties; chemical and phase equilibrium.

713 Applied Chemical Kinetics Spring. 3 credits. Prerequisite: physical chemistry.

R. P. Merrill.
Fundamentals of the kinetics of reacting systems. Collision theory, unimolecular rate theory, transition state theory, and the use of simple statistical models to represent reacting chemical systems are stressed. The application of these concepts to nonideal environments, solvent effects, and reactions on solids is presented with emphasis on catalytic phenomena. The physical chemistry of several industrially important reactive systems will be discussed as illustrations.

731 Advanced Transport Phenomena Fall. 3 credits. 3 lec.

C. Cohen.
An integrated treatment of momentum, mass, and heat transfer. Molecular transport, the equations of change, viscous laminar flow of Newtonian and non-Newtonian fluids. Solutions of the Navier-Stokes equations for selected steady and unsteady-state problems. Perfect fluid theory and boundary layer theory. Models of mass and heat transfer. Multicomponent diffusion. Simultaneous heat and mass transfer.

772 Theory of Molecular Liquids Spring. 3 credits. Prerequisite: 711 or equivalent.

K. E. Gubbins.
Theory of intermolecular forces, and equilibrium statistical mechanics for nonspherical molecules. Distribution functions. Applications to thermodynamics of such fluids using integral equation and perturbation theory techniques. Mixture properties, phase diagrams for mixtures with polar or quadrupolar components. Surface properties.

790 Seminar Fall or spring. 1 credit.

General chemical engineering seminar required of all graduate students majoring in the Field of Chemical Engineering.

792 Advanced Seminar in Thermodynamics Fall or spring. 1 credit.

A forum for talks by graduate students and faculty members on topics of current interest in thermodynamics and statistical mechanics.

891, 892, 893 Thesis Research Fall or spring. Thesis research for the M.S. degree in chemical engineering.

991, 992, 993, 994, 995 Thesis Research Fall or spring.

Thesis research for the Ph.D. degree in chemical engineering.

Civil and Environmental Engineering

School of Civil and Environmental Engineering:
R. N. White, director; G. B. Lyon, assistant director

Department of Structural Engineering: J. F. Abel, P. Gergely, A. R. Ingrassia, F. H. Kulhawy, W. McGuire, A. H. Nilson, T. D. O'Rourke, T. Peköz, D. A. Sangrey, F. O. Slate, R. N. White

Department of Environmental Engineering:
D. P. Loucks, chairman; J. J. Bisogni, W. H. Brutsaert, F. J. Cesario, R. I. Dick, L. B. Dworsky, G. P. Fisher, C. D. Gates,

J. M. Gossett, D. A. Haith, G. H. Jirka, J. A. Liggett, P. L-F. Liu, R. C. Loehr, W. R. Lynn, A. H. Meyburg, N. Orloff, A. J. Richardson, R. E. Schuler, C. Shoemaker, J. R. Stedinger

Program in Environmental Sensing, Measurement, and Evaluation: T. Liang, G. B. Lyon, A. J. McNair

Bachelor of Science

There are two subject departments in the School of Civil and Environmental Engineering, and a Program in Environmental Sensing, Measurement, and Evaluation. Undergraduate specialties can be arranged in a number of subject areas encompassed by these units. The major areas in the Department of Structural Engineering are: analysis, behavior, and design of structures; structural materials; and soils and foundations. Within the Department of Environmental Engineering there are five major areas: environmental quality engineering; fluid mechanics and hydrology; public systems and environmental systems engineering; transportation; and water resources planning and analysis.

Students planning to enter the Field Program in Civil and Environmental Engineering as juniors are required to take T&AM 202, Mechanics of Solids, as one of the sophomore engineering core sciences. It is recommended that they also take OR&IE 260, Introductory Engineering Probability, and either T&AM 203, Dynamics, or MS&E 261, Mechanical Properties of Materials, as two of the other sophomore engineering core science courses. These three courses are required in the field program.

At the upperclass level the curriculum is planned to provide an introduction to the several diverse areas within the field of civil and environmental engineering and to permit more detailed study in at least one area through appropriate selection of electives. A recommended sequence, including the required courses, is given below.

Term	Credits
Term 5	
T&AM 203, Dynamics*	3
CEE C301, Fluid Mechanics I	4
CEE G301, Structural Engineering I	4
OR&IE 260, Introductory Engineering Probability*	3
Liberal studies elective	3
Term 6	
MS&E 261, Introduction to Mechanical Properties of Materials*	3
CEE E301, Environmental Quality Engineering	4
CEE D301, Introductory Soil Mechanics	3
CEE B303, Engineering Economics and Systems Analysis	3
Liberal studies elective	3
Term 7	
Civil and environmental engineering distribution courses (2)†	6
Technical elective	3
Free elective	3
Liberal studies elective	3
Term 8	
Civil and environmental engineering distribution courses (2)†	6
Technical elective	3
Free elective	3
Liberal studies elective	3

*Satisfactory completion of these engineering core science courses in the Division of Basic Studies increases the number of technical electives accordingly.

†Information about distribution requirements may be obtained from the student's faculty adviser.

A student with a well-defined special interest may develop a more individualized program in consultation with a faculty adviser from the school and submit it to the Field Curriculum Committee for approval. It is advisable for a student planning such a program to submit an application as early as the first term of the sophomore year.

Master of Engineering (Civil)

The M. Eng. (Civil) degree program is designed to prepare a student for professional practice in civil and environmental engineering. Requirements, in addition to the general ones for the degree (see the introductory section under College of Engineering), include three required courses: one in professional engineering practice, CEE K520, and two in design, CEE K510 and K511. The design sequence requires the completion of a project involving synthesis, analysis, decision making, and application of engineering judgment, and includes an intensive, full-day, three-week session between semesters.

The remainder of a student's program of studies is designed individually in consultation with an academic adviser and then submitted to the school's Professional Degree Committee for approval. The objectives in course planning are to provide breadth in the fundamentals of civil and environmental engineering, and specialization in one area with some concentration in a related area. Most students will have achieved the necessary breadth during their undergraduate years. Some, however, may require additional course work in the graduate program to fulfill the breadth requirement. Students in the School of Civil and Environmental Engineering may avail themselves of a number of graduate course offerings in fields related to their major interest but outside of the school.

Master of Science and Doctor of Philosophy

The requirements for the degrees of Master of Science and Doctor of Philosophy are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

The courses in civil and environmental engineering are listed under the following headings: *Environmental Sensing, Measurement, and Evaluation; Public and Environmental Systems Engineering; Fluid Mechanics and Hydrology; Geotechnical Engineering; Environmental Quality Engineering; Transportation; Structural Engineering; Water Resources Planning and Analysis; and Professional Practice.*

A. Environmental Sensing, Measurement, and Evaluation

A321 Engineering Surveying Fall, spring (on demand). 3 credits. 2 lec, 1 lab.
A. J. McNair and staff.

Principles and practice of geometric measurements for mapping, boundary surveys, route surveys, and the construction of CEE facilities; and the related topics of photogrammetry, field astronomy, construction and use of topographic maps, introduction to geodesy, and land surveying.

A651 Field Astronomy Fall. 2 credits. Minimum enrollment of six students. 1 lec, 1 lab (including evening observations). Prerequisite: A321 or permission of instructor. May not be offered 1978-79.

G. B. Lyon.

Theory and practice in the determination of latitude and longitude of points and azimuth of lines on the earth by observation of celestial bodies. Topics include: stellar and geographic coordinate systems, use of star catalogs, measurement of time, and pertinent observation and computation procedures.

A652 Geometric Data Adjustments Spring. 3 credits. 3 lec-djsc. Prerequisites: Math 293, CEE A321 or A380, and OR&IE 260, or permission of instructor. May not be offered 1978-79.

G. B. Lyon.

Theory and practice of adjustment of geometrically constrained observations with emphasis on surveying applications. Topics include: error theory, minimum variance and other bases for adjustment, and evaluation of precision of results.

A656 Boundary Surveys Spring. 3 credits. 3 lec. Prerequisite: permission of instructor.

A. J. McNair.

Legal principles governing location of land boundaries. Historical development and methods of original land surveys. Retracement and restoration of property corners. Coordinate systems; mineral land surveys; riparian and littoral rights; environmental presentations; responsibilities of licensed surveyors.

A661 Photogrammetry Fall. 3 credits. 2 lec, 1 lab. Prerequisite: permission of instructor.

A. J. McNair.

Terrestrial, aerial, and space photogrammetry. Photograph geometry: tilt and relief displacements; parallax distortions; control requirements; flight planning. Zeiss Stereometric Camera. Stereo plotting, relative and absolute orientation; Balplex, Wild Autographs, and Terragraph plotters. Geometry of remote sensors.

A662 Analytic Aerotriangulation Spring. 3 credits. 2 lec, 1 lab. Prerequisite: A661.

A. J. McNair.

Ground control types and required dispositions. Pyramid, coplanarity, and colinearity solutions for resection and orientation of single photo, stereo-pair, triplet, subblock, and block assemblies. Solutions of large rectangular matrices in photogrammetry. Coordinate transformations.

A671 Geodesy Spring. 3 credits. 3 lec. Prerequisites: permission of instructor.

A. J. McNair.

The figure of the earth and the precise determination of position on or near the earth's surface. Fundamentals of geometric geodesy, physical geodesy, satellite geodesy, and map projections.

A685 Physical Environment Evaluation Fall. 3 credits. 2 lec, 1 lab. Prerequisite: permission of instructor.

T. Liang.

Physical environment factors affecting engineering planning decisions: climate, soil and rock conditions, water resources. Evaluation methods: interpretation of meteorological, topographic, geologic, and soil maps, airphotos, and subsurface exploration records.

A686 Advanced Physical Environment Evaluation Spring. 3 credits. 2 lec, 1 lab.

Prerequisite: A685 or A687.

T. Liang.

Study of physical environment by airphoto and other remote sensing methods. Conventional photography; spectral, space and sequential photography; thermal and radar imageries. Arctic, tropic, arid, and humid climate regions. Application in projects.

A687 Analyses and Interpretation of Aerial Photographs Fall or spring. 3 credits. 2 lec, 1 lab. Prerequisite: permission of instructor.

Staff.

Identification of a broad spectrum of soils, rocks, and drainage conditions; significance of vegetative and cultural patterns. Specific fields of application are emphasized.

A688 Advanced Interpretation of Aerial Photographs Fall or spring. 3 credits. Prerequisite: A687.

T. Liang.

Lectures and team projects in laboratory and field. Facilities include material for projects in city-regional planning, soil mapping, conservation, ground and surface water, and civil engineering.

A689 Remote Sensing Spring. 3 credits. 2 lec, 1 lab. Prerequisite: permission of instructor.

T. Liang, W. Philipson.

Fundamentals of sensors and sensing in the electromagnetic spectrum. Emphasis is on nonphotographic forms. Coverage includes sensors, sensor and ground data acquisition, data geometry, analysis and interpretation, and mission planning.

A691 Design Project On demand. 1-6 credits. Students may elect to undertake a design project in remote sensing and environment evaluation. The work is supervised by a professor in this subject area.

A692 Research On demand. 1-6 credits. Staff.

For students who wish to study one particular area in depth. The work may take the form of laboratory investigation, field study, theoretical analysis, or development of design procedures.

A693 Seminar On demand. 1 credit.

Staff.

Presentation and discussion of technical papers and current research in the general field or one of its specialized areas.

A694 Special Topics On demand. 1-6 credits. Staff.

Supervised study in small groups on one or more special topics not covered in the regular courses. Special topics may be of a theoretical or applied nature.

A696 Seminar in Remote Sensing Fall or spring. 1 credit each term.

T. Liang, W. Philipson.

Presentation and discussion of current research and development in remote sensing. Lectures by Cornell staff members and invited specialists from government and industry.

B. Public and Environmental Systems Engineering

B301 Economic Analysis of the Private Sector (also Econ 307) Fall. 4 credits. Prerequisite: one year of college-level mathematics.

R. E. Schuler.

Intermediate microeconomic analysis similar to Econ 311 but emphasizing mathematical techniques. Theory of households, firms, monopoly and competitive markets, distribution and equilibrium. A liberal elective for engineers.

B302 Economic Analysis of Government (also Econ 308) Spring. 4 credits. Prerequisite: one year of college-level mathematics plus B301 or Econ 311.

R. E. Schuler.

Analysis of government intervention in a market economy. Public goods, public finance, cost-benefit analysis, environmental regulation, and macroeconomic topics.

B303 Engineering Economics and Systems Analysis Spring. 3 credits.

D. P. Loucks.

Aimed at the junior-senior level. Intended to give the student a working familiarity with the principles and main analytical techniques for reaching decisions about alternative engineering projects. Not intended for students with substantial background in business economics or methods of operations research.

B305 Social Implications of Technology Fall. 3 credits. Approved liberal elective. Not open to freshmen.

W. R. Lynn.

Examines selected issues pertaining to the development, implementation, and assessment of technology. Special emphasis is given to social, political, and economic aspects of current problems that have important technological components.

B416 Seminar in Technology Assessment

Spring. 3 credits. Open to graduate students and to upperclass undergraduates with permission of instructor.

N. Orloff.

An interdisciplinary seminar dealing with the social consequences of technological developments and means by which technology can be guided in socially beneficial directions.

[B614 Legal methods Fall. 3 credits. Open to graduate students and to upperclass undergraduates with permission of instructor. Not offered 1978-79.

N. Orloff.

An introduction to the structure and operation of our legal system. Development of legal skills and the ability to do one's own basic legal research.]

B615 Environmental Law Fall. 4 credits. Open to graduate students and to upperclass undergraduates with permission of instructor.

N. Orloff.

An introduction to how the legal system handles environmental problems. Study of federal statutes, such as the National Environmental Policy Act, the Clean Air Act, and the Clean Water Act; the regulations issued to implement them; and the important judicial decisions that have been handed down under each.

B617 Public Systems Analysis Fall. 3 credits.

Prerequisite: any introductory systems analysis course.

F. J. Cesario.

An introduction to the philosophy and applications of systems analysis to public sector problems in transportation, natural resources, public health, global planning, and energy-environmental quality issues.

B693 Environmental and Water Resources

Systems Analysis Colloquium Fall or spring. 1 credit.

Staff.

Lectures in various topics related to environmental or water resources systems planning and analysis.

B780 Environmental Control Workshop On demand. 1-3 credits.

W. R. Lynn.

Development of research topics dealing with control of the environment (with special emphasis on biological and ecological aspects). Topics discussed in previous workshops include human population control, control of pest and parasite populations, study of species' strategic use of food supply, control of populations by use of predators, and host-parasite systems. Additional topics will be developed.

B791 Environmental and Water Resources

Systems Analysis Design Project On demand.

Credit variable. Prerequisite: permission of instructor. May extend over two semesters.

Staff.

Design or feasibility study of environmental or water resources systems, supervised and assisted by one or more faculty advisers; individual or group participation. Final report required.

B792 Environmental and Water Resources

Systems Analysis Research On demand. Credit

variable. Prerequisite: permission of instructor. Preparation must be suitable to the investigation to be undertaken.

Investigations of particular environmental or water resources systems problems.

B794 Special Topics in Environmental or Water Resources Systems Analysis On demand. Credit

variable.

Staff.

Supervised study, by individuals or small groups, of one or more specialized topics not covered in regular courses.

C. Fluid Mechanics and Hydrology

C301 Fluid Mechanics I Fall. 4 credits. 3 lec, 1 rec. Prerequisite: T&AM 203 (may be taken concurrently.)

Staff.

Hydrostatics, the basic equations of fluid flow, potential flow and dynamic pressure forces, viscous flow and shear forces, steady pipe flow, turbulence, dimensional analysis, selection of turbomachinery.

C302 Hydraulic Engineering Spring. 3 credits. 2 rec, 1 lab. Prerequisite: C301.

Staff.

Steady open channel flow, river modeling, unsteady pipe flow, theory of turbomachinery. Laboratory will include a number of experiments in hydraulic and river engineering. Field trips.

[C609 Descriptive Hydrology Spring. 2 credits. Intended for nonengineering majors. Prerequisite: permission of instructor. Not offered 1978-79.

W. H. Brutsaert.

Introduction to hydrology as a description of the hydrologic cycle and the role of water in the natural environment. Topics include precipitation, infiltration, evaporation, ground water, surface runoff, floods, and droughts.]

C615 Fluid Mechanics II Fall. 3 credits. 3 lec. Prerequisite: C301.

Staff.

Introduction to tensor analysis, conservation of mass, momentum and energy from a rigorous point of view. Study of exact solutions of the Navier-Stokes equations. Asymptotic approximations at low and high Reynolds numbers. Similitude and modeling. Laminar diffusion of momentum, mass, and heat.

[C618 Dynamic Oceanography Fall. 3 credits. Prerequisite: C301. Not offered 1978-79.

P. L.-F. Liu.

The statics and dynamics of oceans and lakes. Currents in homogeneous and stratified bodies of water. Tidal motions. Waves in a stratified ocean.]

C620 Analytical Hydrology Fall. 3 credits. Prerequisite: C301.

W. H. Brutsaert.

Physical and statistical analysis related to hydrologic processes. Hydrometeorology and evaporation. Infiltration and base flow. Surface runoff and channel routing. Linear and nonlinear hydrologic systems analysis. Storage routing and unit hydrograph theory.

[C621 Flow in Porous Media and Ground Water Spring. 3 credits. Prerequisite: C301. Not offered 1978-79.

W. H. Brutsaert.

Fluid mechanics and equations of single-phase and multiphase flow; methods of solution. Aquifer hydraulics, pumping wells; drought flows; infiltration, ground water recharge; land subsidence; sea-water intrusion, miscible displacement; transient seepage in unsaturated materials.]

C622 Engineering Micrometeorology Spring. 3 credits. 3 lec. Prerequisite: C301.

W. H. Brutsaert.

Physical processes in the lower atmospheric environment; turbulent transport in the atmospheric boundary layer; surface-air interaction; disturbed boundary layers; radiation. Applications will include sensible and latent heat transfer from lakes; plant canopy flow and evapotranspiration; turbulent diffusion from chimneys and cooling towers; urban climatology; interaction of wind and structures; snow and ice problems.

C631 Coastal Engineering I Spring. 3 credits. 3 lec. Prerequisite: C301.

P. L.-F. Liu.

Linear wave theory, wave generation by wind, analysis of fluid forces on floating and fixed coastal

structures and modification of waves and currents by these structures, coastal processes and coastal sediment motion.

C633 Coastal Engineering II Fall. 3 credits. 3 lec. Prerequisite: C631.

P. L.-F. Liu.

Review of gravity wave theories, applicability of different wave theories to engineering problems, wave energy transmission, tsunamis, boundary value problems in wave hydrodynamics, behavior of submerged and floating bodies, harbor agitations, ship waves.

C641 Fluid Mechanics of Ambient Water Quality Control Fall. 3 credits. 3 lec. Prerequisite: C301.

G. H. Jirka.

Introduction to mass and heat transport processes due to pollutant discharges into natural waters. Ambient turbulent diffusion equation and its solution for instantaneous and continuous releases. Concept of longitudinal dispersion in shear flow. Applications to pollutant transport prediction in rivers, estuaries, closed basins, and coastal zones. Exchange processes for mass and heat at the water surface. Convective transport due to density currents. Jet mixing and the design of submerged diffuser outfalls.

C643 Unsteady Hydraulics Spring. 3 credits. Prerequisite: C302 or permission of instructor.

J. A. Liggett.

The physical and mathematical basis for unsteady processes in hydraulic engineering, especially unsteady open channel flow. Water hammer, unsteady sediment transport, long waves on large bodies of water, circulation. Numerical methods of solution.

[C651 Environmental Planning and Operation of Energy Facilities Spring. 3 credits. Prerequisites: C641 or equivalent. Alternating years. Not offered 1978-79.

G. H. Jirka.

Survey of analytical methodologies for predicting and controlling the environmental impacts of individual energy facilities or of energy systems. Estimation of construction and operating impacts; pollutant sources, models for pollutant dispersal, modeling the relationships of pollutant concentration and ecological, health, and socioeconomic damages. Pollutant abatement strategies and transient releases techniques. Models for regional energy facility siting. Mixed lecture/seminar format.]

C691 Project On demand. Credit variable. Hours variable. Staff.

The student may elect a design problem or undertake the design and construction of special equipment in the fields of fluid mechanics, hydraulic engineering, or hydrology.

C693 Hydraulics Seminar Spring. 1 credit. Open to undergraduates and graduates and required of graduate students majoring in hydraulics or hydraulic engineering.

Staff.

Topics of current interest in fluid mechanics, hydraulic engineering, and hydrology.

C694 Special Topics in Hydraulics On demand. Credit variable.

Staff.

Special topics in fluid mechanics, hydraulic engineering, or hydrology.

C742 Environmental Transport Modeling

Spring. 3 credits. 3 lec. Prerequisites: C641 or permission of instructor. Alternating years.

G. H. Jirka.

Observed characteristics of turbulent fluid flow in environmental applications. Momentum and scalar transport equations and turbulence closure approaches. Interaction with buoyancy. Integral techniques for self-similar flows: jets, plumes,

wakes, and mixing layers. Horizontally stratified shear flows; blocking, selective withdrawal, density currents, and internal hydraulic jumps. Interfacial phenomena. Experimental approaches to environmental fluid problems, scaling laws. Applications to predictive engineering models, such as: oil spreading on sea, seasonal stratification in reservoirs, plume dispersion in crosswind. Term paper.

C744 Experimental and Numerical Methods in Hydraulics and Hydrology On demand. 2 credits. Staff.

Methods used in planning and conducting laboratory and field experiments and in performing numerical analysis. Specific subject matter varies according to the interests of students and staff.

C792 Research in Hydraulics On demand. Credit variable. Staff.

The student may select an area of investigation in fluid mechanics, hydraulic engineering, or hydrology. The work may be either experimental or theoretical in nature. Results should be submitted to the instructor in charge in the form of a research report.

D. Geotechnical Engineering

D301 Introductory Soil Mechanics Spring. 3 credits. 2 lec, 1 lab/tutorial.

D. A. Sangrey.
Soil as an engineering material. Chemical and physical nature of soil. Engineering properties of soil. Stresses and stress analysis in soil. Introduction to stability, earth pressure, and other design problems. Introduction to laboratory testing.

D606 Foundation Engineering Fall. 3 credits. 3 lec, optional tutorial. Prerequisite: D301.

F. H. Kulhawy.
Soil exploration, sampling, and in-situ testing techniques. Bearing capacity, stress distribution, and settlement. Design of shallow and deep foundations. Compaction and site preparation. Seepage and dewatering of foundation excavations.

D607 Retaining Structures and Slopes Spring. 3 credits. 3 lec, optional tutorial. Prerequisite: D301.

F. H. Kulhawy.
Earth pressure theories. Design of rigid, flexible, braced, tied back, slurry, and reinforced earth walls. Stability of excavation, cut and natural slopes.

D610 Engineering Behavior of Soils Fall. 3 credits. 3 lec. Prerequisite: D301. Seniors must have permission of instructor.

D. A. Sangrey.
Detailed study of physicochemical nature of soil. Stress states and stress-strain-time behavior. In-depth evaluation of the strength, compressibility, and permeability of natural soils. Study of special deposits such as sensitive, organic, frozen, and man-made soils.

D631 Highway Engineering (also Ag En 491) Fall. 3 credits. 2 lec, 1 lab. Prerequisite: D301 or permission of instructor.

L. H. Irwin.
See Ag En 491 for course description.

D632 Bituminous Materials and Pavement Design (also Ag En 492) Spring. 3 credits. 2 lec, 1 lab. Prerequisite: D631 or permission of instructor.

L. H. Irwin.
See Ag En 492 for course description.

D691 Design Project in Geotechnical Engineering On demand. 1-6 credits. Students may elect to undertake a design project in geotechnical engineering. The work is supervised by a professor in this subject area.

D693 Seminar in Geotechnical Engineering

Fall or spring.
Staff.
Presentation and discussion of topics of current research and practice in geotechnical engineering.

D694 Special Topics in Geotechnical Engineering On demand. 1-6 credits. Staff.

Supervised study of special topics not covered in the formal courses.

D711 Rock Engineering Fall. 3 credits. 3 lec.

Prerequisite: D301 or permission of instructor; introductory geology helpful.
F. H. Kulhawy.

Geological and engineering classifications of intact rock, discontinuities, and rock masses. Laboratory and field evaluation of properties. Stress states and stress analysis. Design of foundations on and openings in rock masses. Analysis of the stability of rock slopes.

D712 Graduate Soil Mechanics Laboratory

Fall. 3 credits. Prerequisite: D610.
D. A. Sangrey.
Introductory through advanced techniques for laboratory measurement of soil properties. Emphasis on strength, compressibility, and permeability tests. Critical evaluation of laboratory methodology.

D714 Advanced Foundation Engineering

Spring. 3 credits. 3 lec. Prerequisite: D606. May not be offered 1978-79.
Staff.

A continuation of D606 with detailed emphasis on special topics in soil-structure interaction. Typical topics include: lateral and pullout loading of deep foundations, pile group behavior, foundations for offshore structures, pile-driving dynamics, foundations for special structures.

D715 Soil Dynamics Spring. 3 credits. 3 lec.

Prerequisite: permission of instructor.
D. A. Sangrey.
Principles of vibration under harmonic and transient loading. Wave propagation. Dynamic response of soils and its measurement. Analytical models for harmonic, transient, and earthquake loading. Design examples of foundations and embankments.

D717 Embankment Dam Engineering Spring.

2 credits. 2 lec. Prerequisites: D607 and D711, or permission of instructor.
F. H. Kulhawy.
Principles of analysis and design for earth and rockfill dams. Materials, construction methods, internal and external stability, seepage and drainage, performance monitoring, abutment and foundation evaluation. Introduction to tailings dams.

D718 Case Studies in Geotechnical Engineering

Spring. 3 credits. Prerequisites: D606 and D607. May not be offered 1978-79.
Staff.
Study of case histories in geotechnical engineering. Critical evaluation of successful and unsuccessful projects. Oral presentations and engineering report evaluation of each case.

D719 Tunnel Engineering Spring. 2 credits.

2 lec. Prerequisites: D607 and D711.
F. H. Kulhawy.
Principles of analysis and design for earth and rock tunnels. Materials, construction methods, stability and support systems, deformations, and performance monitoring.

D792 Research in Geotechnical Engineering

On demand. 1-6 credits.
Staff.
For the student who wishes to pursue a particular geotechnical topic in considerable depth.

E. Environmental Quality Engineering

E301 Environmental Quality Engineering

Spring. 4 credits. Prerequisite: C301.
J. J. Bisogni, J. M. Gossett.
Introduction to the engineering aspects of environmental quality control. Emphasis on water quality control concepts, theory, and methods. Elementary analysis and design applicable to water supply and distribution and to wastewater and stormwater collection systems. Introduction to processes underlying water and wastewater treatment. Effects of wastewater on natural waters.

E604 Assimilation of Pollutants in Natural Waters

Fall. 3 credits. 3 lec. Prerequisite: E301 or permission of instructor.
Assimilation and transport of pollutants in the aquatic environment. Emphasis on the physics, chemistry, and biology which form the basis for mathematical description of the assimilation phenomenon in natural waters.

E610 Chemistry of Water and Wastewater

Fall. 3 credits. 3 lec-rec. Prerequisite: one year of college chemistry or permission of instructor.
J. M. Gossett.
Principles of physical, organic, inorganic, and biological chemistry applicable to the understanding, design, and control of water and wastewater treatment processes and to reactions in receiving waters.

E611 Aquatic Chemistry Spring. 3 credits. 3 lec.

Prerequisite: E610 or Chem 287-288.
J. J. Bisogni.
Chemical equilibria in natural aquatic systems, including water and wastewater treatment systems. Chemical thermodynamics, acid-base systems, oxidation-reduction systems, coordination chemistry, solid-liquid-gas interfaces with regard to precipitation, dissolution, and adsorption. Chemical-biological interfaces in natural systems. Emphasis on phenomena, mathematical solution of chemical equilibria, and application to engineering management of water quality.

E630 Solid Waste Management and Resource Recovery

Spring. 3 credits. 3 lec-disc. For seniors and graduate students.
C. D. Gates.
Sources, nature, and properties of municipal and industrial solid wastes. Mechanical, biological, and thermal processing methods for disposal of solid wastes and for recovery of material and energy from them.

E633 Environmental Quality Management

Fall; spring on demand. 3 credits (4 with approval of instructor). 2 lec-disc. For upperclass or graduate students.
L. B. Dworsky.
An introduction to environmental quality management; nature, cause, and control of environmental problems; interaction of physical, social, and cultural environments; emphasis on the interdependent social, economic, development, and environmental issues confronting society.

E634 Air Quality Control Spring. 3 credits. 3 lec-disc.

For seniors and graduate students.
C. D. Gates.
An introduction to air quality and air pollution problems. Sources, characteristics, and effects of specific air pollutants; their dispersion and interactions in the atmosphere. Air quality standards and regulations. Air pollution control methods.

E636 Environmental Effects of Energy Conversion

Fall. 3 credits. 3 lec-disc. For seniors and graduate students.
C. D. Gates.
Sources and characteristics of airborne, waterborne, and solid wastes associated with energy-conversion processes. Phenomena underlying behavior and fate

of these wastes in the environment, and their effect on receptors. Regulatory and engineering aspects of their control. Emphasis is on processes and phenomena related to the production and use of fossil, nuclear, and refuse-derived fuels.

E638 Sludge Treatment, Utilization, and Disposal Spring. 3 credits. Prerequisites: E301 and E610 or permission of instructor.

R. I. Dick.

An analysis of: the quantity and quality of residues produced from wastewater treatment facilities as a function of process design and operation; the alternatives for reclamation or ultimate disposal of residues with assessment of potential environmental impacts and factors influencing the magnitude of those impacts; the fundamental factors influencing performance of treatment processes for altering sludge properties prior to ultimate disposal; and considerations in selection and integration of sludge management processes to approach optimal design.

E693 Environmental Quality Engineering Seminar

Fall or spring. 1 credit. Required of graduate students majoring or minoring in sanitary engineering. Open to undergraduates with permission of instructor. Presentation and discussion of current topics and problems in sanitary engineering and environmental quality engineering.

E712 Water Chemistry Laboratory Fall. 1 credit.

Prerequisites: concurrent registration in E610 and permission of instructor. Enrollment limited.

J. M. Gossett.

Laboratory methods for analysis of pollutants in water and wastewater.

E715 Chemical and Physical Phenomena and Processes

Fall. 4 credits. 3 lec, 1 lab. Prerequisite: E610 or permission of instructor.

J. J. Bisogni.

Theoretical and engineering aspects of chemical and physical phenomena and processes applicable to the removal of impurities from water, wastewater, and industrial wastes, and to their transformation in receiving waters. Analysis and design of treatment processes and systems. Residuals control and treatment. Pertinent laboratory studies.

E716 Biological Phenomena and Processes

Spring. 4 credits. 3 lec, 1 lab. Prerequisite: E715 or permission of instructor.

J. M. Gossett.

Theoretical and engineering aspects of biological phenomena and processes applicable to the removal of impurities from water, wastewater, and industrial wastes, and to their transformation in receiving waters. Biokinetic analysis and design of biological treatment process. Pertinent laboratory studies.

E791 Design Project in Sanitary Engineering

On demand. Variable credit. Prerequisite: E301 or equivalent.

Staff.

The student will elect or be assigned a problem in the design of water or wastewater treatment processes or plants or wastewater disposal systems; or a laboratory project.

E792 Sanitary Engineering Research

On demand. Variable credit. Prerequisites will depend on the particular investigation to be undertaken.

Staff.

For the student who wishes to study a problem in greater depth than is possible in formal courses. Study may be any combination of literature, laboratory, or computational research.

E794 Special Topics in Sanitary Engineering

On demand. Credit variable.

Hours variable. Staff.

Supervised study in special topics not covered in formal courses.

F. Transportation

F620 Transportation Engineering Fall.

3 credits.

G. P. Fisher.

Suitable foundation for advanced courses.

Introduction to technological, economic, and social aspects of transportation. Quantitative planning and operational models, especially for trip generation, distribution, assignment, and modal choice. Urban transportation; institutional and policy issues; terminals; traffic flow theory; traffic engineering; human factors.

F621 Urban Transportation Planning Fall.

4 credits.

A. H. Meyburg, A. J. Richardson.

The urban transportation problem; its roots, manifestations, and implications; the systems analysis approach to transportation; the demand and supply side of transportation; the urban transportation planning process and its modeling components; generation and evaluation of alternatives. A laboratory period is designed for study-team research.

F623 Travel Demand Theory and Applications

Spring, alternate years. 3 credits. Prerequisites: B301 and F621, or permission of instructor.

F. J. Cesario.

Advanced instruction in aggregate and disaggregate travel demand modeling. Emphasis is on new techniques and on directions for future research.

F624 Transportation Systems Analysis Spring.

3 credits. Prerequisites: F621, OR&IE 260, and OR&IE 320, or permission of instructor. Offered in alternate years. May not be offered 1978-79.

F. J. Cesario.

Application of optimization and simulation techniques in the analysis, planning, and design of transportation facilities for the movement of people and goods. Includes elements of traffic flow theory.

[F640 Traffic Flow Theory Spring. 3 credits.

Prerequisites: F621 and OR&IE 260. Not offered 1978-79.

F. J. Cesario.

Study of mathematical theories of traffic flow. Microscopic models (car-following models). Macroscopic models (kinematic wave theory). Probability models for traffic lights and optimal control of signalized intersections. Traffic flow on transportation networks. Simulation methods.]

[F641 Airport Planning and Operations Spring.

3 credits. Not offered 1978-79.

A. H. Meyburg.

The role of air travel within the overall transportation system, terminal access, location and site selection, terminal design and operations, metropolitan air transit systems; environmental impact of airport location, air traffic flow analysis, air traffic control, aircraft technology.]

F643 Operations, Design, and Planning of Public Transportation Systems

Spring. 3 credits.

A. H. Meyburg.

A study of mass transportation of the past and present, innovative forms of mass and individual transportation in urban areas. The financing and organization of mass transportation; the "free transit" versus fares dilemma. Planning for mass transportation: special applications, implementation of plans, planning transportation in new towns.

[F644 Transportation Systems Evaluation Fall.

3 credits. Prerequisite: B301, F621, or equivalent. Not offered 1978-79.

F. J. Cesario.

Economic evaluation of transportation systems and facilities. Basic principles of welfare economics. Elements of benefit-cost analysis applications.]

F645 Freight Transportation Spring. 3 credits.

A. H. Meyburg, G. P. Fisher.

Transportation planning methodology for inter- and intraurban freight movements. Relationship to the urban transportation planning process. Problem identification, solution strategies, analysis techniques. Freight demand analysis. Alternative technologies in view of energy, efficiency, and environmental impacts.

F646 Transportation Economics Fall. 3 credits.

Prerequisite: B301 or equivalent.

F. J. Cesario.

Economic characteristics of alternative modes of transportation and elements of competition among them. Principles of pricing, regulation, and investment. Alternatives for national transportation policy.

F791 Transportation Design Project On

demand. Credit variable.

Staff.

Design or feasibility study of transportation systems, supervised by one or more faculty advisers. Individual or group participation.

F792 Transportation Research On demand.

Credit variable.

Staff.

In-depth investigation of a particular transportation planning or engineering problem mutually agreed upon between the student and one or more faculty members.

F793 Transportation Colloquium Fall or spring.

1 credit.

Lectures in various topics related to transportation planning and analysis.

F794 Special Topics in Transportation On

demand. Credit variable.

Staff.

Individual or small-group study of one or more specialized topics not covered in regular courses.

G. Structural Engineering

G301 Structural Engineering I Fall. 4 credits.

3 lec, one 2-hour lab. Evening exams. Prerequisite: T&AM 202.

T. Peköz.

Fundamental concepts of structural engineering. Behavior, analysis, design, structural planning. Loads, structural form, statically determinate analysis, approximate analysis of indeterminate systems. Behavior and design of steel and concrete members.

G302 Structural Engineering II Spring.

4 credits. 3 lec, one 2-hour lab. Evening exams. Prerequisite: G301.

A. R. Ingraffea.

Fundamentals of statically indeterminate structures. Virtual work, flexibility and stiffness methods, moment distribution, applications to practical structures.

G303 Structural Engineering III Fall. 4 credits.

Prerequisites: G302 and G351 (may be concurrent), or permission of instructor. Evening exams.

Continues the study of the behavior and design of steel and concrete. Structural elements, connections, and systems.

G304 Structural Engineering IV Spring.

3 credits. Prerequisite: G303.

Intended to develop an understanding of the structural design process. Comprehensive design project, drawing on material from previous courses in structures, foundations, and materials.

G305 Structural Behavior Laboratory Spring. 2 credits. To be taken with G302 or G304. A lab course on behavior of structures, utilizing small-scale models. Elastic, inelastic, and nonlinear behavior of structural components and systems. Projects.

G351 Engineering Materials Fall. 3 credits. 2 lec, 1 lab.
F. O. Slate.
Engineering properties of concrete, steel, wood, and other structural materials. Design characteristics and significance of test results of materials used in engineering works. Extensive laboratory testing and report writing.

G610 Fundamentals of Structural Mechanics Fall. 3 credits. Prerequisite: G303 (may be taken concurrently).
J. F. Abel.
Theory of elasticity, energy principles, plate flexure, failure theories, inelastic stress-strain relationships.

G612 Advanced Structural Analysis Fall. 3 credits. Prerequisites: G302, computer programming.
A. R. Ingraffea.
Direct stiffness and flexibility methods in matrix formulation, use of standard analysis programs, error detection, substructuring, and special analysis procedures.

G614 Structural Model Analysis and Experimental Methods Fall. 3 credits. 2 lec, 1 lab. May not be offered 1978-79.
R. N. White.
Dimensional analysis and similitude. Model materials, fabrication, loading, and instrumentation techniques. Experimental stress analysis.

G652 Advanced Plain Concrete Spring. 3 credits. 2 lec, conf. Prerequisite: G351 or equivalent.
F. O. Slate.
Topics such as history of cementing materials, air entrainment, light-weight aggregates, petrography, durability, chemical reactions, properties of aggregates, and construction. Relationships among internal structure, physical properties, chemical properties, and mechanical properties.

[G653 Structure and Properties of Materials Spring. 3 credits. 2 lec, conf. For graduate students in engineering or physical sciences, or undergraduates by permission of instructor. Offered in alternate years. Not offered 1978-79.
F. O. Slate.
Internal structure from amorphous to crystalline state. Forces holding matter together versus forces causing deformation and failure. Correlation of internal structures with physical and mechanical properties. Applications to various engineering materials.]

G654 Low-cost Housing Primarily for Developing Nations Spring. 3 credits. 2 lec, conf. Offered in alternate years.
F. O. Slate.
A multidisciplinary course. Students do intensive study, usually in their own discipline, for a term project, while also being introduced to problems and approaches of other disciplines. Engineers investigate the technological aspects of the subject and other aspects that influence technological decisions, such as cultural and economic factors.

[G655 Low-cost Housing for Developing Nations—Workshop for Physical Planning, Site Selection, and Design Spring. Offered in alternate years. Not offered 1978-79.
F. O. Slate.

For a mixed class of advanced civil engineering and architecture students. Discussions and workshops on physical planning, site selection, choice of materials, and detailed design of individual structures and groupings.]

G690 Planning of Structural Systems Fall. 3 credits. Prerequisite: G302. May not be offered 1978-79.
T. Peköz.
Functional, structural, and other considerations in the planning and selection of structural systems. Preliminary design—estimating overall dimensions and weights, proportioning of members and joints, and optimization. Preliminary analysis of frames, trusses, plates, and shells. Erection, construction, and stress control considerations. Case studies with the participation of practicing engineers.

G693 Structural Engineering Seminar Fall or spring. 1 credit. Open to qualified seniors and graduate students.
Presentation of topics of current interest in the field of structures.

G711 Stability: Theory and Design Spring. 3 credits.
T. Peköz.
Analysis of elastic and plastic stability. Determination of buckling loads and postbuckling behavior of columns. Solid and open web columns with variable cross section. Beam columns. Frame buckling. Torsional-flexural buckling. Lateral buckling of beams. Buckling loads and postbuckling behavior of plates, shear webs, and shells. Critical discussion of current design specification.

G713 Finite Element Analysis Spring. 3 credits. Prerequisite: G610 and G612.
J. F. Abel.
Theoretical and conceptual bases for finite elements in structural mechanics. Development of element-relationships and system solution techniques for analysis of bars, beams, planar structures, solids, plates, and shells.

[G715 Probabilistic Concepts in Structural Engineering Spring. 3 credits. Prerequisite: G303. Offered in alternate years. Not offered 1978-79. Probabilistic models, reliability, inference, decision analysis, design codes, second moment approaches.]

G716 Prestressed Concrete Structures Fall. 3 credits. 3 lec. Prerequisite: G303; G304 recommended.
A. H. Nilson.
Behavior, analysis, design of pretensioned and posttensioned prestressed concrete structures. Partial prestressing. Strength, serviceability, structural efficiency of beams, slabs, tension and compression members, frameworks, bridges.

G717 Advanced Reinforced Concrete Spring. 3 credits. 3 lec. Prerequisite: G303; G304 recommended.
Behavior, analysis, design of reinforced concrete structures. Strength, safety, serviceability, structural efficiency. Beams, columns, slabs, frameworks, composite members, ground-supported slabs, shear walls, deep beams, folded plates.

G718 Advanced Design of Metal Structures Fall. 3 credits. Prerequisite: G303.
W. McGuire.
Behavior and design, with emphasis on connections, plate girders, and cold-formed steel structures. Torsion of steel members.

G719 Advanced Behavior of Metal Structures Spring. 3 credits. Prerequisite: G303. May not be offered 1978-79.

Behavior of beams, beam-columns, and single and multistory frames. Analysis and design of tall building systems. Cable-supported structures. Fatigue and fracture.

[G720 Shell Theory and Design Spring. 3 credits. Not offered 1978-79. Fundamentals of practical shell theory. Differential geometry of surfaces; membrane and bending theory of shells; analysis and design of cylindrical shells, polygonal domes, and paraboloids.]

G722 Structural Design for Dynamic Loads Spring. 3 credits.
P. Gergely.
Analysis, design, and behavior of structures subjected to dynamic effects, with emphasis on earthquake-resistant design.

[G732 Optimum Structural Design Fall. 3 credits. Offered in alternate years. Not offered 1978-79. Design of minimum weight or cost structures. Includes fully-stressed design, classical minimization procedures, and mathematical programming methods.]

G733 Numerical methods in Structural Engineering Fall. 3 credits. Prerequisite: G610 and G612. Offered in alternate years.
J. F. Abel.
Numerical techniques for structural and geotechnical engineering, such as residual, variational, finite-difference, and finite-element methods. Selected numerical analysis topics and solution algorithms with emphasis on linear equations and eigenvalue problems.

[G734 Advanced Topics in Finite Element Analysis. Fall. 3 credits. Prerequisite: G713. Offered in alternate years. Not offered 1978-79.
J. F. Abel.
Lectures and colloquia on selected advanced topics and research in progress, including dynamics, nonlinear analysis, shells, fracture mechanics, fluid dynamics, and computer graphics.]

G757 Civil and Environmental Engineering Materials Project On demand. 1-3 credits.
F. O. Slate.
Individual projects or reading and study assignments involving engineering materials.

G791 Design Project in Structural Engineering Fall or spring. Credit variable.
Students may elect to undertake a design project in structural engineering. The work is supervised by a professor in this subject area.

G792 Research in Structural Engineering On demand. Credit variable.
Hours variable. Staff.
Pursuit of a branch of structural engineering further than can be done in regular courses. Theoretical or experimental investigation of suitable problems.

G794 Special Topics in Structural Engineering On demand. Credit variable.
Hours variable. Staff.
Individually supervised study, or independent design or research, in specialized topics not covered in regular courses.

G801 Thesis Fall and spring. 1-4 credits.
A thesis research topic is selected by the student with the advice of the faculty member in charge, and is pursued either independently or in conjunction with others working on the same topic. Registration for credit must be done with the professor at the start of each term.

H. Water Resources Planning and Analysis

H615 Water Resources Problems and Policies Fall. 3 credits. Lec-disc. Prerequisite: permission of instructor. Intended primarily for graduate engineering and nonengineering students but open to qualified upperclass students.

L. B. Dworsky.
Historical and contemporary perspectives of water problems, organization, and public policies.

H616 Water Resources Planning Seminar Spring. 3 credits. Prerequisite: H615 or permission of instructor.

L. B. Dworsky.
The concepts, processes, and techniques of regional, multipurpose river-basin planning and development. The case study method, including the preparation of an integrated, comprehensive report for the study area.

H624 Stochastic Hydrologic Modeling Fall. 3 credits. Prerequisite: OR&IE 260.

J. R. Stedinger.
Develops statistical techniques in time and frequency domain used to analyze and model stochastic processes. Lectures examine Box-Jenkins, fractional-Brownian noise and other streamflow models, drought and flood frequency estimation, parameter estimation in dynamic systems, and analysis of simulation output.

H626 Water Quality Modeling Spring. 3 credits. Prerequisites: Math 294, and B303 or Ag En 475.

C. A. Shoemaker, D. A. Haith.
Predictive models of the behavior of biological and chemical substances in bodies of water and in surface runoff. Regional management of water quality.

H628 Water Resources Systems Planning I Fall. 3 credits. Prerequisite: B303 or equivalent.

D. P. Loucks.
Application of deterministic optimization and simulation techniques in water resources planning. River-basin modeling, including irrigation planning and operation, hydropower capacity development, flow augmentation, and flood control and protection.

H629 Water Resource Systems Planning II Spring. 3 credits. Prerequisite: H628 and H624 or consent of instructor.

D. P. Loucks.
Optimization and simulation methods for water resource planning under hydrological, technological, and political uncertainty. Concepts of system reliability, vulnerability, resilience, stability, and robustness.

K. Professional Practice

K301 Numerical Solutions to Civil Engineering Problems Fall. 3 credits.

Introduction to numerical and computer methods through consideration of typical problems drawn from a number of disciplines within civil and environmental engineering. Topics include computer use, computer programming, data handling, numerical analysis, and the role of computing in the CE profession.

K502 Civil and Environmental Engineering Practice On demand. 3 credits. For seniors and graduate students.

Analysis of large engineering works using case studies. Project organization, planning, feasibility, finances. Social and political implications.

K510 Civil and Environmental Engineering Design Project I Fall. 3 credits. Normally required for students in the M.Eng. (Civil) program.

School faculty and visiting engineers.
Design of major civil engineering project. Planning and preliminary design in fall term; final design in January intersession (K511).

K511 Civil and Environmental Engineering Design Project II Spring (work done during January intersession). 3 credits. Normally required for students in the M.Eng. (Civil) program.

Prerequisite: K510.
School faculty and visiting engineers.
Continuation of K510.

K520-521 Professional Practice in Engineering Fall. 3 credits. Required for and limited to students in the M.Eng. (Civil) program.

W. R. Lynn.
Introduction to nontechnical aspects of engineering practice: legal, financial, social, and ethical aspects; personnel management; communications; professional organizations.

[K531 Engineering Ethics Spring. 3 credits. For candidates for the professional Master of Engineering (Civil) degree, and others with permission of instructor. Not offered 1978-79. Introduction to ethical issues arising in the discharge of the professional engineer's obligations to clients and to the public. Systematic analysis of the implications of these issues in realistic engineering situations. Topics to be selected from the literature and from the experience of engineers and of students.]

K801 Thesis Fall and spring. 1-4 credits.

A thesis research topic is selected by the student with the advice of the faculty member in charge, and is pursued either independently or in conjunction with others working on the same topic. Registration for credit must be done with the professor at the start of each term.

Computer Science

J. Hartmanis, chairman; G. R. Andrews, R. S. Cartwright, R. L. Constable, R. W. Conway, A. J. Demers, J. E. Dennis, Jr., J. E. Donahue, D. J. Gries, F. Luk, J. E. Hopcroft, G. Salton, F. Schneider, R. Teitelbaum, C. F. Van Loan, J. H. Williams

At Cornell computer science is concerned with fundamental knowledge in automata, computability, programming languages, and systems programming, as well as with subjects (such as numerical analysis and information processing) that underlie broad areas of computer applications. Because of the wide implications of research in the field, the Department of Computer Science is organized as an intercollege department in the College of Arts and Sciences and the College of Engineering.

Bachelor of Science

College Program in Computer Science

Although the department teaches a comprehensive set of undergraduate courses, there is no undergraduate field program in computer science in the College of Engineering. To major in computer science the student may use the College Program leading to the degree of Bachelor of Science (see the introductory section under College of Engineering for a description of the College Program).

Master of Science and Doctor of Philosophy

Programs in the graduate Field of Computer Science are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

100 Introduction to Computer Programming Fall or spring. 3 credits. S-U grades optional. 2 lec, 1 rec (optional), 4 evening tests. Students who contemplate taking both 101 and 100 must take 101 first.

An introduction to elementary computer programming concepts. Emphasis is on techniques of problem analysis, algorithm and program development, and program testing. The principal programming language for the course is PL/I; FORTRAN is also introduced and is used for final problems. Normal computer processing is with the IT batch system, but students can elect to use interactive terminals under the SCMS-PL/CT system. The course does not presume any previous programming experience, but a special elective section for the first three weeks accommodates students with some previous exposure to computing. The course requires no mathematical background; for the last six weeks separate sections are offered for the mathematically and nonmathematically-oriented students.

101 The Computer Age Spring. 3 credits. S-U grades optional. 2 lec, 1 rec. Credit will not be granted for both 100 and 101 unless 101 is taken first. Credit will not be granted for both 100 and 101 unless 101 is taken first.

Nontechnical introduction to computers and computing. Topics include the history of computation; computer applications in business, medicine, law, education, the humanities, and science; computer music, art, and graphics; the issues of privacy and machine intelligence. Each student has the opportunity to write a term paper about the use of computers in his or her field of study. The rudiments of PL/I are covered, although not in as much depth as in 100. Students write several computer programs and gain experience using various application packages.

102 Introduction to FORTRAN Programming Fall or spring (weeks 1 to 5 only). 1 credit. S-U grades optional. Credit will not be granted for both 100 and 102 unless 102 is taken first.

Elementary programming concepts. Laboratory problems using FORTRAN IV language.

104 Introduction to APL Programming Fall or spring (weeks 2 to 5 only). 1 credit. S-U grades optional. Introduction to interactive terminal computing using the APL language.

107 Introduction to Interactive Computing with CMS Fall or spring. (weeks 2 to 5 only). 1 credit. S-U grades only.

Concepts of interactive computing, using the editor, data management, utility commands, remote job submission, interactive language processors, and the EXEC facility.

108 Introduction to Statistical Packages Fall or spring (weeks 10 to 13 only). 1 credit. S-U grades only.

Discussion of the wide range of procedures and data transformation facilities provided by statistical program packages. Topics covered include data preparation and formatting, program control cards, JCL, and hints for debugging.

109 Multistep Job Processing and JCL Fall or spring (weeks 6 to 9 only). 1 credit. S-U grades only. Outline of HASP and OS systems currently implemented. Topics include job control language for using tapes, disks, catalogued procedures and symbolic parameters, and HASP commands for special processing.

211 Computers and Programming Fall or spring. 3 credits. 2 lec, 1 lab, 2 evening quizzes. Prerequisite: 100 or equivalent programming experience.

Intermediate programming in PL/I: procedures, block structure, on conditions, recursion. Introduction to basic data structures and program analysis. Programming assignments for a variety of applications.

280 Discrete Structures Fall. 4 credits. 3 lec. Prerequisite: 211 or permission of instructor. Mathematical aspects of programming and computing. Induction, logical proof, and discrete structures used in programs. Introducing recursive functions, relations, homomorphisms, partially ordered sets, the predicate calculus, and concepts from automata and computability theory.

305 Computers and Society Fall. 3 credits. 2 lec-seminars. The economic, political, and cultural impact of computers and computer-related technology. The cashless society, systems approach to social problems, law enforcement, political campaigns, data banks and privacy, education, machine creativity, and machine intelligence.

314 Introduction to Computer Systems and Organization Fall or spring. 4 credits. 2 lec, 1 lab. Prerequisite: 211 or equivalent. Logical structure of digital computers: representation of information, addressing mechanisms, storage and peripheral hardware, the input-output channel.

321-322 Introduction to Numerical Analysis 321, fall; 322, spring. 4 credits each term. 3 lec. Prerequisites: 321, Math 293 or 221; 322, Math 294 or 222; also, and knowledge of a programming language such as FORTRAN, ALGOL, or PL/I. Students solve representative problems by programming appropriate algorithms and using library programs. Numerical methods for systems of linear equations, integration, eigenvalues, spline, interpolation; differentiation, least squares. Numerical solution of differential equations and nonlinear equations in several variables.

410 Data Structures Fall. 4 credits. 3 lec. Prerequisite or concurrent registration: 314. Lists, trees, graphs, arrays, and other forms of data structure and their implementation. Relation between language and data structure (e.g., introduction to LISP). Dynamic storage allocation and memory management. Searching and sorting methods.

414 Systems, Programming, and Operating Systems Spring. 4 credits. 3 lec. Prerequisite: 314 or permission of instructor. The logical design of systems programs with emphasis on multiprogrammed operating systems. Input-output methods, interacting processes, storage management, sharing, file systems. Case studies. Project to implement a small system.

432 Simulation and File Processing (also OR&IE 383) Spring. 4 credits. 2 lec, 1 rec. Prerequisite: 211. First third of course concerns use of computer for discrete simulation of complex systems. Balance of course is introduction to the problems, techniques, and languages of file and data-base processing. Substantial programming exercises are involved.

481-482 Introduction to Theory of Computing I, II 481, fall; 482, spring. 4 credits each term. 3 lec. Prerequisites: 211 and 280 or equivalent mathematics, or permission of instructor. Introduction to modern theory of computing. Covers automata theory, formal languages, effective computability, computational complexity, analysis of algorithms.

490 Independent Reading and Research Fall or spring. 1-4 credits. Independent reading and research for undergraduates.

600 Computer Science and Programming Fall. 1 credit. Prerequisite: graduate standing in computer science or permission of instructor. Introduction to practical, modern ideas in programming methodology. Covers style and organization of programs, basic techniques for presenting proofs of correctness of programs, the use of a "calculus" for the derivation of programs, analysis of the computational complexity of programs, and related topics.

611 Advanced Programming Languages Fall. 4 credits. 3 lec. Prerequisite: 410 or equivalent. Formal specification of programming languages, including LISP, ALGOL 60, and PL/I, Principles of structure and design and recent developments in programming languages, including ALGOL 68. Introduction to program schemata and semantics and their application in classifying and comparing programming languages.

612 Translator Writing Spring. 4 credits. 3 lec. Prerequisite: 410 and 481 or permission of instructor. Discussion of the models and techniques used in the design and implementation of compilers. Topics include lexical analysis in translators, compilation of arithmetic expressions and simple statements, specifications of syntax, algorithms for syntactic analysis, code generation and optimization techniques, bootstrapping methods, translator writing systems.

613 Operating Systems Principles Fall. 4 credits. 3 lec. Prerequisite: 410 and 414 or permission of instructor. Advanced techniques and models of operating systems. Synchronization of concurrent processes. Deadlock. Verification. Models of paging algorithms and program behavior. Scheduling: queueing models and deterministic models. Protection and security.

[615 Machine Organization Spring. 4 credits. 3 lec. Prerequisite: 314 or permission of instructor. Not offered 1978-79.]

[618 Picture Processing Spring. 4 credits. 3 lec. Prerequisite: 611 or permission of instructor. Not offered 1978-79.]

621-622 Numerical Analysis 621, fall; 622, spring. 4 credits each term. 3 lec. Prerequisites: Math 411 and knowledge of a programming language such as FORTRAN, ALGOL, or PL/I, or permission of instructor. A more thorough treatment of the material of 321-322, at a faster pace, and covering additional topics. Emphasis on algorithms appropriate for use with computers.

632 File Processing (also OR&IE 682) Fall. 4 credits. 2 lec. Prerequisite: 211. Concerned with problems of design, implementation, and operation of data-base systems.

635 Information Organization and Retrieval Spring. 4 credits. 2 lec. Prerequisite: 410 or equivalent. Introduction to information retrieval, file organization and search algorithms. Statistical analysis and automatic classification of information. Structural language analysis. Dictionary techniques. Interactive retrieval. Questioning and answering and data-base retrieval. Evaluation of retrieval effectiveness.

681 Theory of Algorithms and Computing I Fall. 4 credits. 3 lec. Prerequisite: 482 or permission of instructor. Computational models, measures of complexity, analysis of algorithms, arithmetic complexity, lower bounds, reducibilities, polynomial complete problems.

682 Theory of Algorithms and Computing II Spring. 4 credits. 3 lec. Prerequisite: 481 or permission of instructor. Advanced treatment of theory of computation and computational complexity theory.

709 Computer Science Graduate Seminar Fall or spring. 1 credit. 1 seminar. For graduate students interested in computer science. Staff, visitors, and students. A weekly meeting for the discussion and study of important topics in the field.

711 Theory of Programming Languages Spring. 4 credits. 2 lec. Prerequisites: 611 and 481. Offered in alternate years. Advanced topics in formal semantics. Topics may include mathematical semantics, program verification systems, application of formal semantics to language design, variable-free languages, correctness of implementations.

[712 Theoretical Aspects of Compiler Construction Spring. 4 credits. 2 lec. Prerequisites: 612 and 481. Offered alternate years. Not offered 1978-79. Formal methods of syntactic analysis including precedence, bounded context, and LR techniques. General parsing methods and their time-space complexity. Noncanonical parsing techniques. Formal methods of object code optimization.]

719 Seminar in Programming Fall or spring. 4 credits. 1 seminar. Prerequisite: 611 or permission of instructor.

721 Solutions of Nonlinear Equations and Nonlinear Optimization Problems Fall. 4 credits. Prerequisite: 622 or permission of instructor. Emphasis on the rigorous analysis of practical numerical algorithms for nonlinear problems. Sample topics are: nonlinear functional analysis, constrained and unconstrained minimization, and computationally convenient modifications of Newton's method, including quasi-Newton and penalty function methods and nonlinear least squares.

[723 Numerical Solution of Ordinary Differential Equations and Integral Equations Fall. 4 credits. Prerequisite: 622 or permission of instructor. Not offered 1978-79.]

[725 Numerical Solution of Partial Differential Equations Spring. 4 credits. Prerequisite: 622 or permission of instructor. Hours to be arranged. Not offered 1978-79. General classification, solution by method of characteristics, finite-difference methods for hyperbolic and elliptic equations, parabolic equations in two dimensions, direct solution of elliptic finite-difference equations, iterative methods for the solution of elliptic equations, block methods for large systems, singularities in elliptic equations, stability in relation to initial value problems, and nonlinear discretization algorithms.]

[727 Introduction to Approximation Theory Spring. 4 credits. Prerequisite: 622 or permission of instructor. Not offered 1978-79.]

729 Seminar in Numerical Analysis Fall or spring. 4 credits. Prerequisite: permission of instructor.

[735 Selected Topics in Information Processing (also OR&IE 789) Not offered 1978-79.]

734 Seminar in File Processing Fall. Credit and hours to be arranged. Prerequisite: 733.

739 Seminar in Information Organization and Retrieval Fall or spring. 4 credits. Prerequisite: 635.

781 Advanced Theory of Computing Fall. Alternates with 782. 4 credits. Prerequisites: 681 and 682, or permission of instructor. Not offered 1978-79. At instructor's discretion, advanced topics, possibly including automata, computability, computational complexity, program schemata, semantics, and analysis of algorithms.]

782 Advanced Theory of Computing Spring. Alternates with 781. 4 credits.

789 Seminar in Automata Theory Fall or spring. 4 credits. 1 seminar. Prerequisite: permission of instructor.

790 Special Investigations in Computer Science Fall or spring. Prerequisite: permission of a computer science adviser. Independent research.

890 Special Investigations in Computer Science Fall or spring. Prerequisite: permission of a computer science adviser. Master's degree research.

990 Special Investigations in Computer Science Fall or spring. Prerequisite: permission of a computer science adviser. Doctoral research.

Term 7
 Ele E elective† 3 or 4
 Ele E elective with laboratory 3 or 4
 Technical elective 3
 Free elective 3
 Liberal studies elective 3

Term 8
 Ele E elective† 3 or 4
 Ele E elective with laboratory 3 or 4
 Technical elective 3
 Free elective 3
 Liberal studies elective 3

*Satisfactory completion of Ele E 230 as a core science in the Division of Basic Studies allows for the substitution of a technical elective for this requirement.

†One Ele E elective must be selected from among 302, 304, 310, or 407. One Ele E elective must be selected which has either 302, 304, 306, or 310 as a prerequisite.

Specialization is achieved through the four senior-year electrical engineering electives, which are selected from more than sixty offerings of the school. With the approval of his or her faculty adviser, a student with special career goals may substitute appropriate technical or professional electives for two electrical engineering electives.

A brochure describing the field program and concentrations in detail may be obtained from the School of Electrical Engineering, Phillips Hall.

integration to system response. Stability criteria. Transmission line transients. Fourier series and integrals. Discrete and Fast Fourier transforms. Sampling.

303 Electromagnetic Theory I Fall. 4 credits. 3 lec, 1 rec-computing session. Prerequisites: Phys 214 and Math 294.

Foundation of electromagnetic theory. Topics include Maxwell's equations; boundary conditions and the Laplace equation; plane waves, wave propagation and reflection at boundaries, the Poynting theorem; guided TEM, TM, and TE waves, impedance transformation. Introduction to simple antenna systems.

304 Electromagnetic Theory II Spring. 4 credits. 3 lec, 1 rec-computing session. Prerequisites: 301 and 303.

Fundamentals of electromagnetic theory with emphasis on wave propagation and guidance, radiating systems, and the effects of the medium on transmission. Topics include retarded potentials; relation of radiation fields to source distributions, antenna gain concepts and techniques in antenna design; wave guide systems, separation of variables, cavities, and losses; propagation in inhomogeneous and anisotropic media, complex permittivity, plasma and magnetic field effects.

306 Fundamentals of Quantum and Solid-State Electronics Spring. 4 credits. 3 lec, 1 rec-computing session. Prerequisites: Phys 234, Math 294, and coregistration in 303.

Introductory quantum mechanics and solid-state physics necessary for understanding lasers and modern solid-state electronic devices. Quantum mechanics will be presented in terms of wave functions, operators, and solutions of Schroedinger's equation. Topics will include tunneling, atomic structure and the periodic table, electron statistics, and the physics underlying energy bands in solids. Applications will emphasize p-n junctions, solid-state diodes and other devices.

310 Probability and Random Signals Spring. 4 credits. 3 lec, 1 rec-computing session.

Introduction to modeling random phenomena and signals and applications of these models. Topics include: concepts of probability, conditional probability, independence, random variable, expectation, random process; applications to problems of inference, estimation, linear system response drawn from the areas of communications, computers, control, and pattern classification.

315 Electrical Laboratory I Fall. 4 credits. 2 lec, 2 labs. Prerequisites: 210 and coregistration 301.

Basic electrical and electronic instrumentation and measurements involving circuits and fields of both active and passive elements; an experimental introduction to solid-state theory and devices.

316 Electrical Laboratory II Spring. 4 credits. 2 lec, 2 labs. Prerequisites: 303 and 315.

Laboratory studies of solid-state phenomena and devices; experiments illustrating the use of the digital computer in electrical engineering; laboratory studies of high-frequency phenomena and devices; an introduction to ac and dc machinery.

407 Quantum Mechanics and Applications Fall. 4 credits. 3 lec, 1 rec-computing session. Prerequisite: 306.

A continuation of the presentation of quantum mechanical theory. Topics will include the solution to the harmonic oscillator with application to molecular structure, addition of angular momentum and multiplet structure, time-independent and time-dependent perturbation theory. Applications will include electrons in a periodic structure, emission and absorption of radiation, and black-body radiation.

Electrical Engineering

G. C. Dalman, director; J. L. Rosson, associate director; P. D. Ankrum, J. M. Ballantyne, T. Berger, H. D. Block, R. Bolgiano, Jr., N. H. Bryant, R. R. Capranica, H. J. Carlin, L. F. Eastman, W. H. Erickson, D. T. Farley, T. L. Fine, J. Frey, D. W. Hammerstrom, W. J. Heetderks, M. C. Kelley, M. Kim, W. H. Ku, C. A. Lee, R. L. Liboff, S. Linke, R. A. McFarlane, H. S. McGaughan, P. R. Mclsaac, J. A. Nation, B. Nichols, E. Ott, C. Pottle, R. N. Sudan, C. L. Tang, R. J. Thomas, J. S. Thorp, H. C. Torng, N. M. Vrana, C. B. Wharton, G. J. Wolga

Bachelor of Science

Reflecting the large scope of this engineering discipline, the undergraduate Field Program in Electrical Engineering provides a broad foundation in a number of important areas in addition to specialization in one or more.

Students can choose, for example, to concentrate in bioengineering; computer engineering; control systems; electronic circuit design; information, communications, and decision theory; microwave electronics; plasma physics; power and energy systems; quantum and optical electronics; radio and atmospheric physics; or semiconductor devices and applications.

Required courses are included in the following standard curriculum for the field program:

<i>Term 5</i>	<i>Credits</i>
Ele E 301, Electrical Signals and Systems I	4
Ele E 303, Electromagnetic Theory I	4
Ele E 315, Electrical Laboratory I	4
Ele E 230, Introduction to Digital Systems*	3
Liberal studies elective	3
<i>Term 6</i>	
Ele E 306, Fundamentals of Quantum and Solid-State Electronics	4
Ele E 316, Electrical Laboratory II	4
Ele E elective†	4
Ele E elective†	3 or 4
Liberal studies elective	3

Master of Engineering

The degree of M.Eng. (Electrical) prepares the student either for professional work in this area of engineering or for more advanced graduate study in the doctoral program. The M.Eng. differs from the M.S. program mainly in its emphasis, which is on design capability rather than research. The thirty-credit M.Eng. (Electrical) curriculum includes two two-term course sequences in electrical engineering and the design project, which gives three to twelve credits. General admission and degree requirements are described in the introductory section under College of Engineering.

Master of Science and Doctor of Philosophy

Descriptions of the M.S. and Ph.D. degree programs are given in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

210 Introduction to Electrical Systems Fall or spring. 3 credits. 3 lec-rec. Prerequisites: Math 192 and Phys 112.

An engineering core science. See description under Division of Basic Studies.

230 Introduction to Digital Systems Fall or spring. 3 credits. 2 lec, 5 lab experiments.

An engineering core science. See description under Division of Basic Studies.

301 Electrical Signals and Systems I Fall. 4 credits. 3 lec, 1-rec-computing session.

Prerequisites: 210 and Math 294 or equivalents. Formulation of circuit equations, steady-state response. Laplace transform and applications, system functions. State description of linear systems. Natural modes, initial conditions, forced response. Two-port circuit descriptions. Models for active circuits.

302 Electrical Signals and Systems II Spring. 4 credits. 3 lec, 1 rec-computing session.

Prerequisite: 301. Single-sided and bilateral Laplace transforms. Applications of complex functions and contour

430 Introduction to Lasers and Optical

Electronics Spring, 4 credits. 2 lec, 1 lec-rec, 1 lab. Prerequisite: 306 or equivalent (such as Phys 443).

G. J. Wolga.

An introduction to stimulated emission devices such as masers, lasers, and optical devices based on linear and nonlinear responses to coherent fields. Material discussed, based on quantum mechanical results, will employ phenomenological theories and will stress applications to modern devices. Discussions of applications will include the operating principles of a variety of important lasers, crystal optics with application to electrooptic modulators, and an introduction to integrated optics. Labs present an opportunity to work with a variety of the lasers discussed in lectures.

434 Physical Electronics of Solids

Fall, 4 credits. 3 lec, 1 rec. Prerequisites: 306 and 304 or 407 or consent of instructor.

Topics include crystal symmetry and effects on device processing and operation; lattice vibrations; energy bands and their effects on device design and operation; hot-electron effects; transport of electrons and holes; optical properties; magnetic properties. These topics are discussed in terms of their influence on the operation of solar cells, photocathodes, microwave semiconductor devices, junction lasers and LEDs, and bubble and charge-control memories.

480 Thermal and Statistical Physics for Engineers

Fall, 3 credits. Prerequisite: Phys 214.

R. Liboff.

Thermodynamic principles. Elementary theory of transport coefficients. Electrical noise. Quantum and classical statistics. Black body radiation. Thermal properties of solids. Elementary descriptions of the p-n junction, shock waves, superfluidity, superconductivity, and the laser.

499 Fundamentals of Acoustics (also T&M

666) Spring, 3 credits. 3 lec, biweekly lab.

See T&M 666 for course description.

531-532 Electronic Circuit Design

531, fall; 532, spring, 4 credits fall; 3 or 4 credits spring, 3 lec, 1 lab. Prerequisites: 230 and 316.

N. H. Bryant.

Design techniques for circuits used in electronic instrumentation. Circuits will be designed to provide specific functions, then constructed and tested in the laboratory. At the level of *Electronics for Scientists* by Malmstadt et al.

551 Electrical Machinery

Fall, 3 credits. 2 lec, 1 lab-computing session. Prerequisite: staff permission.

Theory, analysis, characteristics, operation, and applications of polyphase synchronous and asynchronous machines. Single-phase motors. Selsyn and other specialized machines.

581 Wave Phenomena in the Atmosphere

Fall, 3 credits. 3 lec-rec. Prerequisites: 301 and 304.

R. Bolgiano.

An elementary treatment of wave phenomena in the atmosphere of the earth, including gravity waves, planetary waves, acoustic waves, radiowaves, and plasma waves; attention is directed to the role of these phenomena in various atmospheric processes and engineering processes such as weather, diffusive transport, air-sea interaction, radio communication, and remote sensing.

591-592 Senior Project

591, fall; 592, spring, 3 credits.

Individual study, analysis, and, usually, experimental tests in connection with a special engineering problem chosen by the student after consultation with the faculty member directing the project; an engineering report on the project is required.

620 Bioelectric Systems (also Bio S 696)

Spring, 3 credits (optional 1-credit lab by permission). 3 lec. Prerequisite: 301 or Bio S 397 or 423.

M. Kim, R. Capranica.

Application of electrical systems techniques to biological problems. Electrical activity of nerve cells; generation and propagation of nerve impulse; voltage clamp technique and its use in phase-plane analysis; neuromuscular systems; synaptic transmission; models of nerve cell, sensory receptors, and encoding in nervous system; analysis of electrophysiological data; electrodes and instrumentation techniques.

621 Introduction to Biomechanics, Bioengineering, Bionics, and Robots (also T&M 681)

See T&M 681 for course description.

623 Active and Digital Network Design

Fall, 3 or 4 credits (4 credits with lab). 3 lec, 1 lab.

Prerequisite: 301.

W. H. Ku.

Design of passive filters and matching networks. Active filter design using operational amplifiers. Design of transistor amplifiers. Digital signal processing. Z-transform and discrete Fourier transform (DFT). Design of nonrecursive and recursive digital filters. Fast Fourier transform (FFT) algorithms.

624 Computer Methods in Electrical

Engineering Spring, 4 credits. Prerequisite: 301.

Modern techniques for solving electrical engineering problems on the digital computer. Emphasis on efficiency and numerical stability rather than on theoretical implications. Solution of linear and nonlinear algebraic equations; integration; solution of ordinary differential equations; random number generators. Applications to power systems, control systems, communication systems, and circuit design.

627 Fundamentals of Linear Networks

Fall, 4 credits. 3 lec. Prerequisite: 302.

H. J. Carlin.

Scattering and generalized network formalisms with applications. Nonreciprocal and active network properties. Applications of Tellegen's theorem. Passive and active network invariants applied to gain and stability problems.

628 Network Theory and Applications

Spring, 4 credits. 3 lec. Prerequisite: 302.

H. J. Carlin.

Circuit properties in complex frequency domain. Realizability theory. Insertion loss design of lumped and microwave filters, equalizers, and linear phase structures. Gain bandwidth theory for broadband matching and wideband amplifiers.

631-632 Semiconductor Electronics I and II

631, fall; 632, spring, 4 credits each term. 3 lec, 1 lab. Prerequisites: 306 and 316.

P. D. Ankrum.

Band theory of solids; properties of semiconductor materials; the physical theory of p-n junctions, metal semiconductor contacts, and p-n junction devices; fabrication and properties of semiconductor devices such as diodes and rectifiers, light-sensitive and light-emitting devices, field-effect and bipolar transistors, unijunction transistors, p-n-p-n devices (diodes, controlled rectifiers, and switches), integrated circuits, etc.; device equivalent-circuit models; the applications of semiconductor devices as active or passive elements in discrete-component and integrated circuits for use as power supplies, power controls, amplifiers, oscillators and multivibrators, pulse circuits, gates and switches, etc.; transistor noise. At the level of *Semiconductor Electronics* by Ankrum.

633 Solid-State Microwave Devices and

Subsystems I Fall, 3 credits. 2 lec, 1 lab.

Prerequisite: 304.

Theoretical and experimental studies of circuits, amplifiers, oscillators, detectors, receivers, and electrical noise at microwave frequencies. Typical topics: one- and two-port resonators; negative resistance amplifiers; oscillator load characteristics, locking and stabilization; microwave transistor amplifiers; intermodulation effects; resistor and shot noise; noise temperature, fm noise.

634 Solid-State Microwave Devices and

Subsystems II Spring, 3 credits. 2 lec, 1 lab.

Prerequisite: 633.

Basic theories of solid-state devices at microwave frequencies. Specific devices studied: varactors, avalanche diodes; transferred electron diodes; npn oscillator diodes; tunnel diodes; pin diodes; and microwave transistors. Studies of experimental methods of characterizing these devices include use of H.P. network analyzer and other microwave equipment.

635 Circuit Design for Integration

Fall, 3 credits. 2 lec, 1 lab. Prerequisite: permission of instructor.

Concepts of design and analysis of digital and linear circuits to be realized in silicon integrated circuit technology. Circuit design as both limited and facilitated by technology. Bipolar logic systems (ECL, TTL, and I^2L); MOS and CMOS logic systems, RAM and ROMs, and bipolar linear ICs, such as op amps and D/A converters. At the level of current papers in the *IEEE Journal of Solid-State Circuits*.

636 Integrated Circuit Technology

Spring, 4 credits. 2 lec, 1 lab. Prerequisite: 306 or MS&E 262 or permission of instructor.

Integrated circuit techniques applicable in the fields of computer hardware, telecommunication systems, and optoelectronics, with emphasis on device technology. Diffusion, oxidation, ion implantation; limits on device performance and device design, both MOS and bipolar. Compound semiconductors. At the level of current papers in *IEEE Trans. on Electron Devices*.

651-652 Electric Energy Systems I and II

651, fall; 652, spring, 4 credits each term. 3 lec-rec, 1 lab-computing session. Fall prerequisite: 316 or permission of instructor.

S. Linke.

Engineering principles underlying operation of modern electric power systems under steady-state and transient conditions emphasizing major power-system parameters. Digital computer used as dynamic "laboratory" model of complex power systems for load-flow, fault, stability, and economic-dispatch studies. At the level of *Elements of Power System Analysis* (3rd ed.) by Stevenson.

655 Advanced Power Systems Analysis I

Fall, 3 credits. Prerequisite: 302 and concurrent registration in 651, or consent of instructor.

R. J. Thomas, S. Linke.

Analysis of power-system components; these will include rotating machines, and systems for excitation control, automatic voltage regulation, boiler-turbine control, and speed regulation as well as ancillary three-phase networks. Emphasis on derivation of mathematical models from first principles; development of algorithms for the formation of applicable network matrices.

656 Advanced Power Systems Analysis II

Spring, 3 credits. Prerequisites: 655 and concurrent registration in 652 or consent of instructor.

J. S. Thorp, C. Pottle.

Computer methods in power systems applied to short-circuit studies, load-flow studies, transient-stability studies, economic dispatch, and security load flows. Use of sparse-matrix techniques.

Comparison of algorithms for digital relaying. State-estimation algorithms. Emphasis on the use of the digital computer in the planning and operation of large-scale power systems. At the level of *Computer Methods in Power System Analysis* by Stagg and El-Abiad.

661 Coding Algorithms Fall. 3 or 4 credits (4 with lab). 3 lec, 1 lab. Lab prerequisite: FORTRAN, PL/I, or assembly language. Coding algorithms for compression and storage of information and correction of errors in data processing and transmission. Design, analysis, and implementation of underlying codes. Linear block codes, maximum likelihood decoding, linear sequential machines, cyclic codes, BCH codes, burst error protection. Lab consists of computer simulation, modification, and evaluation of algorithms covered in lecture. At the level of *Error Correcting Codes* by Peterson and Weldon.

662 Fundamental Information Theory Spring. 3 or 4 credits (4 with lab). 3 lec, 1 lab. Prerequisite: 310 or equivalent. Prerequisite for lab only: 661 with lab. 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. Lab projects investigate problems of statistical characterization of sources and channels using computer simulation, and evaluate the coding algorithms introduced in 661.

664 Decision Making and Estimation Fall. 4 credits. Prerequisite: 310 or equivalent. T. Fine.

Concepts and key results of decision and estimation will be developed and applied to problems arising in pattern classification and communications. The design philosophies to be discussed include those of minimum expected loss, Neyman-Pearson, and minimax risk/regret. Lab projects, if elected, will involve the computer-based design and simulation of a pattern classifier.

667 Communication Systems I Fall. 4 credits. 2 lec, 1 rec. Prerequisite: 310 or equivalent. Analog and digital signal representation, spectral analysis, linear signal processing, modulation and demodulation systems. Time and frequency division multiplex systems. Introduction to random processes and noise in analog and digital systems.

668 Communication Systems II Spring. 4 credits. 3 lec, 1 rec. Prerequisite: 667 or equivalent. Analysis of analog and digital communication systems in the presence of random signal and noise. System optimization, matched filters, linear smoothing, and prediction of stationary processes. Signal extraction in the presence of additive noise. Signal design for digital transmission. Signal detection in radar and digital communications. Selected topics in hypothesis testing and parameter estimation applied to receiver design.

671-672 Feedback Control Systems 671, fall; 672, spring. 3 credits each term (4 with lab). Prerequisite: 302 or permission of instructor. System performance specifications. Analysis of linear feedback control systems by root locus and frequency response methods. Classical cascade and feedback compensation techniques. State space approach; controllability, observability, infinite-interval optimal-control problem, parameter optimization, state variable feedback. Nonlinear feedback systems; stability by Nyquist, Lyapunov, and Popov conditions. Limit cycle behavior by describing function techniques. Sampled-data systems and digital compensation. Laboratory work consists of familiarization with system frequency response measurements, transfer function

measurements, and transient response measurements; also, design and compensation of linear positional and speed control systems, analysis of nonlinear systems and sampled-data systems. Emphasis is on correlation of theoretical and experimental results.

675 Computer Structures Fall. 3 credits (4 with lab). Prerequisite: 230 or Com S 314; 230 is prerequisite for lab in 675. H. C. Torng. Organization and design of digital computers, arithmetic hardware, I/O systems. Three laboratory groups combine efforts to design and build a digital computer.

676 Microprocessor Systems Spring. 3 credits (4 with lab). Prerequisite: 675; lab in 675 is prerequisite for lab in 676. N. M. Vrana. System design using microprocessors. Hardware and software techniques employed for logic design, interfacing, instrumentation, and control.

677 Computer Processor Organization and Memory Hierarchy Fall. 4 credits. Prerequisites: 676 and 310, or consent of instructor. D. Hammerstrom. Design and evaluation of processor and memory architectures will be examined in light of actual implementations of both large-scale and small-scale (microprocessors) systems. Topics include: microprogramming and directly executable languages, number representation and instruction set trade-offs, parallel and pipelined architectures, interleaved memories, cache and virtual memories, multilevel memory hierarchies, and protection mechanisms.

678 Computer Input/Output and Distributed Architectures Spring. 4 credits. Prerequisite: 677 or consent of instructor. H. C. Torng. Methods and approaches to input/output processing, device interface, selector and multiplexor channels, parallel processing, task partitions and resource allocations, distributed processing, interconnection topology, minicomputer and microcomputer networks, interprocessor communications.

679 Current Topics in Computer Engineering Fall. 3 credits. 2 lec. Prerequisite: 677 or coregistration in 677. H. C. Torng, D. Hammerstrom. In-depth treatment of current and emerging computer engineering research and development activities. Topics vary from year to year and will be chosen from research reports and published journal articles. Subjects may include: fault tolerant computing, reliability studies, innovative microcomputer structures, direct execution of high-level languages, and impact of very-large-scale integration technologies on computer organizations.

680 Elementary Plasma Physics and Gas Discharges Spring. 3 credits. 2 lec, 1 lab. Prerequisite: 304 or equivalent. C. B. Wharton. Coordinated lectures and ten experiments. Discharges, arcs, reflex discharge. Positive column, collisions, diffusion, breakdown, sheaths. Langmuir probes. Electromagnetic waves, plasma oscillations, space-charge waves, cyclotron harmonic radiation.

681 Introduction to Plasma Physics (also A&E 606) Fall. 4 credits. 3 lec. Prerequisites: 303 and 304 or equivalent. First-year graduate-level course; open also to exceptional fourth-year students at discretion of instructor. R. N. Sudan. Plasma state; motion of charged particles in fields; collisions, coulomb scattering; transport coefficients, ambipolar diffusion, plasma oscillations and waves;

hydromagnetic equations; hydromagnetic stability and microscopic instabilities; test particle in a plasma; elementary applications.

682 Advanced Plasma Physics (also A&E 607) Spring. 4 credits. 3 lec. Prerequisite: 681. R. N. Sudan. Boltzmann and Vlasov equations; waves in hot plasmas; Landau damping, microinstabilities; drift waves, low-frequency stability, collisional effects; method of dressed test particles, high-frequency conductivity and fluctuations; neoclassical toroidal diffusion, high powered beams.

683 Electrodynamics Fall. 4 credits. 3 lec. Prerequisite: 304 or equivalent. Maxwell's equations, electromagnetic potentials, integral representations of the electromagnetic field. Special theory of relativity. Radiation of accelerated charges, Cerenkov radiation. Optional topics: electrostatics of dispersive dielectric and magnetic media; elementary quantum electrodynamics, second quantization, interaction of electromagnetic fields with atoms. At the level of *Classical Electrodynamics* by Jackson.

684 Microwave Theory Spring. 4 credits. 3 lec. Prerequisite: 304 or equivalent. P. McIsaac. Theory of passive microwave devices. Homogeneous and inhomogeneous waveguides. Nonreciprocal waveguide devices. Scattering matrix analysis of multipoint junctions, resonant cavities, directional couplers, isolators, circulators. Periodic waveguides, coupled mode theory. At the level of *Introduction to the Theory of Microwave Circuits* by Kurokawa.

[685-686 Upper Atmosphere Physics I and II] 685, fall; 686, spring. 3 credits each term. 3 lec. Not offered 1978-79. Physical processes in the earth's ionosphere and magnetosphere, the solar corona, and the solar wind. Diagnostic techniques including radar and in situ observations; production, loss, and transport of charged particles in the ionosphere and magnetosphere; airglow; tides, winds, and gravity waves; electric fields generated by the solar wind and winds in the neutral atmosphere and their effects on transport processes; the equatorial and auroral electrojets; instabilities in space plasmas; structure of the solar corona and solar wind and their interaction with the magnetosphere; acceleration and drift of energetic particles in the magnetosphere; precipitation of particles and the aurora; magnetic and ionospheric storms.]

687 Electromagnetic Wave Propagation I Fall. 3 credits. 3 lec. Some aspects of antenna theory; diffraction; refraction and ducting in the troposphere; propagation of radiowaves and cold plasma waves in the ionosphere and magnetosphere; Alfvén, whistler mode, and hybrid waves; the CMA diagram; WKB solutions of the coupled wave equations.

688 Electromagnetic Wave Propagation II Spring. 3 credits. 3 lec. Full-wave solutions of the wave equations; interactions between particles and waves; scattering of radio waves from random fluctuations in refractive index; scatter propagation; incoherent scatter from the ionosphere and its use as a diagnostic tool; radio star and satellite scintillations and their use as diagnostic tools; radar astronomy.

690-699 Special Topics in Electrical Engineering 1-3 credits. Seminar, reading course, or other special arrangement agreed upon between the students and faculty members concerned.

721 Theory of Linear Systems Fall. 4 credits. Prerequisite: 302 or permission of instructor. The state-space model for linear systems. Fundamental and transition matrices. Matrix exponential functions, the Cayley-Hamilton theorem, and the Jordan form. Forced network and system response. Controllability, observability, stability, realizability. Applications of Fourier, Laplace, Hilbert Transforms. Paley-Wiener theorem. At the level of *System Theory* by Padulo and Arbib.

722 Theory of Nonlinear Systems Spring. 4 credits. 3 lec. Prerequisite: 721. Analysis of nonlinear systems with applications. Phase-plane analysis; singular points, limit cycles, and equilibrium states; Stability of nonlinear systems; the methods of Lyapunov and Popov; circle criteria. Forced nonlinear systems; periodic systems, Floquet theory, Mathieu-Hill theory; applications to the stability of nonlinear and parametrically excited systems.

731 Quantum Electronics I Fall. 4 credits. 3 lec. 1 rec-computing session. Prerequisites: 306 and 407 or Phys 443. C. L. Tang. A detailed treatment of the physical principles underlying lasers and masers, related fields, and applications. Topics will include: a review of quantum mechanics and the quantum theory of angular momentum, the interaction of radiation and matter, the quantum mechanical density matrix and macroscopic material properties, theory of the laser and maser.

732 Quantum Electronics II Spring. 4 credits. 3 lec, 1 rec-computing session. Prerequisite: 731 or permission of instructor. A continuation of 731. Topics will include: optical resonators, output power of amplifiers and oscillators; dispersive effects and laser oscillation spectrum. Spectroscopy of atoms, molecules, and ions in crystals as examples of laser media; survey of chemical and dye lasers; noise in optical devices; principles of electro-optic and parametric devices.

733 Opto-Electronic Devices Fall. 4 credits. 3 lec, 1 rec. Prerequisites: 304 and 434 or equivalent. Aimed at providing an understanding of physical properties of solids that affect use in optical devices. Wave propagation in lossy, anisotropic, layered, and electro-optic media; microscopic and band-theoretic models for dielectric constant and loss; carrier transport, scattering and trapping; photoconductivity; electro-optics, photoemissive and photoconductive devices; noise in optical detectors.

734 Theory and Applications of Nonlinear Optics 4 credits, 3 lec, 1 rec. Prerequisite: 731 or 733 or equivalent of Phys 572. C. L. Tang. Recent developments in the theory and applications of nonlinear optics and related electro-optic devices. Topics include: properties and theories on nonlinear optical processes; nonlinear and electro-optic properties of III-IV and II-VI compounds and other optical materials; optical mixing; spontaneous and stimulated processes involving nonlinear interactions of electromagnetic waves, phonons, and molecular vibrations.

735 Solid State Devices I Fall. 4 credits. 3 lec. Prerequisite: 434 or equivalent. Not offered 1978-79. C. A. Lee. Band structure, generation recombination statistics, ambipolar transport, deep level spectroscopy, p-n junction analysis, contact technology, secondary ionization, and noise. A review of ion implantation technology with emphasis on associated material and device problems. Topics are presented on the level of current device research literature. Presentation concentrates on relating basic material properties to device parameters. Term paper.]

736 Solid State Devices II Spring. 4 credits. 3 lec. Prerequisite: 735 or equivalent. Not offered 1978-79. C. A. Lee. A general treatment of the time dependence of secondary ionization and the simpler "quasistatic" approximation. Applications to microwave generation and amplification and broadband optical detection, including stability, nonlinearity, and noise. The fundamentals of transferred electron devices, including band structure, distribution functions, stability, and doping configurations of devices. Term paper.]

737 Physics and Technology of Very-Large-Scale Integration (VLSI) Fall. 3 credits. No lab. Prerequisites: 635 and 636. J. Frey. Basic materials and technology problems to be considered in the design and fabrication of VLSI circuits, utilizing devices with submicron dimensions. The material problems include: reduction of threshold voltage in submicron-channel MOSFETs; hot-electron tunneling through MOSFET oxides; mobility reductions in thin epitaxial layers; role of velocity overshoot effects in short-channel devices; comparison of elemental and compound semiconductors. Technology problems to be studied include: fabrication methods for submicron dimensions; light-sensitive, electron-beam, and X-ray, resists; testing of VLSI circuits; throughput; yield.

738 Physics of Solid-State Devices Spring. 2-3 credits. 2 lec. Prerequisite: 736 or equivalent. Basic theory of electron and hole scattering in semiconductors. Examination of methods for obtaining high electric field solutions for the distribution function from the Boltzmann equation. Hot electron phenomena reviewed with emphasis on band-structure induced instabilities.

761-762 Random Processes in Electrical Systems 761, fall; 762, spring. 4 credits each term. 3 lec. Prerequisites: 302 and 310. The concepts of randomness and uncertainty and their relevance to the design and analysis of electrical systems. An axiomatic characterization of random events. Probability measures, random variables, and random vectors. Distribution functions and densities. Functions of random vectors. Expectation and measures of fluctuation. Moments and probability inequalities. Properties and applications of characteristic functions. Modes of convergence of sequences of random variables: laws of large numbers and central limit theorems. Kolmogorov consistency conditions for random processes. Poisson process and generalizations. Gaussian processes. Covariance stationary process, correlation function, spectra; Bochner and Wiener-Khinchin theorems. Continuity, integration, and differentiation of sample functions. Optimum filtering and prediction. Spectral representation, orthogonal series representations. Markov chains and processes. Linear and nonlinear transformations of random processes.

763 Advanced Topics in Information Theory Fall. 4 credits. 3 lec. Prerequisites: 662 and either 761 or Math 571, or permission of instructor. An in-depth treatment of an information theory research area. The topic varies from year to year and will be chosen from the following subjects: source encoding (rate-distortion theory), convolutional codes and sequential decoding, multiterminal communication networks, ergodic theory and information, and complexity and instrumentability of coding schemes.

764 Foundations of Inference and Decision Making Spring. 3 credits. 3 lec. Prerequisite: a course in probability and some statistics, or permission of instructor. T. Fine.

An examination of methods for characterizing uncertainty and chance phenomena and for transforming information into decisions and optimal systems. Discussion of the foundations of inference includes: comparative probability; quantitative probability; relative frequency interpretations; computational complexity; randomness; classical probability and invariance; induction; subjective probability.

771 Estimation and Control in Discrete Linear Systems Fall. 4 credits. 3 lec. Prerequisites: 302 and 310 or permission of instructor. Optimal control, filtering, and prediction for discrete time linear systems with extensive use of the APL/360 system. Approximation on discrete point sets. The principle of optimality. Kalman filtering. Stochastic optimal control.

772 Optimal Control and Estimation for Continuous Systems Spring. 4 credits. 3 lec. Prerequisite: 771 or permission of instructor. Control system design through parameter optimization, with and without constraints. The minimum principle; linear regulators, minimum time and minimal fuel problems. Computational techniques; properties of Lyapunov and Riccati equations.

773 Random Processes in Control Systems Spring. 4 credits. 3 lec. Prerequisites: 762 and 772. Not offered 1978-79. Prediction and filtering in control systems: Gaussian-Markov process, prediction problem, stochastic optimal and adaptive control problems. Control of systems with uncertain statistical parameters; stochastic differential equations, optimal nonlinear filtering; stability of control systems with random parameters.]

781 Kinetic Theory (also A&EP 761) Fall. 3 credits. 2 lec. Prerequisite: 407 or Phys 561, or permission of instructor. Offered in alternate years. R. L. Liboff. Theory of the Liouville equation. Prigogine and Bogoliubov analysis of the BBKGY sequence. Master equation, density matrix, Wigner distribution. Derivation of fluid dynamics. Transport coefficients. Boltzmann, Krook, Fokker-Planck, Landau, and Balescu-Lenard equations. Properties and theory of the linear Boltzmann collision operator. The relativistic Maxwellian. Klimontovich formulation. At the level of *Introduction to the Theory of Kinetic Equations* by Liboff.

782 Nonlinear Phenomena in Plasma Physics Fall. 3 credits. Corequisite: 682. Not offered 1978-79. (1) Coherent nonlinear processes (echoes, trapped particles, solitary waves, shocks, and parametric instabilities); (2) statistical theories of plasma turbulence (quasilinear theory, wave kinetic equations, the random phase approximation, resonant mode-mode coupling, nonlinear Landau damping, strong turbulence, and anomalous transport). Applications to controlled fusion and space plasmas.]

791-792 Electrical Engineering Colloquium 791, fall; 792, spring. 1 credit each term. For students enrolled in the graduate Field of Electrical Engineering. Lectures by staff, graduate students, and visiting authorities. A weekly meeting for the presentation and discussion of important current topics in the field.

793-794 Electrical Engineering Design 793, fall; 794, spring. 3 credits each term. For students enrolled in the M.Eng. (Electrical) degree program. Utilizes real engineering situations to present fundamentals of engineering design.

795-799 Special Topics in Electrical Engineering 1-3 credits.

Seminar, reading course, or other special arrangement agreed upon between the students and faculty members concerned.

Geological Sciences

J. E. Oliver, chairman; W. A. Bassett, J. M. Bird, A. L. Bloom, L. D. Brown, J. L. Cisne, B. L. Isacks, D. E. Karig, S. Kaufman, R. W. Kay, J. E. Knight, F. H. T. Rhodes, W. B. Travers, D. L. Turcotte

Bachelor of Science

Study in geological sciences is offered for students who are preparing for careers in solid earth science, for those who want a broad background in the geological sciences as preparation for careers in other fields, or for those who wish to combine geological training with other sciences such as agronomy, astronomy and space science, biological sciences, chemistry, economics, mathematics, physics, or various fields of engineering. The Department of Geological Sciences is organized as an intercollege department in the College of Arts and Sciences and the College of Engineering. College of Arts and Sciences students should consult the section on geological sciences given under that college as well as the course listing here.

In the College of Engineering, students interested in entering the Field Program in Geological Sciences follow the Basic Studies Program for the first two years. It is recommended that Geol 101 and 102, Chem 208, and, for those students interested in geobiology, Bio S 101-102 and 103-104 be taken as electives during this period. The upperclass curriculum is as follows:

<i>Term 5</i>	<i>Credits</i>
Geol 355	4
Geol 376	4
Required science course	3 or 4
Liberal studies elective	3
Technical or free elective	3 or 4
<i>Term 6</i>	
Geol 356	4
Geol 325	4
Required science course	3 or 4
Liberal studies elective	3
Geol 704	6
or	
Technical or free elective	3 or 4
A summer field course is required unless approval for an alternative field experience is granted.	
<i>Term 7</i>	
Geol 345	4
Required science course	3 or 4
Liberal studies elective	3
Technical or free elective	3 or 4
<i>Term 8</i>	
Geol 388	4
Required science course	3 or 4
Liberal studies elective	3 or 4
Technical or free elective	3 or 4
Free elective	3 or 4

Students intending to specialize in *geophysics* should select their *required sciences* from the following courses or their equivalents: Math 421-422-423, Applicable Mathematics; T&AM 310-311, Advanced Engineering Analysis I and II; A&EP 355, Intermediate Electromagnetism; A&EP 333, Mechanics of Particles and Solid Bodies; A&EP 356, Intermediate Electrodynamics; A&EP 434, Continuum Physics; Phys 410, Advanced Experimental Physics; T&AM 450, Introduction to Continuum Mechanics.

Students intending to specialize in *geochemistry* (including petrology, mineralogy, and mineral deposits) should select their *required sciences* from

the following courses or their equivalents: Chem 287-288, Introductory Physical Chemistry; Chem 300, Introductory Quantitative Analysis; Chem 301, Experimental Chemistry I; Chem 302, Experimental Chemistry II; Chem 303, Experimental Chemistry III; Chem 357-358, Introductory Organic Chemistry; Chem 389-390, Physical Chemistry I and II; MS&E 331, Structure and Properties of Materials; MS&E 335, Thermodynamics of Condensed Systems.

Students intending to specialize in *geobiology* should select their *required sciences* from the following courses or their equivalents: Bio S 310, Invertebrate Zoology; Bio S 330-331, Principles of Biochemistry; Bio S 245, Plant Biology; Bio S 448, Plants and Time (paleobotany); Bio S 360, General Ecology; Bio S 274, The Vertebrates; Bio S 477, Organic Evolution; Bio S 281, Genetics; Chem 253, Elementary Organic Chemistry; Geol 471, Invertebrate Paleontology.

Students who wish to pursue further training or immediate employment in *applied geology* (environmental/engineering geology, mineral exploration and exploitation, ground water, petroleum geology, or geological engineering) should select their *required sciences* from the following courses or their equivalents, with two of the four from the same field: Agron 301, Identification, Appraisal, and Geography of Soils; Agron 701, Soil Chemistry; Agron 607, Soil Physics; CEE D301, Introductory Soil Mechanics; CEE D610, Engineering Behavior of Soils; CEE A685, Physical Environment Evaluation; MS&E 331, Structure and Properties of Materials; MS & E 466, Mechanical Properties of Materials; CEE C301, Fluid Mechanics I; CEE C302, Hydraulic Engineering; CEE E301, Environmental Quality Engineering; Math 421-422-423, Applicable Mathematics; OR&IE 260, Introductory Engineering Probability; OR&IE 370, Introduction to Statistical Theory with Engineering Applications.

Students who want a more general background, or who wish to remain uncommitted with regard to specialty, must choose at least two of the four required science courses from the same field, and all four required science courses must be at the 300 level or above. The technical electives may be chosen from offerings in geological sciences or in other science or engineering fields, and may be courses also approved as required sciences. Outstanding students may request substitution of an honors thesis for a fourth-year technical elective.

Students intending to pursue graduate study in geology are reminded that many graduate schools require proficiency in reading the scientific literature in one or two of the three languages French, German, or Russian. Undergraduate preparation in at least one of these languages is therefore advantageous.

Master of Science and Doctor of Philosophy

The Department of Geological Sciences maintains a number of strong interdisciplinary research programs. The curriculum is designed to accommodate students who are trained in geology or who have no introductory education in geology but are otherwise well qualified. A strong background in mathematics and the basic sciences is recommended. Descriptions of the program are given in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

The courses in geological sciences are listed under the following headings: *Freshman and Sophomore Courses; Junior, Senior, and Graduate Courses, and Field Courses.*

Freshman and Sophomore Courses

101 Introductory Geological Sciences Fall or spring. 3 credits. 2 lec, 1 lab. Evening exams, field trips.

W. B. Travers, fall; J. M. Bird, spring. Understanding the natural earth; weathering, erosion, the evolution of coast lines and river valleys, glaciation, the origins of earthquakes and mountains, the genesis of volcanoes, and the drifting of continents. Studies of ground water, mineral deposits, petroleum, and coal. Recognizing major minerals and rocks, interpretation of topographic and geologic maps.

102 Introduction to Historical Geology Spring. 3 credits. 2 lec, 1 lab, evening exams. Prerequisite: 101 or permission of instructor.

J. L. Cisne. A continuation of 101. History of the earth and life in terms of evolutionary processes. The geologic record, its formation, and interpretation of earth history. Introduction to the evolution of life and to fossils and their use in reconstructing past environments and dating rocks.

103 Earth Science Fall. 3 credits (see 105, Earth Science Laboratory). 3 lec.

A. L. Bloom. Physical geography, including earth and lunar orbits that determine seasons and tides. Figure and structure of the earth; climatic regions; atmospheric and oceanic circulation; erosion by rivers, glaciers, wind, and waves; climatic change.

105 Earth Science Laboratory Fall. 1 credit (to be taken concurrently with Earth Science 103).

A. L. Bloom. Astronomical determination of position and seasonal events. Topographic mapping and map interpretation. Minerals and rocks, world climatic regions.

107 Frontiers of Geology I Fall. 1 credit (to be taken concurrently with or after 101). 1 lec.

J. L. Cisne and staff. Lectures by members of the department on selected fundamental topics of current interest, such as continental drift and related tectonic processes, volcanoes, earthquake prediction, natural energy sources, and mineral resources.

108 Frontiers of Geology II Spring. 1 credit (to be taken concurrently with or after 101 or 102). 1 lec.

J. L. Cisne and staff. Lectures by members of the department on selected fundamental topics of current interest such as plate tectonics, the evolution of mountain belts and island arcs, the deep structure of continents, ecology and evolution of fossil organisms, correlation of strata by fossils, sea-level changes, and fossil fuels.

[131 Geology and the Environment Fall. 3 credits. 2 lec, 1 lab. Field trips. Not offered 1978-79.

The principles of geological science, with emphasis on the physical phenomena and rock properties as they influence the natural environments of man.]

262 Mineral and Energy Resources and the Environment Spring. 3 credits. 2 lec, 3 exercises. Reading assignments, term projects.

W. A. Bassett. Occurrence, location, and scientific principles underlying the availability of mineral and energy resources of today and tomorrow. Limitations on utilization imposed by economic and environmental factors, hazards, patterns of usage, and industrial development. Relation to national and international policy and conservation.

Junior, Senior, and Graduate Courses

Of the following, the core courses 325, 345, 355–356, 376, and 388 may be taken by those who have successfully completed 101–102 or the equivalent, or who can demonstrate to the instructor that they have adequate preparation in mathematics, physics, chemistry, biology, or engineering.

325 Structural Geology and Sedimentation

Spring. 4 credits. 3 lec, 1 lab. Prerequisite: 101 or permission of instructor.

W. B. Travers.

Nature, origin, and recognition of geologic structures. Behavior of geologic materials. Geomechanical and tectonic principles applied to the solution of geologic problems. Introduction to the sedimentary processes and petrology of sedimentary rocks. Description, classification, provenance, transportation, depositional environment of sediments, and diagenesis of sediments.

344 Geological Oceanography

Spring. 3 credits. 3 lec. Prerequisite: 102 or Bio S 461.

A. L. Bloom, D. E. Karig.

Shoreline erosion, transportation, and deposition; origin and structure of continental shelves and ocean basins. Geologic processes and geomorphic development in the marine environment.

345 Geomorphology

Fall. 4 credits. 2 lec, 1 lab. Prerequisite: 102 or permission of instructor.

A. L. Bloom.

Description and interpretation of land forms in terms of structure, process, and stage.

355 Mineralogy, Petrology, and Geochemistry I

Fall. 4 credits. 2 lec, 1 lab. Assigned problems and readings; field trips. Prerequisite: 102 or permission of instructor.

W. A. Bassett, R. W. Kay.

Megascopic and optical properties, chemistry, structure, and petrogenetic significance of rock-forming minerals. Principles of phase equilibria as applied to igneous and metamorphic systems. Description, classification, chemistry, origin, regional distribution, and dating of igneous and metamorphic rocks. Geochemical distribution of trace elements and isotopes in igneous and metamorphic systems.

356 Mineralogy, Petrology, and Geochemistry II

Spring. 4 credits. 2 lec, 1 lab. Assigned problems and readings; field trips.

W. A. Bassett, R. W. Kay.

Principles of phase equilibrium as applied to igneous and metamorphic systems. Description, classification, chemistry, origin, regional distribution, and dating of igneous and metamorphic rocks. Geochemical distribution of trace elements and isotopes in igneous and metamorphic systems. The petrological evolution of the planets.

376 Historical Geology and Stratigraphy

Fall. 4 credits. 2 lec, 2 labs. Additional assigned problems.

J. L. Cisne.

Application of geologic principles to interpretation of earth history; development of the geologic column, geochronology, and geochronometry; correlation by fossils and the zone concept; sedimentary environments and provinces; geosynclines and platforms; problems of the pre-Cambrian and continental evolution.

388 Geophysics and Geotectonics

Spring. 4 credits. 3 lec, 1 lab. Prerequisites: Math 112 and Phys 208 or equivalent.

B. L. Isacks.

Global tectonics and the deep structure of the solid earth as revealed by investigations of earthquakes, earthquake waves, the earth's gravitational and magnetic fields, and heat flow.

410 Experiments and Techniques in Earth Sciences

Spring. 2 credits. Prerequisites: Phys 207–208 and Math 191–192 or equivalents, or permission of instructor.

S. Kaufman.

Lab and field experiments chosen in accordance with students' interests. Designed to familiarize them with instruments and techniques used in earth sciences. Independent work is stressed.

423 Petroleum Geology

Fall. 3 credits. 3 lec, 1 lab. Field trip. Recommended prerequisite: 325.

W. B. Travers.

Sedimentation and tectonics as conditions of hydrocarbon entrapment. Problems of petroleum exploration, including economics of exploration, subsurface mapping, the movement of underground fluids, and the geophysical properties of subsurface fluids and sediments. Organization and operation of the petroleum industry; on-shore and off-shore exploration and production techniques.

424 Tectonics of Orogenic Zones; Modern and Ancient

Spring. 3 credits. 1 lec. Prerequisite: permission of instructors. Offered alternate years.

D. E. Karig, W. B. Travers.

A comparative study of island arcs and mountain ranges.

[428 Geomechanics

Spring. 3 credits. 3 lec. Prerequisites: Math 240 or 296; 101. Not offered 1978–79.

D. L. Turcotte.

Use of mathematical analysis to explain such geological observations as ocean ridges—their thermal structure, elevation, heat flow, and gravity; ocean trenches—the structure and mechanics of the bending lithosphere; folding—buckling, viscous and plastic flow; faulting—a detailed mechanical and geological study of the San Andreas fault; intrusives—geothermal power.]

431 The Earth's Crust: Structure, Composition, and Evolution

Fall. 3 credits. 3 lec. Prerequisites: 356 and 388.

L. D. Brown.

Structure and composition of the crust from geophysical observations, analysis of xenoliths, and extrapolation of petrological laboratory data. Radioisotopic considerations. The nature of the crust-mantle boundary. Thermal and rheological structure of the crust. Oceanic vs. continental crust. Origin and evolution of oceanic and continental crust.

432 Digital Processing and Analysis of Geophysical Data

Spring. 3 credits. 3 lec.

Prerequisites: 488 and familiarity with a programming language.

L. D. Brown, S. Kaufman.

Sampling theory. Fourier, Laplace, and Z-transform techniques. Spectral and cepstral analysis. Temporal and spatial filtering. Geophysical modeling. Deconvolution, migration, and velocity analysis of reflection data. Downward and upward continuation of potential field data.

[433 Interpretation of Seismic Reflection Data

Spring. 3 credits. 2 lec, 1 lab. Prerequisite: 488 or equivalent. Not offered 1978–79.

Techniques for inferring geologic structure and lithology from multi-channel seismic reflection data. Data processing sequences, migration, velocity analysis, correlation criteria, resolution considerations, wave form analysis, and synthetic seismograms. Synergistic approaches to interpretation. Seismic stratigraphy.]

455 Isotope Geology

Fall. 3 credits. 3 lec. Prerequisite: 355–356 or equivalent.

R. W. Kay.

Nucleosynthetic processes and the isotopic abundance of the elements. Dating by Pb, Ar, Sr, and Nd isotope variations. Theories of crustal and mantle evolution. Pleistocene chronology using

U-series and ¹⁴C dating. Time constants for geochemical cycles. The use of O and H isotopes as tracers in the earth's hydrosphere, and hydrothermal circulation systems.

456 Chemical Geology

Spring. 3 credits. 3 lec. Prerequisite: 355–356 or equivalent.

W. A. Bassett.

Crystallography and crystal chemistry of minerals and the methods for their study. Thermodynamic evaluation of homogeneous and heterogeneous equilibrium and disequilibrium processes of geologic interest. Topics include crystal symmetry, mineral structures, X-ray diffraction, mineral equilibrium, and diffusion in minerals.

461 Mineral Deposits I

Fall. 4 credits. 3 lec, 1 lab. Assigned problems and readings; field trip.

Prerequisite: 365 or permission of instructor.

462 Mineral Deposits II

Spring. 4 credits. 3 lec, 1 lab. Field trips. Prerequisite: 461 or permission of instructor.

471 Invertebrate Paleontology

Fall. 4 credits. 2 lec, 2 labs. Prerequisites: 102 and a course in invertebrate zoology.

J. L. Cisne.

Paleobiology and classification of important fossil invertebrates. Problems of evolution. Use of organisms in reconstructing past environments.

473 Stratigraphy

Fall. 3 credits. 2 lec, 1 additional hour to be arranged. Prerequisite: 376.

J. M. Bird.

Principles of stratigraphy, developed by detailed study of selected American and European systematic examples.

483 Marine Tectonics

Fall. 3 credits. 2 lec. Possible field trips. Prerequisites: 325 and a course in physics or geophysics.

D. E. Karig.

Study of geophysical and geological characteristics of the earth's crust beneath the oceans. Review of strengths and limitations of marine exploratory techniques. Emphasis on recent geologic data concerning plate margins in the ocean, especially the island arc systems.

[485 Physics of the Earth I

Fall. 3 credits. 2 lec, 1 lab. Open to upperclass engineers, majors in the physical sciences, and others by permission of instructor. Not offered 1978–79.

D. L. Turcotte.

Rotation and figure of the earth, gravitational field, seismology, geomagnetism, creep and anelasticity, radioactivity, earth's internal heat, continental drift, and mantle convection.]

488 Introduction to Geophysical Prospecting

Fall. 3 credits. 2 lec. Prerequisites: Phys 112–213 and Math 191–192, or equivalents, or permission of instructor.

S. Kaufman.

Physical principles, instrumentation, operational procedures, and interpretation techniques in geophysical exploration for oil, gas, and minerals. Seismic reflection, seismic refraction, gravity, and magnetic and electrical methods of exploration.

490 Senior Thesis

Fall or spring. 1 credit.

Staff.

642 Glacial and Quaternary Geology

Spring. 3 credits. 2 lec, 1 lab. Several Saturday field trips.

Prerequisite: 345 or permission of instructor.

A. L. Bloom.

Glacial processes and deposits and the stratigraphy of the Quaternary.

681 Geotectonics Fall, 4 credits, 2 lec. Prerequisite: permission of instructor. J. M. Bird. Theories of orogeny; ocean and continent evolution. Kinematics of lithosphere plates. Rock-time assemblages of modern oceans and continental margins, and analogs in ancient orogenic belts. Time-space reconstructions of specific regions. Problems of dynamic mechanisms—corollaries and evidence from crustal features.

685 Advanced Geophysics I Fall, 3 credits, 3 lec. Prerequisite: 388 or 485. D. L. Turcotte. Mantle convection, heat flow, the driving mechanism for plate tectonics, the energy balance, definition of the lithosphere.

686 Advanced Geophysics II Spring, 3 credits, 3 lec. Prerequisite: 388 or 485. D. L. Turcotte. Gravity, figure of the earth, earth tides, magnetism, mechanical behavior of the lithosphere, changes in sea level.

[687 Seismology I] Fall, 3 credits, 3 lec-rec. Prerequisite: T&AM 611 or equivalent. Offered alternate years. Not offered 1978–79. B. L. Isacks. Generation and propagation of elastic waves in the earth. Derivation of the structure of the earth and the mechanism of earthquakes from seismological observations.]

688 Seismology II Fall, 3 credits. Prerequisite: 687. B. L. Isacks. A continuation of 687.

690–699 Seminars and Special Work Fall and spring, 2 credits each term. Prerequisite: permission of instructor. Advanced work on original investigations in geological sciences.

690: Structural geology, sedimentation, and tectonics. W. B. Travers.

691: Petrology and geochemistry. R. W. Kay.

692: Coastal geomorphology and Pleistocene geology. A. L. Bloom.

693: Environmental-engineering geology, geomechanics, and hydrogeology.

694: Geophysics, seismology, gravity, magnetism, heat flow, geotectonics. B. L. Isacks, D. E. Karig, S. Kaufman, J. E. Oliver, D. L. Turcotte.

695: Invertebrate paleontology and paleoecology. J. L. Cisne.

696: Mineral deposits and resources. Staff.

697: Environmental problems. W. B. Travers.

698: Marine geology. D. E. Karig.

699: Plate tectonics and geology. J. M. Bird.

Field Courses

[601 Intersession Field Trip] 1 credit. Prerequisites: 101–102 or equivalent and permission of instructor. Not offered 1978–79. A trip of one week to ten days in an area of interesting geology in the lower latitudes. Travel and subsistence expenses to be determined. Interested students should contact the instructor during the early part of the fall semester.]

604 Western Adirondack Field Course Spring, 1 credit. One week at the end of the spring semester. W. A. Bassett. Field mapping methods, mineral and rock identification, examination of Precambrian metamorphic rocks and lower Paleozoic sediments, talc and zinc mines. Students should be prepared for overnight camping and will have to pay for their own meals.

704 Western Field Course Spring, 6 credits. Weekly rec and 35-day trip to California, Nevada, and Utah. Prerequisites: four courses in Geol at the 300 level, and permission of instructor. W. B. Travers.

A comparative study of California Coast Range, Sierra Nevada, Basin and Range of Nevada, and Uinta Mountains, Utah. Pretrip seminars and extensive reading at Cornell. Study of Mesozoic ophiolites, and subduction near San Luis Obispo, California; recent earth movements along the San Andreas fault near San Francisco; granitic pluton emplacement and volcanism in the northern Sierra Nevada; multiple-phase mountain building near Dixie Valley, Nevada; sedimentology and block faulting of the Uinta Mountains, Utah. Five-day raft trip on the Green River through the core of the Uinta mountains. Visit to an oil field in California and a mine in Nevada. Lectures and field trips with local experts. Students should be prepared for overnight camping and will have to pay for their own meals.

Materials Science and Engineering

A. L. Ruoff, director; D. G. Ast, B. W. Batterman, J. M. Blakely, E. W. Hart, H. H. Johnson, C. Y. Li, R. Raj, W. Krakow, E. J. Kramer, D. L. Kohlstedt, S. L. Sass, D. N. Seidman

Bachelor of Science

No particular engineering core science is required for entry into the upperclass Field Program in Materials Science and Engineering. The basic upperclass curriculum, which includes the required field courses, is given below. The sequence of the courses may vary, however, in accordance with the plan worked out by each student in consultation with his or her faculty adviser.

Term	Credits
Term 5	
MS&E 331, Structure and Properties of Materials	4
MS&E 335, Thermodynamics of Condensed Systems	3
MS&E 333, Research Involvement I or a Field-approved option elective*	3
Free elective	3
Liberal studies elective	3
Term 6	
MS&E 336, Kinetics, Diffusion, and Phase Transformations	3
MS&E 446, Mechanical Properties of Materials	3
MS&E 334, Research Involvement II or a Field-approved option elective*	3
Free elective	3
Liberal studies elective	3
Term 7	
MS&E 445, Electrical and Magnetic Properties of Materials	3
MS&E 440, Macroprocessing of Materials	3
MS&E 443, Senior Materials Laboratory I†	3
Technical elective	3
Liberal studies elective	3

Term	Credits
Term 8	
MS&E 441, Microprocessing of Materials	3
MS&E 448, Current Topics in Materials	3
MS&E 444, Senior Materials Laboratory II	3
Technical elective	3
Liberal studies elective	3

*The Research Involvement option gives undergraduates the opportunity to work with faculty members and their research groups on current projects. The alternative option elective provides students interested in industrial careers an additional opportunity to broaden their engineering education.

†One term of Senior Laboratory may be replaced by Phys 360, Introductory Electronics, or by a one-term project in association with a faculty member.

Students with a special interest in processing and applications are advised to include in their elective courses MS&E 447, Applied Metallurgy; MS&E 337, Materials and Manufacturing Processes; and MS&E 338, Analysis of Manufacturing Processes.

Master of Engineering (Materials)

Students who have completed a four-year undergraduate program in engineering or the physical sciences are eligible for consideration for admission to the M.Eng. (Materials) program, which includes the following:

1. A project qualifying for at least twelve credits and requiring individual effort and initiative. This project, carried out under the supervision of a member of the faculty, is usually experimental, although it can be analytical.
2. Six credits of courses in mathematics or applied mathematics. This requirement may be satisfied by courses T&AM 310 and 311; students who have previously completed these must select other courses acceptable to the faculty.
3. Courses in materials science and engineering selected from any of those offered at the graduate level, or other courses approved by the faculty, required to bring the total credits to thirty.

General admission and degree requirements are described in the introductory section under College of Engineering.

Master of Science and Doctor of Philosophy

Graduate programs in materials science and engineering are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

The courses in materials science and engineering are listed under the following headings: *Undergraduate Courses; Graduate-Level Professional Courses; Graduate Core Courses; and Further Graduate Courses.*

Undergraduate Courses

201 Elements of Materials Science Spring, 3 credits. Relations between atomic structure and macroscopic properties of such diverse materials as metals, ceramics, and polymers. Properties discussed include magnetism, superconductivity, insulation, semiconductivity, mechanical strength, and plasticity. Applications to microelectronics, desalination by reverse osmosis, superconducting power transmission lines, synthetic bones and joints, etc. Extensive use of modern educational techniques, including slides, audiotutorial systems, movies.

261 Introduction to Mechanical Properties of Materials Fall. 3 credits. 2 lec, 1 rec or lab. See description under Division of Basic Studies.

262 Introduction to Electrical Properties of Materials Spring. 3 credits. 2 lec, 1 rec or lab. See description under Division of Basic Studies.

331 Structure and Properties of Materials Fall. 4 credits. 1 lec and 1 lab.

The most widely used techniques to investigate materials such as metals, glasses, ceramics, and polymers; associated laboratory work teaches the use of the optical microscope and X-ray diffraction, and exposes the student to electron microscopy and the use and application of the scanning electron microscope. Discussion of how knowledge of microscopic structure obtained with these techniques can be used to predict and understand important engineering properties.

333 Research Involvement I Fall. 3 credits. Prerequisite: approval of department. Semi-independent research project in affiliation with faculty member and research group of the department.

334 Research Involvement II Spring. 3 credits. Prerequisite: approval of department. May be a continuation of 333 or a one-term affiliation with a research group.

335 Thermodynamics of Condensed Systems Fall. 3 credits. 3 lec. The various phases of materials and the changes that occur when temperatures and pressures change are considered by developing the laws of thermodynamics and applying them to different systems. The use of phase diagrams to predict the phase(s) of an alloy system at any given temperature and pressure in order to understand heat treatment such as the hardening of aluminum alloys and the quenching of steels. Phase transformations under conditions of quenching and their influence on hardness. Guidelines for heat treatment of steels.

336 Kinetics, Diffusion, and Phase Transformations Spring. 3 credits. 3 lec. Introduction to absolute rate theory, atomic motion, and diffusion. Applications to nucleation and growth of new phases in vapors, liquids, and solids; solidification, crystal growth, oxidation and corrosion, radiation damage, recrystallization, gas-metal reactions.

337 Materials and Manufacturing Processes (also M&AE 311) Fall or spring. 3 credits. 2 lec, 1 lab. May be taken in addition to 261. Prerequisite: T&AM 202, or permission of instructor. See M&AE 311 for course description.

338 Analysis of Manufacturing Processes (also M&AE 512) Spring. 3 credits. 3 rec. Prerequisite: 337. See M&AE 512 for course description.

440 Macroprocessing of Materials Spring. 3 credits. 3 lec, occasional lab. Control of chemical composition through smelting, reaction, and refining processes; applications to iron and steel, aluminum, refractories, etc. Shape control; casting and solidification, welding; mechanical shaping through rolling, drawing, etc. Deformation and annealing, textures; relation to material properties. Thermomechanical treatments for control of material properties.

441 Microprocessing of Materials Fall. 3 credits. 3 lec, occasional lab. The materials technology of electronic and magnetic devices; single crystals as well as thin films. Growth and purification (zone refining) of semiconducting crystals; doping procedures, including ion implantation; composition control; oxide growth; photoetching. Preparation of thin films by vapor

deposition; sputtering; plating; evaluation of film geometry and composition. Material aspects of recent devices (superlattice growth, magnetic amorphous bubbles, etc.)

443-444 Senior Materials Laboratory 443, fall; 444, spring. 3 credits.

Experiments are available in structural studies, properties of materials, deformation and plasticity, mechanical and chemical processing, phase transformation, surface physics, etc.

445 Electrical and Magnetic Properties of Materials Spring. 3 credits. 3 lec. An introduction to electrical and magnetic properties of materials with emphasis on structural aspects. Classification of solids, charge and heat transport in metals and alloys, semiconductors and insulators, principles of operation and fabrication of semiconductor devices, behavior of dielectric and magnetic materials, magnetic devices, phenomenological description of superconducting materials.

446 Mechanical Properties of Materials Fall. 3 credits. 3 lec. The mechanical properties of materials and how they can be understood and analyzed in terms of microscopic irregularities (lattice defects) in perfect regular crystals. The general relation between stress and strain; the concept of equivalent stresses and strains. How the concept of local defects can explain many aspects of plastic flow, creep, fatigue, and rupture in classical and new engineering materials. Application of these concepts to the development of improved materials.

447 Materials Engineering (also M&AE 513) Spring. 3 credits. 2 lec, 1 lab. Prerequisite: 261 or M&AE 311 or permission of instructor. W. W. Carson. See M&AE 513 for course description.

448 Current Topics in Materials Spring. 3 credits. 3 lec. Coordinated lectures on topics of current interest, such as biomaterials, fuel cells, composite materials, materials problems in power generation and distribution systems, stress corrosion cracking.

449 Introduction to Ceramics Fall. 3 credits. 3 lec. Prerequisite: 261 or permission of instructor. Designed to develop an understanding of ceramic materials and processes for engineering applications. The crystallographic nature of some ceramics, and structural imperfections that can occur. Ionic motions in crystalline ceramics and their relation to properties and forming methods (such as sintering). Mechanical properties, such as cracking, in terms of microscopic mechanisms. The properties of some new ceramic materials, such as silicon nitride and barium titanate, in special applications.

Graduate-Level Professional Courses

553-554 Special Project 553, fall; 554, spring. 6 credits each term. Research on a specific problem in the materials area.

Graduate Core Courses

601 Topics in Thermodynamics and Kinetics Fall. 3 credits. The following topics are treated for condensed systems: free energy and phase equilibria; thermodynamics of solutions; interfaces; thermodynamics under applied fields; irreversible thermodynamics; reaction rate theory and diffusion.

602 Elasticity and Physical Properties of Crystals Fall. 3 credits. Cartesian tensors, elastic stress and strain, constitutive relations between stress and strain,

—symmetry of crystals, generalized tensor representation of elasticity and other reversible and irreversible properties of crystals, mathematical theory of infinitesimal elasticity with applications including wave propagation and stress fields of dislocations, mathematical theory of yield stress and plasticity, origin of elastic behavior, including rubberlike behavior. At the level of *Physical Properties of Crystals* by Nye.

603 Structure of Solids Spring. 3 credits. Prerequisites: 601 and 602, or equivalent. Binding energies in perfect crystals. Structure and energetics of point, line and planar defects in crystalline materials, including metals, ionic solids, covalent solids, and polymers. Interactions between defects. Bonding and random packing in amorphous materials. Observation of defects in crystalline materials. Structural analysis of amorphous materials.

604 Plastic Flow and Fracture of Materials Fall. 3 credits.

Experimental and theoretical aspects of the deformation and failure of structural materials. Although the emphasis is on metals and alloys, consideration is given also to glasses, ceramics, and polymeric materials. Some of the topics included are: theory and practice of mechanical testing, deformation behavior of polycrystal and single-crystal metals, phenomenological theories of deformation, micromechanical theories of plastic flow and creep, relationship of microstructure to mechanical properties, brittle and ductile fracture of materials.

605 Phase Transformations Spring. 3 credits. Prerequisites: 601, 602, and 603, or equivalent. Nucleation theory. Growth theory. Formal theory of nucleation and growth transformation. Spinodal decomposition. Diffusionless transformations. Discussions of topics such as crystal growth from the vapor, solidification; eutectic transformations, solid state precipitation, eutectoid transformations, martensitic transformations. Transformations in polymers and glasses. At the level of *Phase Transformations*, American Society of Metals, 1970.

See also:

Introductory Solid-State Physics (Physics 454, College of Arts and Sciences)

Further Graduate Courses

610 Principles of Diffraction (also A&EP 711) Fall. 3 credits. Offered in alternate years. Introduction to diffraction phenomena as applied to solid-state problems. Scattering and adsorption of neutrons, electrons, and X-ray beams. Diffraction from two- and three-dimensional periodic lattices. Fourier representation of scattering centers, and the effect of thermal vibrations. Phonon information from diffuse X-ray and neutron scattering and Bragg reflections. Diffraction from almost-periodic structures, surface layers, gases, and amorphous materials. Survey of dynamical diffraction from perfect and imperfect lattices.

611 Friction and Wear of Materials (also M&AE 581) Spring. 3 credits. 3 lec. See M&AE 581 for course description.

614 Electron Microscopy 3 credits. Electron optics. Abbe theory of image formation with applications to the direct imaging of small defects and atomic planes. Kinematical theory of diffraction with applications to the study of the structure of grain boundaries and the imaging of crystal defects. Dynamical theory of diffraction as applied to the calculation of the images of crystal defects. Instruction in the use of the microscope.

669 Ceramic Materials 3 credits. Prerequisites: 601 and some familiarity with crystal structures. Crystal structure and bonding of typical ceramic materials; structure of silicate and nonsilicate glasses; imperfections in oxides; point defects and point defect chemistry, line defects, extended defects; diffusion in stoichiometric and nonstoichiometric ceramics; phase transformations; equilibrium and nonequilibrium phases; grain growth and sintering; plastic deformation and creep; topics from research papers.

701 Electrical and Magnetic Properties of Materials 3 credits. Prerequisite: Phys 454 or equivalent. Electronic transport properties of metals and semiconductors, semiconductor devices, optical and dielectric properties of insulators and semiconductors, laser materials, dielectric breakdown, structural aspects of superconducting materials, ferromagnetism and magnetic materials. At the level of *Physics of Semiconductor Devices* by Sze, *Ferromagnetism* by Bozworth, and current review articles.

702 Amorphous and Semicrystalline Materials 3 credits. Prerequisite: Phys 454 or equivalent. Topics related to the science of the amorphous state selected from within the following general areas: structure of liquids and polymers; rheology of elastomers and glasses; electrical, thermal, and optical properties of amorphous materials. Presented at the level of *Modern Aspects of the Vitreous State* by Mackenzie, "Glass Transitions" by Shen and Eisenberg in *Progress in Solid State Chemistry*, and *The Physics of Rubber Elasticity* by Treloar.

703 Physics of Solid Surfaces (also A&EP 762) 3 credits. Prerequisites: 601 and some knowledge of solid-state physics. See A&EP 762 for course description.

704 Advanced Topics in Crystal Defects 3 credits. Prerequisites: 601, 602, and 603, or equivalent. The structure and properties of point, line, and planar crystal defects treated from a fundamental point of view. Thermodynamics and kinetics of point defects. Atomistic and continuum theories of dislocations. Thermodynamic treatment of grain boundaries. Structure of grain boundaries. Emphasis given throughout to interactions between the various types of defects and to their roles in important phenomena such as diffusion, precipitation, plasticity, radiation damage.

705 Radiation Damage and Nuclear Materials 3 credits. Cross section for atom displacement, the atomic collision cascade, focusing of atomic collisions, mass transport along collision spectra within a cascade, range concepts, channeled particles and the effect of crystal imperfections, Rutherford scattering and channeling and their application to the lattice location of impurity atoms, sputtering of single and polycrystalline metals, recovery mechanisms for radiation damage, void formation in metals irradiated to high fluences, and the problem of swelling in liquid metal fast breeder reactors.

775 Advanced Topics in Mechanical Properties 3 credits. 3 lec. Prerequisite: 604 or permission of instructor. Topics from current research in mechanical properties of structural materials, selected from the following: modern theories of deformation, high-strength alloys, effects of nuclear radiation, amorphous solids, cyclic deformation and fatigue, fracture of brittle and ductile solids, anelasticity and internal friction. The lectures will be based largely on the current literature.

779 Special Studies in Materials Science Fall or spring. Credit variable. Supervised studies of special topics in materials science.

Mechanical and Aerospace Engineering

A. R. George, director; J. F. Booker, assistant director; P. L. Auer, D. L. Bartel, A. H. Burstein, D. A. Caughey, B. J. Conta, P. C. T. deBoer, F. C. Gouldin, S. Jahanmir, S. Leibovich, R. L. Levin, J. L. Lumley, W. J. McLean, F. K. Moore, R. M. Phelan, S. L. Phoenix, P. T. Radulovic, E. L. Resler, Jr., S. F. Shen, D. L. Taylor, K. E. Torrance, K. K. Wang, Z. Warhaft, R. L. Wehe

Members of the faculty of the graduate Fields of Aerospace Engineering and of Mechanical Engineering are listed in the *Announcement of the Graduate School*.

Bachelor of Science

Mechanical Engineering

The upperclass Field Program in Mechanical Engineering is designed to provide a broad background in this basic branch of engineering, as well as an introduction to the many professional and technical areas with which mechanical engineering is particularly concerned. Two main areas of concentration, corresponding to the two major streams of mechanical engineering technology, are offered in the field program.

Mechanical Systems and Design is concerned with those aspects of mechanical engineering that involve the design, analysis, and manufacture of devices, machines, and systems. Particular areas of concentration that are available are mechanical design and analysis, vehicle engineering, and manufacturing engineering.

Engineering of Energy and Fluid Systems is concerned with (1) the conversion of energy for various requirements for electric power and transportation (terrestrial and aerospace); (2) the study of environmental modification, which involves such areas as pollution control, refrigeration and air conditioning, acoustics and noise, and combustion engines; and (3) theoretical and experimental aspects of fluid dynamics and heat transfer.

The Field Program is open to students who have taken the course T&AM 202, Mechanics of Solids, as one of the sophomore engineering core sciences. It is recommended that underclass students who definitely intend to major in mechanical engineering also take as engineering core sciences the courses T&AM 203, Dynamics, and M&AE 221. Thermodynamics, which are required for the field program. Another course required for the field program that can be taken as a sophomore core science is Ele E 210, Introduction to Electrical Systems. Also, a student who takes MS&E 261, Introduction to Mechanical Properties of Materials, as a core science in DBS need not necessarily take M&AE 311, Materials and Manufacturing Processes, which is normally part of the field program.

The courses required for the Field Program in Mechanical Engineering are included in the curriculum sample outlined below. It should be noted that if some of the field requirements are fulfilled in DBS, as recommended, released electives may be substituted for them; it should also be noted that many courses may be taken in different terms from the ones indicated below.

Term	Credits
Term 5	
T&AM 203, Dynamics	3
M&AE 221, Thermodynamics	3
M&AE 311, Materials and Manufacturing Processes	3
Mathematics elective	3
Liberal studies elective	3
Term 6	
M&AE 325, Mechanical Design and Analysis	4
M&AE 323, Fluid Mechanics	4
Ele E 210, Introduction to Electrical Systems	3
Field elective	3
Liberal studies elective	3
Term 7	
M&AE 324, Heat Transfer and Transport Processes	3
M&AE 326, Systems Dynamics	3
M&AE 453, Mechanical Engineering Laboratory	4
Technical elective	3
Liberal studies elective	3
Term 8	
Field elective	3
Technical elective	3
Free elective	3
Free elective	3
Liberal studies elective	3

The mathematics elective is chosen from an approved list. The two field electives are selected from upperclass courses offered in mechanical and aerospace engineering.

Aerospace Engineering

Although there is no separate undergraduate program in aerospace engineering, students may prepare for a career in this area by majoring in mechanical engineering and taking a number of aerospace engineering electives, such as M&AE 305, 536, 606 and 607, and 636. Students may prepare for the graduate program in aerospace engineering by majoring in mechanical engineering or through other appropriate engineering specialties such as electrical engineering, engineering physics, or physical science. Other subjects recommended as preparation for graduate study include thermodynamics, fluid mechanics, applied mathematics, chemistry, and physics.

Master of Engineering (Aerospace)

The Master of Engineering (Aerospace) program is designed to increase the student's facility in the application of the basic sciences to important professional problems. Because aerospace engineering is continually engaged in new areas, an essential guideline for the program is to reach beyond present-day practices and techniques. This is achieved by supplying the student with the fundamental background and the analytical techniques that will remain useful in all modern engineering developments.

General admission and degree requirements are described in the introductory section under College of Engineering.

Required courses for the M.Eng. (Aerospace) degree include four three-credit core courses.

Also required are six credits of elective subjects. A list of suggested electives is available from the Program Representative, M.Eng. (Aerospace), in Grumman Hall. Further requirements are six credits of mathematics (T&AM 610-611 or Math 415-416 or the equivalent), participation in the weekly colloquium (one credit each term), one advanced seminar (two credits), and one professional design project (two credits). This makes a total of thirty credits.

The school has particular strengths in the areas of fluid dynamics, aerodynamics, high-temperature gasdynamics, turbulence, chemical kinetics, aerodynamic noise, sonic boom, nonlinear waves,

atmospheric flows, combustion processes in low-pollution engines, and solution of flow problems by finite element and numerical methods. Professional design projects may be arranged in any of these areas.

Available core courses are:

	Credits
M&AE 459, Plasmadynamics	3
M&AE 506, Aerospace Propulsion Systems	3
M&AE 507, Dynamics of Flight Vehicles	3
M&AE 543, Combustion Processes	3
M&AE 602, Aerodynamics I	3
M&AE 603, Aerodynamics II	3
M&AE 608, Physics of Fluids I	3
M&AE 610, Gasdynamics	3
M&AE 630, Atmospheric Turbulence and Micrometeorology	3
M&AE 632, Theoretical Fluid Mechanics I	3
M&AE 633, Theoretical Fluid Mechanics II	3
M&AE 648, Seminar on Combustion	3
M&AE 653, Experimental Methods in Fluid Mechanics and Combustion	3
M&AE 670, Mechanical and Aerospace Structures II	3
M&AE 734, Turbulence and Turbulent Flow	3
M&AE 737, Numerical Methods in Fluid Flow and Heat Transfer	3

Master of Engineering (Mechanical)

The Master of Engineering (Mechanical) degree program provides a one-year course of study for those who wish to develop a high level of competence in current technology and engineering design.

The program is designed to be flexible so that candidates may concentrate on any of a variety of specialty areas. These areas include bioengineering, machine dynamics and control, mechanical analysis and development, vehicles and propulsion, propulsion engines, energy systems, thermal environment, manufacturing engineering, and materials removal. An individual student's curriculum includes a six-credit design project, a major consisting of a minimum of twelve credits, and sufficient technical electives to meet the degree requirement of thirty credits.

The design project, which may be undertaken individually or by a small team, is a significant part of the program. Although "design" is interpreted broadly, the project should clearly involve the creation and evaluation of alternative solutions to an engineering problem. Each student chooses a project from a list of those offered by the faculty, or proposes a project and finds a faculty member who will agree to serve as adviser. Some recent projects have been concerned with the design and analysis of crankshaft and crankcase structures, the development of equipment for holographic interferometry measurements, the design of orthopedic implants, the University's energy policy, energy self-sufficiency, a new type of wind turbine, pollution control in automobile engines, motorcycle suspensions, and the analysis and design of flywheel-internal combustion engine hybrid drives for short-range cars.

A coordinated program of courses for the entire year is agreed upon by the student and his or her adviser. The proposed curriculum, together with a statement of overall objectives and a statement of the purpose of the major, is submitted for approval to the Master of Engineering Committee in the School of Mechanical and Aerospace Engineering. Any subsequent changes must also be approved by this committee.

The courses that constitute the major must be graduate-level courses in mechanical and aerospace engineering or a closely related field such as theoretical and applied mechanics. At least twenty-one credits of the total for the degree must be in mechanical engineering or related areas, and in

general all courses must be beyond the level of those required in the undergraduate program in mechanical engineering. Credit may be granted for an undergraduate, upper-level first course in some subject area if the student has done little or no previous work in that area, but such courses must have the special approval of the Master of Engineering Committee.

The technical electives may be courses of appropriate level in mathematics, physics, chemistry, or engineering; a maximum of six credits may be taken in areas other than these if the courses are part of a well-defined program leading to specific professional objectives. It is expected that all students will use technical electives to develop proficiency in mathematics beyond the minimum required of Cornell undergraduates if they have not already done so before entering the program. Courses in advanced engineering mathematics or statistics are particularly recommended.

Master of Science and Doctor of Philosophy

Programs in the graduate Fields of Aerospace Engineering and of Mechanical Engineering are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

101 Naval Ship Systems Spring, 3 credits. Open to freshmen and sophomores only.

R. L. Wehe.
An introduction to primary ship systems and their interrelation. Basic principles of ship construction, stability, propulsion, control, internal communications, and other marine systems.

208 The Role of Energy in Society On demand, 3 credits.

P. L. Auer.
A seminar-format course including: patterns of energy consumption; United States and world comparisons; fuel resources; technology of fuel extraction, energy conversion, and utilization; energy policies and regulations; environmental conflict; limits to growth.

221 Thermodynamics Fall or spring, 3 credits. 3 lec. Prerequisites: Math 191 and 192, Phys 112. See description under Division of Basic Studies.

302 Technology, Society, and the Human Condition Spring, 3 credits. Open to upperclass engineers and others by permission of instructor. S-U grading permitted. Enrollment limited to 40.

B. J. Conta.
An introduction to the history of technology from the origin of man to the present. Emphasis will be on the social and human consequences of technology rather than on internal or gadget history. The primary interest will be on the nineteenth and twentieth centuries and the pervasive effects of industrialization—a process that began with manufacturing and was rapidly extended to agriculture, culminating in what Ivan Illich has called the industrialization of man. Among the current topics included will be the transition from an economy of abundance and affluence to one of impending shortages and limits to growth, alternative life styles, alternative energy sources and systems, and the growing interest in intermediate or appropriate technology.

305 Introduction to Aeronautics Fall, 3 credits. Open to upperclass engineers. Others by permission of instructor.

D. A. Caughy.
Introduction to atmospheric flight vehicles. Principles of incompressible and compressible aerodynamics, boundary layers, and wing theory.

Propulsion system characteristics. Static aircraft performance; range and endurance. Elements of stability and control.

311 Materials and Manufacturing Processes (also MS&E 337) Fall or spring, 3 credits. 2 lec, 1 lab. May be taken in addition to MS&E 261. Prerequisite: T&AM 202.

Material structures. Physical and metallurgical properties of materials and their control by mechanical and metallurgical means. Manufacturing processes. Emphasis on correlations among design, material properties, and processing methods.

323 Fluid Mechanics Fall or spring, 4 credits. 4 rec. Prerequisites: 221, T&AM 202 and 203, or permission of instructor. Statics, kinematics, potential flow, dynamics, momentum and energy relations. Thermodynamics of compressible flow; dimensional analysis; real fluid phenomena, laminar and turbulent motion; boundary layer; lift and drag; supersonic flow.

324 Heat Transfer and Transport Processes Fall or spring, 3 credits. 1 lec, 2 rec. Prerequisite: 323.

Conduction of heat in steady and unsteady situations. Fin surfaces and systems with heat sources. Emission and absorption of radiation, and radiative transfer between surfaces. Forced and natural convection of heat owing to flow around bodies and through ducts. Combined modes of transfer and heat exchangers.

325 Mechanical Design and Analysis Fall or spring, 4 credits. 3 rec, 1 lab. Prerequisites: T&AM 202 and 203.

Application of the principles of mechanics and materials to problems of analysis and design of mechanical systems.

326 Systems Dynamics Fall or spring, 4 credits. Prerequisite: 325.

Dynamic behavior of mechanical systems, modeling, analysis techniques and applications, digital- and analog-computer simulation, balancing of rotating and reciprocating machinery, vibrations of single and multi-degree-of-freedom systems, linear control systems. PDF control, stability analysis.

389 Computer-Aided Design Spring, 3 credits. 2 lec-rec, 1 computing lab. Open to juniors and seniors.

A broad introduction to computational methods in mechanical design. Term project.

439 Acoustics and Noise Spring, 3 credits. Prerequisite: some knowledge of fluid mechanics or permission of instructor.

A. R. George.
Vibration and wave motion. Sound transmission and absorption. Sound radiation by surfaces and flow. Loudspeakers. Hearing, noise, and noise control criteria. Architectural acoustics and noise control techniques.

449 Combustion Engines Fall, 3 credits. 3 rec. Prerequisite: 221.

Introduction to combustion engines, with emphasis on application of thermodynamics and fluid dynamics and on control of undesirable exhaust emissions. Emphasis on performance, efficiency, and emissions of current and future spark-ignited and diesel reciprocating engines. Discussion of alternative engines and fuels.

453 Mechanical Engineering Laboratory Fall, 4 credits. 1 lec, 2 labs. Prerequisites: 325, 323, and concurrent registration in 326 and 324.

Laboratory exercises in instrumentation, techniques, and methods in mechanical engineering. Measurements of pressure, temperature, heat flow, drag, fluid flow rate, solar energy, thermoelectricity, displacement, force, stress, strain, vibrations, noise, etc.

459 Plasmatronics Spring, 3 credits.

Prerequisite: Phys 214.

P. L. Auer.

An elementary treatment of principles on which the concepts of controlled thermonuclear reactors (fusion) are based. Comparisons between fission and fusion systems. Fundamental aspects of plasma physics; other plasma devices (e.g., MHD converters) as time permits.

464 Design for Manufacture Fall, 3 credits.

Prerequisite: 311 or permission of instructor.

Design for casting, forging, stamping, welding, machining, heat treatment, and assembly; beneficial prestressing; improving the distribution of loads and deflections. Selection of materials; dimensioning and fits; joints, fasteners, and shaft mountings. Specifications for manufacturing and maintenance to minimize fatigue failures and improve reliability. Short design problems.

483 Mechanical Reliability Spring, 3 credits.

Prerequisite: OR&IE 260 or 270 or equivalent.

S. L. Phoenix.

Classic system reliability, hazard function concepts, reliability bounds; static and time-dependent material strength models, static and dynamic fatigue, weakest link models; structural system reliability, static and time-dependent parallel member models, Monte Carlo simulation of structural systems with load sharing.

486 Automotive Engineering Spring, 3 credits.

Prerequisite: 325.

Selected topics in the analysis and design of vehicle components and vehicle systems. Emphasis is on automobiles, trucks, and related vehicles. Powerplant, driveline, brakes, suspension, and structure. Other vehicle types may be considered.

490 Special Investigations in Mechanical and Aerospace Engineering Fall or spring. Credit arranged.

Prerequisite: permission of instructor. Intended for an individual student or a small group of students who wish to pursue a particular analytical or experimental investigation outside of regular courses, or for informal instruction supplementing that given in regular courses.

506 Aerospace Propulsion Systems. Spring.

3 credits, 3 rec. Prerequisite: 323 or permission of instructor. Offered in alternate years.

F. C. Gouldin.

Application of thermodynamics and fluid mechanics to design and performance of thermal-jet and rocket engines. Mission analysis in space. Auxiliary power supply; study of advanced methods of space propulsion.

507 Dynamics of Flight Vehicles Spring.

3 credits. Prerequisites: 305 and T&M 203 or permission of instructor. Offered in alternate years.

D. A. Caughey.

Introduction to stability and control of atmospheric flight vehicles. Review of aerodynamic forces and methods for analysis of linear systems. Static stability and control. Small disturbance equations of unsteady motion. Dynamic stability and transient control response. At the level of *Stability and Control of Airplanes and Helicopters* by Seckel.

512 Analysis of Manufacturing Processes (also MS&E 338) Spring, 3 credits, 3 lec. Prerequisite: 311. Offered in alternate years.

Analytical treatment of metal cutting and metal forming processes; conventional and nontraditional manufacturing methods; production systems and machine tool dynamics.

513 Materials Engineering (also MS&E 447) Spring, 3 credits, 2 lec, 1 lab. Prerequisite: 311 or MS&E 261 or permission of instructor.

Designed to aid in the design, selection, and use of materials. Theory and practice of extractive,

physical, and mechanical metallurgy. Corrosion principles and control; metallurgical failure analysis and prevention; nondestructive testing; metallurgical examination techniques; mechanical properties of polymers and ceramics; welding; powder metallurgy.

514 Numerical Control in Manufacturing Fall.

3 credits, 3 rec.

K. K. Wang.

Principles and the state of the art of numerical control (NC) technology; programming methods of NC machine tools; economic aspects and manufacturing systems.

536 Turbomachinery Spring, 3 credits, 3 rec.

Prerequisite: 323 or permission of instructor.

Aerothermodynamic design of turbomachines in general; energy transfer between fluid and rotor in specific types, axial and radial units, compressible flow, 3-D effects, surging. Outline design of high-performance compressor-turbine unit.

540 The Thermodynamics of Energy Husbandry Fall, 3 credits. Prerequisite: 221.

B. J. Conta.

Energy sources, energy conversion, and energy utilization. Emphasis on the detailed information provided by the second law analysis of energy problems made possible by application of the Gibbs availability function. Development of the availability function, the special cases of the Helmholtz and Gibbs free energies, and the quantitative evaluation of irreversibility. Applications to gas and vapor cycles and their variations, the multistaging of turbines and compressors, chemical processes, internal combustion engines and turbines, space heating, and industrial processes.

543 Combustion Processes Spring, 3 credits.

3 rec. Prerequisites: 323, 324.

An introduction to combustion and flame processes with emphasis on fundamental fluid dynamics, heat and mass transport, and reaction-kinetic processes that govern combustion rates. Both premixed and diffusion flames are considered.

554 Environmental Control On demand.

3 credits. Prerequisites: thermodynamics, fluid mechanics.

Environmental living systems; heating, cooling, air conditioning. Refrigeration, cryogenic systems, artificial environments, and life-support systems for space and underwater. Environmental effects of technological thermal sources.

555 Direct Energy Conversion Spring, 3 credits.

3 lec. Prerequisite: 221 or equivalent. Offered in alternate years.

Primarily a survey of methods for the direct conversion of heat into electrical energy, with emphasis on efficiency, maximum power, practical applications, and limitations. Thermoelectric generators and refrigerators. Thermionic generators. Solar cells. Magneto-fluid-dynamic generators. Fuel cells.

556 Power Systems I Fall, 3 credits.

Prerequisite: 323 or equivalent.

F. K. Moore.

A broad survey of methods of large-scale power generation, emphasizing energy sources, thermodynamic cycle considerations, and component description. Power industry, economic, and environmental factors. Trends and projections.

557 Power Systems II Spring, 3 credits.

Prerequisite: some energy-related course or permission of instructor.

F. K. Moore.

Options for future power generation: costs, feasibility, benefits, impacts; hydrogen, solar, geothermal, wind, and MHD are examples. Environmental and siting issues. Problems of scale;

"power parks." Uses of waste heat. Energy storage. Seminar format based on study projects reflecting student preparation and interests.

560 Transport Phenomena and Living Systems (also Chem E 630) Spring, 3 credits. Prerequisites: 221, 323, 324, or equivalent.

R. L. Levin.

Study of mass, momentum, and energy transport within biological systems. Mass transport through biological and artificial membranes: diffusion, osmosis, solute flow, ion flow, active transport. Momentum transport: biorheology, flow of particulate suspensions, pulsate flow in ducts. Bioheat transport: thermal modeling and properties of biomaterials, thermal interactions between the human body and the environment, cryobiology, and cryosurgery. Examples will be drawn from areas of current biomedical engineering interest: heart-lung machines, kidney dialysis machines, artificial organs, and surgical cryostats.

563 Mechanical Components Spring, 3 credits.

Prerequisite: 325.

Advanced analysis of machine components and structures. Application to the design of new configurations and devices. Selected topics from the following: lubrication theory and bearing design, fluid drives, shells, thick cylinders, rotating disks, fits, elastic-plastic design, thermal stresses, creep, impact, indeterminate and curved beams, plates, contact stresses.

565 Biomechanical Systems—Analysis and Design Fall, 3 credits, 3 rec. Prerequisites: T&M 202, 203.

D. L. Bartel.

Selected topics from the study of the human body as a mechanical system. Emphasis on the modeling, analysis, and design of biomechanical systems frequently encountered in orthopedic surgery and physical rehabilitation. Term project.

569 Mechanical and Aerospace Structures I Fall, 3 credits. Prerequisite: 325 or permission of instructor.

A study of advanced topics in the analysis of stress and deformation of deformable bodies with applications to the analysis and design of mechanical and aerospace systems. Topics selected from advanced strength of materials, energy methods in stress analysis, strength theories, and experimental stress analysis.

577 Mechanical Vibrations Spring, 3 credits.

2 rec, 1 lab. Open to qualified undergraduates.

Prerequisite: 326 or equivalent.

Further development of vibration phenomena in single-degree and multidegree of freedom linear and nonlinear systems, with emphasis on engineering problems involving analysis and design.

578 Automatic Control Systems Fall, 3 credits.

2 rec, 1 lab. Open to qualified undergraduates.

Prerequisite: 326 or equivalent.

R. M. Phelan.

Further development of the theory and implementation of feedback control systems, with particular emphasis on the application of pseudo-derivative-feedback (PDF) control concepts to linear and nonlinear systems.

581 Friction and Wear of Materials (also MS&E 611) Spring, 3 credits. Prerequisite: 311 or MS&E 261 or equivalent. Open to seniors with permission of instructor.

S. Jahanmir.

Fundamental aspects of friction and generation of heat in sliding systems. Wear mechanisms in metals and polymers with special emphasis on the role of microstructure and mechanical properties. Friction and wear in some specific applications such as metal processing, bearings, gears, cams, and

biomechanical systems. New methods of monitoring wear in machinery and measures to control friction and wear.

[587 Dynamics of Vehicles] Fall. 3 credits. Prerequisite: T&AM 203. Offered in alternate years. Not offered 1978-79.

Introduction to the dynamics of ground vehicles including cars, trucks, trailers, motorcycles, and railroad vehicles. Emphasis is on the handling behavior and stability of the automobile, tire theory, and suspension analysis. Performance and comfort criteria are developed. Further topics are included to reflect interests of the class.]

590 Mechanical Engineering Design Project Fall and spring. 3 credits each term. Intended for students in M. Eng. (Mechanical) degree program. Design of an engineering system or a device of advanced nature. Projects by individuals or small groups, sometimes in collaboration with an external organization.

592 Seminar and Design Project in Aerospace Engineering Fall and spring. 2 credits each term. Prerequisite: approval of director of school. Study and discussion of topics of current research interest in aerospace engineering. Individual design projects.

602 Aerodynamics I Fall. 3 credits. Intended for graduate students interested in fluid dynamics or aerodynamics research. Open to qualified undergraduates with permission of instructor. Basic equations, vorticity and flow development. Incompressible potential flow theory; singularity distributions, airfoil, wing, and slender body theory, complex-variable methods, unsteady phenomena.

603 Aerodynamics II Spring. 3 credits. Prerequisite: 632, 633, or equivalent. Open to qualified undergraduates by permission of the instructor. Basic conservation laws and fundamental theorems of compressible fluid flow. Shock waves, method of characteristics, wave interactions. Perturbation theories and similarity rules. Expansion procedures and singular perturbation problems. Linearized supersonic flow, wing theory, wave drag. Nonlinear theories of transonic and supersonic flow.

608 Physics of Fluids I Fall. 3 credits. Elementary kinetic theory of gases and a microscopic derivation of the Navier-Stokes equations. Statistical mechanics and applications to gas reactors. Elementary chemical kinetics as related to pollution studies.

609 Physics of Fluids II - Spring, on demand. 3 credits. Molecular structure bonding theory, heats of reaction. Atomic and molecular spectroscopy, applications to pollution. Nonequilibrium statistical mechanics; Boltzmann equation, H-theorem, review of Hilbert-Enskog-Chapman theory, fluctuations. Onsager's relations. Radiative transfer; lasers. At the level of *The Dynamics of Real Gases* by Clarke and McChesney.

[610 Gasdynamics] Spring. 3 credits. Offered in alternate years. Not offered 1978-79.

E. L. Resler, Jr.
A survey of the nonlinear theory of characteristics as applied to two-dimensional steady supersonic flows and one-dimensional unsteady flows. The role of chemical reactions in these flows will be treated, as well as experimental techniques to measure chemical reaction rates. Among the topics treated are heat capacity lag and its effects on acoustics, gasdynamic lasers, and shock-tube techniques. Magnetically driven shock waves will also be treated, if time permits.]

622 Introductory Magnetohydrodynamics On demand. 3 credits.

E. L. Resler, Jr.
Basic equations of magnetohydrodynamics. Tensor conductivity and MHD power generation. Aerodynamic flow problems. Plasma waves studied as a continuum. Hydromagnetic shock waves.

630 Atmospheric Turbulence and Micrometeorology Spring. 3 credits. Prerequisites: permission of instructor, knowledge of the Navier-Stokes equations, familiarity with elementary statistical methods. Open to qualified undergraduates. Offered in alternate years.

Z. Warhaft.
Basic problems associated with our understanding of the structure of the velocity field and the transport of scalars such as temperature and moisture in the lower atmosphere, from both theoretical and experimental viewpoints. Topics include the second-order turbulence equations and their closure, Monin-Obukhov theory, diffusion of scalars, spectral characteristics of atmospheric variables, experimental techniques including remote sensing, and the analysis of random time series.

632 Theoretical Fluid Mechanics I Fall. 3 credits. Introduction to the mechanics of fluids. Derivation of the Navier-Stokes equations. Boundary conditions. Exact solutions. Vorticity theorems. Methods of solution of irrotational flows. Rotational flows. Boundary layer theory. Exact methods of solution of the boundary layer equations.

633 Theoretical Fluid Mechanics II Spring. 3 credits. Approximate methods in boundary layer theory. Heat transfer. Buoyancy-driven flows. Stability of fluid flow. Introduction to turbulent flows. Dynamics and thermodynamics of compressible flows. Sound waves. Subsonic and supersonic flow. One-dimensional steady flows. Method of characteristics, shock waves.

646 Laser Measurements Spring. 3 credits. Open to qualified undergraduates with permission of instructor. May not be offered 1978-79.
P. T. Radulovic.
Methods using coherent laser light for measuring displacement, velocity, vibration, mass density, electron density, particle concentration, and temperature. Visualization and measurements in solid and fluid mechanics, heat transfer, aerodynamics, and plasmadynamics. Laboratory demonstrations.

[648 Seminar on Combustion] Spring. Offered in alternate years. 3 credits. 3 rec to be arranged. Prerequisite: permission of instructor. Not offered 1978-79.
Discussion of contemporary problems in combustion research with emphasis on applications of modern experimental and analytical techniques. Typical problems include formation and removal of pollutants in combustion systems, combustion of alternative fuels, coal combustion, and modification of combustion systems for energy efficiency improvement.]

650 Transport Processes I Fall. 3 credits. Prerequisite: 324 or permission of instructor.
K. E. Torrance.
Advanced treatment of heat conduction and thermal radiation. Differential and integral conduction equations. Exact and approximate solutions; superposition; phase change boundaries. Radiative transport equation and Kirchhoff's laws. Emission and scattering by real surfaces and by gases. Heat exchange in enclosures.

651 Transport Processes II Spring. 3 credits. Prerequisites: 323, 324, or permission of instructor.

P. T. Radulovic.
Advanced convection heat transfer. Integral and differential formulations. Basic equations reasoned in detail. Exact and approximate solutions. Natural convection. Forced convection. Laminar, transitional, and turbulent flows. Effects of variable properties, viscous dissipation, and compressibility. Mass transfer. Boiling and condensation.

653 Experimental Methods in Fluid Mechanics and Combustion Fall. 3 credits. 2 lec, 1 lab.

F. C. Gouldin.
Study of experimental techniques and data analysis procedures for investigation of fluid and combustive systems, with emphasis on experimental capabilities, underlying principles, and statistical treatment of data. Topics include laser velocimetry, hot-wire anemometry, and spectroscopy.

670 Mechanical and Aerospace Structures II Spring. 3 credits. Prerequisite: 569 or permission of instructor.

J. F. Booker.
Introduction to modern computational methods for static and dynamic analysis of mechanical and aerospace structures. Emphasis on underlying mechanics and mathematics. Discussion of inherent capabilities and limitations of general-purpose structural mechanics programs (e.g., NASTRAN). Term project.

672 Experimental Methods in Machine Design Fall. 3 credits. 1 rec, 2 labs. Prerequisite: 325 or equivalent.
Investigation and evaluation of methods used to obtain design and performance data. Photoelasticity, strain measurement, photography, vibration and sound measurements, transducers.

676 Advanced Mechanical Vibrations Fall. 3 credits. Prerequisite: 577 or equivalent. Offered in alternate years.

D. L. Taylor.
Vibratory response of multi-degree-of-freedom systems, matrix formulation, concepts of impedance, mobility, frequency response, and complex mode shapes. State-of-the-art techniques such as FFT, sine sweep, and single-point random excitation. Nonlinear vibrations, limit cycle analysis, parametric resonance, self-excited oscillations, and nonconservative systems. Random vibrations and stochastic excitation. Introduction to vibrations of elastic bodies.

679 Digital Simulation of Dynamic Systems Fall. 3 credits. Open to qualified undergraduates by permission of instructor. Some previous exposure to systems dynamics and digital programming is assumed. Offered in alternate years.

J. F. Booker.
Modeling and representation of physical systems by systems of ordinary differential equations in vector form. Applications from diverse fields. Simulation diagrams. Analog and digital simulation by direct integration. Problem-oriented digital-simulation languages (e.g., CSMP). Digital analysis of stability and response of large linear systems.

680 Design of Complex Systems Fall, on demand. 3 credits. Two 2-hour meetings. Prerequisite: permission of instructor.

R. L. Wehe.
A seminar course relying heavily on student participation in discussing frontier problems such as systems for space and underwater exploitation, salt water conversion, and transportation. Reports that set forth recommendations and the reasoning leading to them will be required.

682 Hydrodynamic Lubrication Fall, 3 credits. Offered in alternate years. Not offered 1978-79. J. F. Booker.

Designed to acquaint those having a general knowledge of solid and fluid mechanics with the special problems and literature currently of interest in various fields of hydrodynamic lubrication. General topics include equations of viscous flow in thin films, self-acting and externally pressurized bearings with liquid and gas lubricant films, bearing-system dynamics, and computational methods. Also selected special topics.]

684 Advanced Mechanical Reliability Fall, 3 credits. Prerequisite: 483 or permission of instructor. Offered in alternate years. Not offered 1978-79.

S. L. Phoenix.
Advanced course in random loading and statistical failure processes in mechanical systems. Continuous and discrete random loadings, random vibrations of mechanical structures, random fatigue processes in materials, order statistics and statistical estimation, reliability, simulation, and computation in mechanical structures, coherent systems and monotone load-sharing, stochastic failure of bundles and composites.]

685 Optimum Design of Mechanical Systems Spring, 3 credits. 3 rec. Prerequisite: graduate standing or permission of instructor. D. L. Bartel.

The formulation of design problems frequently encountered in mechanical systems as optimization problems. Theory and application of methods of mathematical programming for the solution of optimum design problems.

690 Special Investigations in Mechanical and Aerospace Engineering Fall or spring. Credit arranged. Prerequisite: graduate standing.

704 Theory of Viscous Flows Spring, 3 credits. Prerequisite: 632 or equivalent. S. F. Shen.

A systematic study of laminar flow phenomena and methods of analysis. Exact solutions of the Navier-Stokes equations. The small Reynolds number approximation. Matched asymptotic expansion. The boundary layer approximation; general properties. Transformations for compressibility and axisymmetric effects. Approximate methods of calculation. Unsteady problems. Stability of laminar flows.

707 Aerodynamic Noise Theory On demand. 3 credits. Prerequisites: 439 and 632-633 or permission of instructor.

Advanced topics in acoustics relevant to aerodynamic and transportation noise sources and control. Random processes. Geometrical acoustics in inhomogeneous moving media, Kirchhoff and Poisson formulas, diffraction, scattering. Lighthill-Curle formulations for sound generation. Absorption and transmission in fluids and at boundaries. Applications to aerodynamic noise sources.

734 Turbulence and Turbulent Flow Fall, 3 credits. J. L. Lumley.

Topics will include the dynamics of buoyancy and shear-driven turbulence, boundary-free and bounded shear flows, second-order modeling, the statistical description of turbulence, turbulent transport, and spectral dynamics.

735 Dynamics of Rotating Fluids On demand. 3 credits. Prerequisites: 632-633. S. Leibovich.

Review of classical fluid mechanics. Rotating coordinate systems. Linearized theory for rapidly rotating fluids. Inviscid regions, viscous layers. Spinup. Motions past objects. Waves in rotating

fluids. Motions in concentrated vortices. "Vortex breakdown" in swirling flows. Boundary layer interactions.

737 Numerical Methods in Fluid Flow and Heat Transfer Spring, 3 credits. Prerequisites: 323, 324 and some Fortran programming. K. E. Torrance.

Discretization procedures for the Navier-Stokes and scalar transport equations. Finite differences and finite elements. Analysis of accuracy, stability, and convergence. Survey and comparison of current methods with applications. Assigned problems are solved with a digital computer.

738 Nonlinear Wave Propagation On demand. 3 credits. S. Leibovich.

Mathematical treatment of nonlinear effects associated with waves in continua. Examples are taken primarily from geophysical fluid dynamics and gas dynamics. Methods of averaging, variational methods, wave interactions, and exact solutions of nonlinear evolution equations.

791 Mechanical and Aerospace Engineering Research Conference Fall and spring, 1 credit each term.

For graduate students involved in research projects. Short presentations on research in progress by students and staff.

795 Special Topics in Mechanical and Aerospace Engineering Fall or spring. Credit arranged. Prerequisite: permission of instructor. Topics of current importance in mechanical and aerospace engineering and research. Lecture or seminar format. More than one topic may be taken if offered.

799 Mechanical and Aerospace Engineering Colloquium Fall and spring, 1 credit each term. Credit limited to graduate students. All students and staff invited to attend.

Lectures by Cornell staff members, graduate students, and visiting scientists on topics of interest in mechanical and aerospace science, especially in connection with new research.

890 Research in Mechanical and Aerospace Engineering Credit arranged. Prerequisite: candidacy for M.S. degree in mechanical or aerospace engineering, or approval of the director. Independent research in an area of mechanical and aerospace engineering under the guidance of a member of the staff.

990 Research in Mechanical and Aerospace Engineering Credit arranged. Prerequisite: candidacy for Ph.D. degree in mechanical or aerospace engineering or approval of the director. Independent research in an area of mechanical and aerospace engineering under the guidance of a member of the staff.

Nuclear Science and Engineering

Faculty members of the graduate Field of Nuclear Science and Engineering are listed in the *Announcement of the Graduate School*. Many of these professors are members of the School of Applied and Engineering Physics, which offers most of the course work in this area.

Undergraduate Study

Although there is no special undergraduate field program in nuclear science and engineering, students who intend to enter graduate programs in this area are encouraged to begin specialization at the undergraduate level. This may be done by

choice of electives within regular field programs (such as those in engineering physics, materials science and engineering, and civil, chemical, electrical, or mechanical engineering) or within the College Program.

College Programs

The suggested curriculum for the College Program in Nuclear Engineering includes A&EP 303 and 304, Introduction to Nuclear Science and Engineering I and II, plus two of the four courses A&EP 612, A&EP 651, A&EP 633, and A&EP 609. Also available is the College Program in Energy Conversion, a synthesis of nuclear, thermal, and electrical engineering. See the introductory section under College of Engineering for a general description of the College Program.

Master of Engineering (Nuclear)

The two-term curriculum leading to the degree of M.Eng. (Nuclear) is intended primarily for individuals who want a terminal professional degree, but it may also serve as preparation for doctoral study in nuclear science and engineering. The course of study covers the basic principles of nuclear reactor systems with a major emphasis on reactor safety and radiation protection and control. The special facilities of the Ward Laboratory of Nuclear Engineering are described in the *Announcement of the Graduate School*.

The interdisciplinary nature of nuclear engineering allows students to enter from a variety of undergraduate specializations. The recommended background is: (1) an accredited baccalaureate degree in engineering, physics, or applied science; (2) physics, including atomic and nuclear physics; (3) mathematics, including advanced calculus; and (4) thermodynamics. Students should see that they fulfill these requirements before beginning the program. In some cases, deficiencies in preparatory work may be made-up by informal study during the preceding summer. General admissions and degree requirements are described in the introductory section under College of Engineering.

The following courses are included in the thirty-credit program:

Fall term

A&EP 612, Nuclear Reactor Theory I
A&EP 633, Nuclear Reactor Engineering
A&EP 609, Low-Energy Nuclear Physics
Technical elective

Spring term

A&EP 651, Nuclear Measurements Laboratory
Technical elective,
Engineering design project
Mathematics or physics elective

Engineering electives should be in a subject area relevant to nuclear engineering, such as energy conversion, radiation protection and control, feedback control systems, magnetohydrodynamics, controlled thermonuclear fusion, and environmental engineering. Typical examples are: M&AE 651, Transport Processes II; Ele E 681, Introduction to Plasma Physics; Ele E 682, Advanced Plasma Physics; M&AE 622, Introductory Magnetohydrodynamics; and Ele E 671-672, Feedback Control Systems.

Master of Science and Doctor of Philosophy

Programs in the graduate Field of Nuclear Science and Engineering are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

Courses in nuclear science and engineering include the following courses described in the appropriate sections of this *Announcement*: A&EP 303 and 304, Introduction to Nuclear Science and Engineering I and II; A&EP 609, Low-Energy Nuclear Physics; A&EP 612 and 613, Nuclear Reactor Theory I and II; A&EP 633, Nuclear Reactor Engineering; A&EP 634, Nuclear Engineering Design Seminar; A&EP 636, Seminar on Thermonuclear Fusion Reactors; A&EP 651, Nuclear Measurements Laboratory; A&EP 652, Advanced Nuclear and Reactor Laboratory; Chem E 627, Nuclear and Reactor Engineering; and MS&E 705, Radiation Damage and Nuclear Materials.

Operations Research and Industrial Engineering

G. L. Nemhauser, director; W. L. Maxwell, associate director; N. U. Prabhu, graduate faculty representative; R. E. Bechhofer, L. J. Billera, R. G. Bland, J. A. Bloom, T. Boucher, R. W. Conway, D. C. Heath, W. F. Lucas, J. A. Muckstadt, T. J. Santner, B. W. Saunders, L. W. Schruben, A. Schultz, Jr., M. S. Taqqu, H. M. Taylor 3d, M. J. Todd, L. E. Trotter, Jr., B. W. Turnbull, L. I. Weiss

Bachelor of Science

During the sophomore year in the Division of Basic Studies, a student who plans to enter the Field Program in Operations Research and Industrial Engineering must elect, as one of the four engineering core sciences, OR&IE 260, Introductory Engineering Probability. Other recommended core sciences are OR&IE 213, Ele E 210, T&AM 202, and Com S 211. Early consultation with an OR&IE faculty member or with the associate director can be helpful in making appropriate choices. In the junior year the following courses are required:

Term	Credits
Term 5	
OR&IE 320, Optimization I	4
OR&IE 350, Cost Accounting, Analysis, and Control	4
OR&IE 370, Introduction to Statistical Theory with Engineering Applications	4
Com S 211, Computers and Programming*	3
Liberal studies elective	3
Term 6	
OR&IE 321, Optimization II	3
OR&IE 361, Introductory Engineering Stochastic Processes	4
OR&IE 383, Introduction to File Processing and Simulation	4
Behavioral science†	3
Liberal studies elective	3

*If Com S 211 is completed during the sophomore year, an appropriate three-credit technical elective may be substituted by agreement with the OR&IE adviser.

†The behavioral science requirement can be satisfied by any one of several courses of an advanced nature, including B&PA 540 (recommended for those contemplating the pursuit of a graduate business degree), B&PA 541, ILR 121, ILR 150, and ILR 151. The adviser must approve the selection in all cases.

The basic senior-year program, from which individualized programs are developed, comprises the following courses:

	Credits
Four courses consisting of two two-course sequences as described below	minimum of 12
Two technical electives (these need not be sequential)	6
Two liberal studies electives	6
Two free electives	6

Available OR&IE sequences are as follows:
 Industrial systems: OR&IE 410 and 421* 8
 Information systems: OR&IE 682 and Com S 414 8
 Optimization methods: OR&IE 435 and 432, or 435 and 431 6
 Applied statistics: OR&IE 471 and 561, or 471 and 570 7

*This sequence must be selected by students who plan to participate in the cooperative program with the Graduate School of Business and Public Administration.

Students who have established specific career goals and wish to apply the OR&IE methodology in other technological areas may substitute a course sequence appropriate to the outside discipline for one of the required OR&IE sequences. Examples of possible sequences outside OR&IE are:

Manufacturing systems: M&AE 311 and 512	6
Transportation systems: CEE F621 and F624	7
Public systems: CEE B617 and either F624 or H628	6
Electrical systems: Ele E 301 and 302	8
Computer systems: Ele E 675 and 676	6
Numerical methods: Com S 321 and 322	8
Information systems: Com S 613 and 635	8

Other sequences are possible and should be checked with the student's adviser.

These options, together with an appropriate choice of technical electives, enable a student to earn at least twelve credits in a technological field other than OR&IE. Through an appropriate choice of free electives also, as many as eighteen credits can be earned in the secondary discipline.

Scholastic requirements for the field are a passing grade in every course, maintenance of a cumulative grade-point average of at least 2.0, maintenance of at least a 2.0 average for those courses taken while enrolled in the School, and satisfactory progress toward the completion of the degree requirement. The student's performance is reviewed at the conclusion of each term.

Master of Engineering (OR&IE)

This one-year professional degree program is application-oriented rather than research-oriented, and requires completion of a project. The course work centers on additional study of analytical techniques, with particular emphasis on engineering applications, especially in the design of new or improved man-machine systems, information systems, and control systems.

General admission and degree requirements are described in the introductory section under College of Engineering. The M.Eng. (OR&IE) program is integrated with the undergraduate degree program in OR&IE, and students who apply during their senior year will generally be admitted. Also welcome are requests for admission from Cornell undergraduates in engineering programs other than OR&IE, or from qualified non-Cornellians. To ensure completion of the program in one calendar year, the entering student should have completed courses in probability theory and basic probabilistic models and in computer programming, and should have acquired some fundamental knowledge of economic concepts required for decision making.

The two parallel course programs leading to the M. Eng. (OR&IE) degree are outlined below.

I. For matriculants with preparation comparable to that provided by the undergraduate Field Program in OR&IE:

Fall term	Credits
OR&IE 516, Mathematical Models—Development and Application	4

OR&IE 680, Digital Systems Simulation	4
OR&IE 893, Applied OR&IE Colloquium	1
OR&IE 899, Project	1
Depth elective	minimum of 3
Breadth elective	minimum of 3
<i>Spring term</i>	
OR&IE 551, Advanced Engineering Economic Analysis	4
OR&IE 894, Applied OR&IE Colloquium	1
OR&IE 899, Project	minimum of 4
Depth elective	minimum of 3
Breadth elective	minimum of 3

The electives specified above will normally be chosen from graduate courses offered by the School of Operations Research and Industrial Engineering. The depth elective will generally continue study in one of the topics elected to satisfy one of the fourth-year sequence requirements. The breadth elective will generally be one of these sequences available in the fourth year (see listing under Bachelor of Science) but not selected by the student for the undergraduate curriculum.

II. For matriculants from other major fields of engineering who fulfill the basic prerequisite requirements but do not qualify for Program I:

Fall term	Credits
OR&IE 370, Introduction to Statistical Theory with Engineering Applications	4
OR&IE 622, Operations Research I	3
OR&IE 516, Mathematical Models—Development and Application	4
OR&IE 893, Applied OR&IE Colloquium	1
OR&IE 899, Project	1
Professional elective	minimum of 3
<i>Spring term</i>	
OR&IE 383, Introduction to File Processing and Simulation	4
OR&IE 623, Operations Research II	3
OR&IE 551, Advanced Engineering Economic Analysis	4
OR&IE 894, Applied OR&IE Colloquium	1
OR&IE 899, Project	minimum of 4
Professional elective	minimum of 3

The M.Eng. (OR&IE) student fulfills the project requirement by working individually or as part of a group of no more than four students on an operational systems problem that actually exists in some organization. Appropriate problems are suggested by various operating organizations such as manufacturing firms, retailing organizations, service organizations, government agencies, and educational institutions.

Cooperative Program with Business and Public Administration

Of the three degree programs offered by the School of Business and Public Administration at Cornell, the Master of Business Administration program is of most interest to engineers. Because modern management is concerned with the operations of production and service systems, much of the analytical methodology required to deal with operating decisions is the same as that used by systems engineers in designing the systems. Therefore, there are several subjects required in the M.B.A. program which OR&IE students take as undergraduates, and an agreement between the School of Operations Research and Industrial Engineering and the Graduate School of Business and Public Administration provides an opportunity to complete the M.B.A. program in one additional year following completion of the M.Eng. degree requirements.

Essential aspects of this combined six-year B.S./M.Eng./M.B.A. program are:

1. that the OR&IE candidate have completed by course work, advanced standing, or exemption examinations, the core course work required for the

M.B.A. degree, except for Business Policy, by the end of the fifth year;
 2. that thirty credits, at most, of advanced standing will be awarded by the School of Business and Public Administration for work done before the start of the sixth year in the undergraduate B.S. program, in the M.Eng. program, and in Business and Public Administration;
 3. that during the sixth year, over a period of two semesters, the candidate will earn twenty-six credits in elective courses approved by Business and Public Administration, plus four credits for Business Policy.

The candidate would qualify for the B.S. degree at the end of four years, the M.Eng. degree at the end of five years, and the M.B.A. degree at the end of six years.

Further details and applications forms for this special program may be obtained from the office of the School of Operations Research and Industrial Engineering, Upson Hall.

Master of Science and Doctor of Philosophy

Programs available in the Graduate Field of Operations Research are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

213 Systems Analysis and Design Fall. 3 credits. 2 lec, 1 rec.

See description under Division of Basic Studies.

260 Introductory Engineering Probability Fall or spring. 3 credits. 3 lec. Prerequisite: first-year calculus.

See description under Division of Basic Studies.

270 Basic Engineering Statistics Fall or spring. 3 credits. 2 lec, 1 rec.

See description under Division of Basic Studies.

[301 Introduction to Systems Engineering Fall. 3 credits, 3 lec-rec. Not offered 1978-79. An introduction to modern industrial systems. Historical development of industrial engineering and operations research. Study of industrial organizations and their functions of production, marketing, and costing.]

320 Optimization I Fall. 4 credits. 3 lec, 1 rec. Prerequisite: Math 293 or 221.

Formulation of linear programming problems and solution by the simplex method. Related topics such as sensitivity analysis, two-person games, network and integer programming. Applications will include such models as resource allocation, production planning, and political districting.

321 Optimization II Spring. 3 credits, 2 lec, 1 rec. Prerequisite: 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 will be stressed, as well as numerous applications. The computer will be used in solving typical problems.

350 Cost Accounting, Analysis, and Control

Fall or spring. 4 credits. 3 lec, 1 computing-disc. Principles of accounting, financial reports; job order and process cost systems—historical and standard costs; cost characteristics and concepts for control, analysis, and decision making.

361 Introductory Engineering Stochastic Processes I Spring. 4 credits. 3 lec, 1 rec. Prerequisite: 260 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 queueing and reliability.

370 Introduction to Statistical Theory with Engineering Applications Fall or spring. 4 credits. 3 lec, 1 rec. Prerequisite: 260 or equivalent.

Provides a working knowledge of basic statistics as it is most often applied in engineering and a basis in statistical theory for continued study. Topics include a review of distributions of special interest in statistics; testing simple and composite hypotheses; point and interval estimation; correlation; linear regression; curve fitting.

383 Introduction to File Processing and Simulation Spring. 4 credits. 2 lec, 1 rec.

Prerequisites: 206, 370, Com S 211.

The application of computers in the areas of management decision making. Design of large data bases and their retrieval and maintenance systems. Simulation methodology. Use of available program packages and special purpose languages. Considerable programming project work.

410 Industrial Systems Analysis Fall. 4 credits. 3 lec, 1 computing session. Prerequisites: 350 and 370.

Engineering economic analysis, including engineering economy, replacement, taxation effects, decision making based on economic considerations. Operations analysis including process flow, process evaluation, procedural analysis, resource layout, methods analysis and design, work measurement, job evaluation, quality control elements. Project planning and control.

417 Layout and Material Handling Systems

Spring. 2 lec, 1 rec. Prerequisite: 361, 383.

Design of the layout of processes and storage areas and the material handling system for movement of items. Typical equipment used. The functions of identification, control, storage, movement, batching, merging, and dispersion. Introduction to new technologies.

421 Production Planning and Control Spring. 4 credits. 3 lec. Prerequisites: 320 and 361 or permission of instructor.

Planning and control of large-scale production operations. Inventory control. Leveling, smoothing, and scheduling of production. Job shop scheduling and dispatching. Demand forecasting. Economic and practical interpretation of planning and control procedures.

[431 Discrete Models Spring. 3 credits. 3 lec-rec. Not offered 1978-79.

Basic concepts about graphs, networks, and discrete optimization. The use of finite mathematical techniques to model contemporary problems selected from operations research, including voting procedures and decision making, efficient and equitable allocations, energy and environment, traffic and urban systems.]

432 Introductory Nonlinear Programming

Spring. 3 credits. 2 lec, 1 rec. Prerequisites: 320, Com S 100.

Optimization techniques involving nonlinear functions. Stress is on solution methods such as one-dimensional search, steepest-descent and second-order methods for unconstrained optimization; penalty, barrier, cutting-plane and feasible-direction methods for constrained optimization.

435 Introduction to Game Theory Fall. 3 credits. 3 lec.

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. Structure theory for games arising from complex organizations.

462 Introductory Engineering Stochastic Processes II Fall. 4 credits. 3 lec, 1 rec.

Prerequisite: 361 or equivalent.

A selection of topics from the following: Time series, Markov and semi-Markov processes, optimal stopping; examples and applications are drawn from several areas.

471 Applications of Statistics to Engineering Problems Fall. 4 credits. 3 lec, 1 rec. Prerequisite: 370 or equivalent.

Sample size calculations for one- and two-sample tests; theory of multiple linear regression and applications to problems in engineering and the sciences, including graphic and analytic techniques useful in model building; analysis of data from experiments with qualitative factors including one-way and two-way Anova models. Use of the computer as a tool for statistics is stressed.

472 Statistical Decision Theory Spring.

3 credits. 3 lec. Prerequisite: 471 or equivalent.

Same topics as 672, with emphasis on applications in sampling inspection, inventory control, estimation of parameters, testing hypotheses.

516 Mathematical Models—Development and Application Fall. 4 credits. 4 lec-labs.

Prerequisites: 320 and 361 or permission.

A laboratory course concerned with structuring problems and operational systems as mathematical models. A sequence of situations for which students must construct representative models is considered. Models are examined for their usefulness in analysis, synthesis, and design.

519 Industrial Engineering Field Work Fall or spring. Credit arranged. Prerequisite: permission of instructor.

Project-type work, under faculty supervision, on a real problem existing within some firm or institution, usually a regional organization. About one trip each week to visit the organization. Opportunities in the course may be discussed with the associate director.

551 Advanced Engineering Economic Analysis

Spring. 4 credits. 2 lec-disc. Prerequisite: 350.

Brief review of accounting bases of financial reporting, control, and decision making. Processes of definition of objectives and goals. Forecasting, pricing, planning, budgeting, and control. Product and market decisions; interdependence of organization, operations, and economic decisions. Cash flow, measurement and control of nonmanufacturing activities. Related topics of special interest to class.

[561 Queueing Theory and Its Applications

Fall. 3 credits. 3 lec. Prerequisite: 361 or permission. Not offered 1978-79.

Basic queueing models. Design and control of queueing systems. Statistical inference from queueing processes. Solution techniques (including simulation). Scheduling and equipment maintenance. Highway and urban traffic networks. Analysis of computer systems.]

562 Inventory Theory Fall. 4 credits. 2 lec, 1 rec. Prerequisite: 320 and 361.

Discussion of the nature of inventory systems and their design and control. Periodic and continuous review policies for single-item and single-location problems. Multi-item and multi-echelon extensions. Dynamic and static models are discussed. Redistribution methods are analyzed. Applications are stressed.

[570 Statistical Methods in Quality and Reliability Control Spring. 3 credits. 3 lec.

Prerequisite: 370 or equivalent. Not offered 1978-79. Control concepts and methods for attributes and variables; process capability analysis; acceptance sampling plans; elementary procedures for variables; acceptance-rectification procedures.

Reliability concepts; exponential and normal distributions in reliability; life and reliability analysis of components and systems; redundancy.]

614 Facilities Location and design Spring. 3 credits. 3 lec-rec. Prerequisite: 320 or 622 or permission of instructor. Not offered 1978-79. Formulation, analysis, and solution techniques for location and facility design problems. Applications in industrial, environmental, and regional arenas.]

622 Operations Research I Fall. 3 credits. 3 lec-rec. Not open to students who have had 320. Survey of deterministic models. Models are drawn from linear, mixed-integer, nonlinear and dynamic programming. Network theory, game theory, and deterministic inventory models. Modeling and applications will be stressed.

623 Operations Research II Spring. 3 credits. 3 lec-rec. Prerequisite: 260 or 270 or permission. Not open to students who have had 361. Models of inventory and production control, Markov decision models, queueing theory and its applications. Simulation. Illustrative examples and problems.

625 Scheduling Theory Spring. 3 credits. 3 lec-rec. Prerequisite: permission of instructor. Not offered 1978-79. Scheduling and sequencing problems. Single resource scheduling, parallel processing, flow shop scheduling. Methodology drawn from dynamic and integer programming; simulation techniques and heuristic methods.]

626 Advanced Production and Inventory Planning Spring. 3 credits. 3 lec. Introduction to a variety of production and distribution planning problems; the development of mathematical models corresponding to these problems; a study of approaches for finding solutions.

630 Linear Programming Fall. 3 credits. 3 lec. Prerequisite: advanced calculus. Theory of polyhedral convex sets. Relationship to systems of linear equations and inequalities, including the Farkas lemma. Dual pairs of linear programming problems and the duality theorem. Simplex method and dual simplex method. Transportation problem. Decomposition principle. Introduction to integer and nonlinear programming.

631 Integer Programming Spring. 3 credits. 3 lec. Prerequisite: 630. Not offered 1978-79. Discrete optimization. Linear programming in which the variables are restricted to be integer-valued. Theory, algorithms, and applications. Cutting plane methods, enumerative methods, and group theoretic methods; additional topics drawn from recent research in this area.]

632 Nonlinear Programming Fall. 3 credits. 3 lec. Prerequisite: 630. Not offered 1978-79. Necessary and sufficient conditions for unconstrained and constrained optima. Computational methods, including interior (e.g., penalty functions), boundary (e.g., gradient projection), and exterior (e.g., cutting plane) approaches.]

635 Game Theory I Fall. 3 credits. 3 lec. Prerequisite: Math 411 or permission. The minimax theorem for two-person zero-sum games. Two-person general sum games and noncooperative n-person games; Nash equilibrium points. Cooperative n-person games; the core, stable sets, Shapley value, bargaining set, kernel, nucleolus.

637 Dynamic Programming Fall. 3 credits. 3 lec. Prerequisite: concurrent registration in 660 and Math 411 or equivalent. Not offered 1978-79. Optimization of sequential decision processes.

Deterministic and stochastic models, infinite horizon Markov decision models, policy iterations. Contraction mapping methods. Applications drawn from inventory theory, production control; discrete combinatorial examples.]

639 Convex Analysis Fall. 3 credits. 3 lec. Prerequisite: Math 411 and Math 431 or permission. The theory of finite dimensional convex sets developed through the study of real valued convex functions and Fenchel duality. Separation of convex sets, polarity correspondences, recession cones, theorems of Helly and Caratheodory.

643 Graph Theory and Network Flows Spring. 3 credits. 3 lec. Prerequisite: permission of instructor. Directed and undirected graphs. Bipartite graphs. Hamilton cycles and Euler tours. Connectedness, matching, and coloring. Flows in capacity-constrained networks. Maximum flow and minimum cost flow problems.

644 Combinatorial Analysis Spring. 3 credits. 3 lec. Prerequisite: permission of instructor. Topics in combinatorics, graphs, and networks. These include matching, matroids, polyhedral combinatorics, and optimization algorithms.

660 Applied Probability Fall. 4 credits. 3 lec, 1 rec. Introduction to basic probability. The sample space; events; probability. Conditional probability. Independence. Product spaces. Random variables. Important distributions. Characteristic functions. Convergence concepts. Limit theorems.

661 Applied Stochastic Processes Spring. 4 credits. 3 lec, 1 rec. Prerequisite: 660 or equivalent. An introduction to stochastic processes which presents the basic theory together with a variety of applications. Topics include Markov processes, renewal theory, random walks, branching processes, Brownian motion, stationary processes.

670 Applied Statistics Spring. 4 credits. 3 lec, 1 rec. Prerequisite: 660 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.

671 Intermediate Applied Statistics Fall. 4 credits. 3 lec, 1 rec. Prerequisite: 670 or equivalent. 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. Correlation, ridge regression. Use of the computer as a tool for statistics is stressed.

672 Statistical Decision Theory Spring. 3 credits. 3 lec. Prerequisite: 471 or 670 or equivalent. Not offered 1978-79. The general problem of statistical decision theory and its applications. Comparison of decision rules; Bayes, admissible, and minimax rules. Problems involving sequences of decisions over time. Use of the sample cdf and other simple nonparametric methods. Applications.]

673 Nonparametric Statistical Analysis Spring. 3 credits. 3 lec. Prerequisite: 670 or permission. Estimation of quantiles, cdf's, and pdf's. Properties of order statistics and rank-order statistics. Hypothesis testing in one- and several-sample

situations; sign tests; use of ranks for tests and estimation. Small and large sample properties of tests. Asymptotic distributions of test statistics. Testing goodness of fit.

674 Design of Experiments Spring. 4 credits. 3 lec. Prerequisite: 671 or permission. Not offered 1978-79. Use and analysis of experimental designs such as randomized blocks and Latin squares; analysis of variance and covariance, factorial experiments; statistical problems associated with finding best operating conditions; response-surface analysis.]

675 Qualitative Data Analysis Spring. 3 credits. Prerequisite: 671. Not offered 1978-79. Varieties of categorical data; cross classifications and contingency tables; tests for independence; multidimensional tables and log-linear models; maximum likelihood and weighted least squares estimation; tests of goodness of fit; analysis of incomplete tables; life tables; paired comparison experiments.]

676 Statistical Analysis of Life Data Fall. 3 credits. Prerequisite: 671 or equivalent. Analysis of data from reliability, fatigue, and life-testing studies in engineering; also biomedical applications. Survival distributions, hazard rate, censoring. Life tables. Estimation and hypothesis testing. Standards. Goodness of fit, hazard plotting. Covariance analysis, accelerated life testing. Multiple decrement models, competing risks. Sample size determination. Adaptive sampling.

680 Digital Systems Simulation Fall. 4 credits. 2 lec, 1 rec. Prerequisites: Com S 211 and OR&IE 370 or permission of instructor. Digital computer programs to simulate the operation of complex discrete systems in time. Modeling, program organization, random number and deviate generation, simulation languages, statistical considerations; applications to a variety of problem areas.

682 File Processing (also Com S 632) Fall. 4 credits. 2 lec. Prerequisite: Com S 211 or permission of instructor. See Com S 632 for course description.

736 Game Theory II Spring. 3 credits. 3 lec. Prerequisite: 635. A continuation of 635, including in-depth treatment of some of the same topics plus such additional topics as games in extensive form, games without side payments, economic market games, and games with infinitely many players.

738 Selected Topics in Game Theory Fall or spring. Credit arranged. Not offered 1978-79. Current research topics in game theory.]

739 Selected Topics in Mathematical Programming Fall or spring. Credit arranged. Current research topics in mathematical programming.

752 Advanced Inventory Control Spring. 3 credits. 3 lec. Prerequisite: permission of instructor. Not offered 1978-79. The theoretical foundation of inventory theory. Both single-item, single-location problems and multi-item, multi-echelon inventory systems will be analyzed. Topics covered include a study of static and dynamic (s,S) policies under a variety of assumptions concerning the demand process and system structure as well as computational techniques.]

761 Advanced Queueing Theory Fall. 3 credits. 3 lec. Prerequisite: 660 or equivalent. A study of stochastic processes arising in a class of problems including congestion, storage, dams, and insurance. The treatment will be self-contained.

Transient behavior of the processes will be emphasized. Heavy traffic situations will be investigated.

[762 Advanced Stochastic Processes Fall. 3 credits. 3 lec. Prerequisite: 661 or equivalent. Not offered 1978-79.

A selection of topics from the following: stationary processes, Levy processes, diffusion processes, point processes, martingales, regenerative phenomena, stochastic calculus, weak convergence.]

[764 Deterministic and Stochastic Control

Spring. 3 credits. 3 lec. Prerequisite: 661 or equivalent. Not offered 1978-79.

Topics include: elements of calculus of variations, Pontryagin's maximum principle, Markov decision processes, dynamic programming. Problems in filtering and prediction, production planning and inventory control, congestion phenomena, storage models, and environmental management will be discussed.]

769 Selected Topics in Applied Probability Fall or spring. Credit arranged.

Topics will be chosen from current literature and research areas of the staff.

773 Statistical Selection and Ranking

Procedures Spring. 3 credits. 3 lec. Prerequisite: 674 or permission.

A study of multiple-decision problems in which a choice must be made among two or more courses of action. Major emphasis is placed on selection and ranking problems involving choosing the "best" category where goodness is measured in terms of a particular parameter of interest. Statistical formulations of such problems: indifference-zone, subset, and other approaches. Single-stage, two-stage, and sequential procedures. Applications. Recent developments.

779 Selected Topics in Applied Statistics Fall or spring. Credit arranged.

Topics chosen from current literature and research areas of the staff.

[789 Selected Topics in Information Processing (also Com S 733) 4 credits. 2 lec, 1 computing session. Not offered 1978-79.

Selected topics in the design and optimization of record storage and file accessing methodology using operations research techniques.]

890 Special Investigations in OR&IE Fall or spring. Credit arranged. Prerequisite: permission of instructor.

For individuals or small groups. Study of special topics or problems under faculty guidance.

891 OR Graduate Colloquium Fall or spring. 1 credit.

A weekly 1½-hour meeting devoted to presentations by distinguished visitors, by faculty members, and by advanced graduate students, on topics of current research in the field of operations research.

893-894 Applied OR&IE Colloquium 893, fall; 894, spring. 1 credit each term.

A weekly meeting of M.Eng. students. Discussion of assigned topics; presentations by practitioners in the field.

899 Project Fall and spring. 5 credits. For M.Eng. students.

Identification, analysis, design, and evaluation of feasible solutions to some applied problem within the OR&IE field. A formal report and oral defense of the approach and solution are required.

Structural Engineering

See Civil and Environmental Engineering.

Theoretical and Applied Mechanics

Y. H. Pao, chairman; H. D. Block, J. A. Burns, H. D. Conway, P. A. Dashner, E. W. Hart, P. J. Holmes, J. T. Jenkins, R. H. Lane, G. S. S. Ludford, F. C. Moon, S. Mukherjee, R. H. Rand, W. H. Sachse

Undergraduate Study

The Department of Theoretical and Applied Mechanics is responsible for courses in engineering mechanics and engineering mathematics, some of which are part of the underclass engineering curriculum in the Division of Basic Studies.

College Program in Engineering Science

Although no upperclass field program is offered by the Department of Theoretical and Applied Mechanics, a student may enroll in the College Program in Engineering Science, which is sponsored by the department. The College Program is described in the introductory section under College of Engineering.

Master of Engineering (Engineering Mechanics)

Students who are interested in advanced study in mechanics and who intend to emphasize engineering practice rather than teaching or research may apply for admission to the M.Eng. (Engineering Mechanics) degree program. General admission and degree requirements are described in the introductory section under College of Engineering. Specific requirements for the M.Eng. (Engineering Mechanics) degree are:

1. Completion of a minimum of three credits of work on an individual project, either analytical or experimental, under the direction of a faculty member.
2. Satisfactory completion of six credits of 600-level courses in mathematics or applied mathematics.
3. Courses in or related to theoretical and applied mechanics, selected in consultation with the student's adviser from those offered at the graduate level, to bring the total credits to at least thirty.

Master of Science and Doctor of Philosophy

The research-oriented degree programs offered by the graduate Field of Theoretical and Applied Mechanics are described in the *Announcement of the Graduate School and Graduate Study in Engineering and Applied Science*.

Description of Courses

Courses are listed under the following headings: *Basics in Engineering Mathematics and Mechanics*; *Engineering Mathematics*; *Experimental Mechanics*; *Continuum Mechanics and Inelasticity*; *Elasticity and Waves*; *Dynamics and Space Mechanics*; *Biomechanics*; and *Special Courses, Projects, and Thesis Research*.

Basics in Engineering Mathematics and Mechanics

105 Finite Mathematics for Biologists (also Math 105) Offered by the Department of Mathematics 1978-79. Fall. 3 credits. 2 lec, 2 rec.

106 Calculus for Biologists (also Math 106) Offered by the Department of Mathematics 1978-79. Spring. 3 credits, 2 lec, 2 rec.

202 Mechanics of Solids Fall or spring. 3 credits. 2 lec, 1 rec, 1 lab. Evening exams. Prerequisite: coregistration in Math 293. See description under Division of Basic Studies.

203 Dynamics Fall or spring, 3 credits. 2 lec, 1 rec, 1 lab. Evening exams. Prerequisite: coregistration in Math 294. See description under Division of Basic Studies.

293 Engineering Mathematics (also Math 293) Fall or spring. 4 credits. Evening exams (see Math 293). Prerequisites: Math 192 or 194, computer programming equivalent to DBS 105.

First-order differential equations, linear algebra, matrix theory, infinite series, complex numbers, linear transformations, applications. Problems for programming and running on the computer will be assigned.

294 Engineering Mathematics (also Math 294) Fall or spring. 3 credits. Prerequisite: Math 293. Evening exams (see Math 294).

Vector spaces and eigenvalues, linear differential equations, differential vector calculus, Fourier series and boundary-value problems.

295 Engineering Mathematics (also Math 295) Fall or spring. 4 credits. Honors section of 293. Prerequisite: Math 192 or 194.

Follows the general plan and covers the material of 293 with substantially greater emphasis on fundamental unifying concepts. Additional topics may include the convergence in metric spaces, complex numbers in power series, invariance, the Jordan canonical form.

296 Engineering Mathematics (also Math 296) Fall or spring. 4 credits. Honors section of 294. Prerequisite: Math 295 or permission of instructor.

Follows the general plan and covers the material of 294 with substantially greater emphasis on fundamental unifying concepts. Additional topics may include matrix solutions for ordinary differential equations, particular solutions by the superposition integral, and a project.

Engineering Mathematics

310 Advanced Engineering Analysis I Fall. 3 credits. 3 lec. Prerequisite: Math 294 or equivalent. Ordinary differential equations as applied in engineering context. Analytical and numerical methods. Special functions, initial value, boundary value and eigenvalue problems in linear partial differential equations, introduction to nonlinear ordinary differential equations.

311 Advanced Engineering Analysis II Spring. 3 credits. Prerequisite: 310 or equivalent.

Functions of several variables, introduction to complex variables, analytic functions, conformal mapping, method of residues. Application to the solution of Laplace's equation, and transform inversion techniques. Examples drawn from fluid mechanics, heat transfer, electromagnetics, and elasticity.

610 Methods of Applied Mathematics I Fall. 3 credits. 3 lec.

Intended for beginning graduate students in engineering and science who have a heterogeneous mathematical background. An intensive course, requiring more time than is normally available to undergraduates (see 310-311), but open to exceptional undergraduates with permission of instructor. Emphasis is on applications. Linear algebra; calculus of several variables; vector analysis; series; ordinary differential equations; complex variables.

611 Methods of Applied Mathematics II Spring. 3 credits. 3 lec. Prerequisite: 610 or equivalent. Emphasis on applications. Partial differential equations; tensor analysis; calculus of variations.

613 Methods of Applied Mathematics IIIa Fall. 2 credits. Prerequisite: 611 or equivalent. First of an 8-credit sequence (613, 614, 615, 616) that develops advanced mathematical techniques for engineering problems. Review of complex variable theory; conformal mapping; complex integral calculus. Nonlinear partial differential equations; general theory of characteristics.

614 Methods of Applied Mathematics IIIb Spring. 2 credits. Prerequisite: 613 or equivalent. Integral transforms for partial differential equations. Green's function; asymptotics, including steepest descent and stationary phase, Wiener-Hopf technique. Problems drawn from vibrations and acoustics, fluid mechanics and elasticity, heat transfer, and electromagnetics.

615 Methods of Applied Mathematics IVa Fall. 2 credits. Prerequisite: 611, or equivalent. In context of applications: regular and singular perturbation theory, method of matched asymptotic expansions, two timing (method of multiple scales), WKB approximation.

616 Methods of Applied Mathematics IVb Spring. 2 credits. Prerequisite: concurrent registration in 614 or equivalent. In context of applications: Hilbert-Schmidt and Fredholm theories of integral equations, Wiener-Hopf equations with application to finite interval, Carleman equation and its generalization, effective approximations.

Experimental Mechanics

640-641 Experimental Mechanics 640, fall; 641, spring. 3 credits. 1 lec. Each student is expected to perform six to ten experiments in mechanics, selected to meet his or her individual interests. Topics: elastic, viscoelastic, microplastic, and plastic response of materials; linear and nonlinear vibration of discrete and continuous systems; acoustic and elastic wave propagation and scattering phenomena; dynamical stability of rigid body; analog and digital simulation of dynamic systems; magnetoelastic interactions.

Continuum Mechanics and Inelasticity

450 Introduction to Continuum Mechanics Fall. Offered in alternate years. 3 credits. Provides a foundation for further studies in fluid and solid mechanics; materials science, and other branches of engineering. Vector and tensor analysis; kinematics of deformation; analysis of stress and strains; balance laws of physics; constitutive equations; examples of elasticity and fluid mechanics.

[651 Continuum Mechanics and Thermodynamics Fall. 3 credits. Offered in alternate years. Not offered 1978-79. Kinematics; conservation laws; the entropy inequality; constitutive equations; frame indifference; material symmetry. Simple materials and the position of classical theories in the framework of modern continuum mechanics.]

[752 Topics in Continuum Mechanics Spring. 3 credits. Prerequisite: 651. Offered in alternate years. Not offered 1978-79. Theory of (nonlinear) elasticity and thermoelasticity; universal solutions, wave propagations, and stability theory. Nonlinear viscoelastic fluids and solids. Viscometric flows: Materials with continuum microstructure.]

754 Analytical Methods in Continuum Mechanics Spring. 3 credits. Prerequisite: permission of instructor. Offered in alternate years. Tensor analysis with applications to shell theory, incompatibility, and finite elasticity. Calculus of variations. Group theoretical methods in solid and fluid mechanics. Noether's theorem. Conservation laws.

[757 Viscoelasticity, Creep, and Fracture Fall. 3 credits. Offered in alternate years. Not offered 1978-79.

Linear viscoelasticity: constitutive equations, models, differential and integral operators, Laplace transforms, complex modulus, vibrations and wave propagation, boundary value problems. Thermoviscoelasticity. Creep: classical and modern theories, stress redistribution, boundary value problems. Fracture: criteria, stress singularities.]

758 Theory of Plasticity Fall. Offered in alternate years. 3 credits. Plastic stress-strain laws, yield criteria, flow rules. Work hardening. Flexure and torsion of bars. Boundary-value problems—thick cylinders, spheres, discs, general 3-D. Residual stress. Limit analysis of structures. Plane strain—slip line theory.

Elasticity and Waves

663 Applied Elasticity Fall. 3 credits. Two 1½-hour lec. Thin curved bars. Plane stress and strain in cylinders; effects of pressure, rotation, and thermal stress. Small (and large) deflection theory of plates; classical, approximate, and strain-energy methods. Thin cylindrical shells. A first course in elastic deformable bodies with structural applications.

664 Theory of Elasticity Spring. 3 credits. Two 1½-hour lec. Analysis of stress and strain. Airy's stress function solutions using Fourier series and integrals. Torsion theory. Three-dimensional solutions. Bending of prismatical bars. Axially loaded circular cylinder and half space.

666 Fundamentals of Acoustics (also Ele E 499) Spring. 3 credits. 3 lec, biweekly lab. Introduction to the principles and theories of acoustics. The vibrations of strings, bars, membranes, and plates; plane and spherical acoustic waves; transmission phenomena; resonators and filters; waves in solids and fluids. Application is made to sonic and ultrasonic transducers, music and noise, and architectural acoustics. At the level of *Fundamentals of Acoustics* by Kinsler and Frey.

667 Mechanical Waves and Vibrations Fall. 4 credits. Two 1½-hour lec, 1 lab. Review of vibrations of discrete systems, including multi-degree-of-freedom vibrations, forced oscillations, determination of natural modes and frequencies. Unified treatment of vibrations and wave phenomena in continuous elastic systems including strings, rods, beams, membranes, and plates. Approximate methods for finding natural modes and frequencies. Calculation of wave speeds, dispersion, and group velocity. Plane, cylindrical, and spherical waves. Transient response of discrete and continuous systems.

[765 Mathematical Theory of Elasticity Spring. Offered in alternate years. 3 credits. Prerequisite: 664. Not offered 1978-79. The basic equations of large-deformation elasticity; solution of certain large-deformation problems. Linearization. Boussinesq-Papkovich potentials and three-dimensional problems; plane stress by method of Muskhelishvili; conformal mapping; torsion problems.]

768 Elastic Waves in Solids Fall. 3 credits. Two 1½-hour lec. Offered in alternate years. An advanced course on dynamic stress analysis and wave propagation in elastic solids. Theory of elastodynamics. Waves in isotropic and anisotropic media. Reflection and refraction. Surface waves and waves in layered media. Transient waves and methods of Lamb-Cagniard-Pekeris. Thick plate theories. Vibration of spheres. Scattering of waves and dynamic concentration.

Dynamics and Space Mechanics

670 Intermediate Dynamics Fall. 3 credits. Two 1¼-hour lec. Newtonian mechanics for single particles and systems of particles, conservation laws, central-force motion; special relativity; Eulerian mechanics for rigid bodies, tops, gyroscopes; generalized coordinates, D'Alembert's principle, Lagrangian equations, analytic mechanics for particles and rigid bodies.

672 Space Flight Mechanics (also Astro 579) Spring. 3 credits. Two 1¼-hour lec. Offered in alternate years. Description of orbits; 2-body, 3-body and n-body problems; Hill curves, libration points and their stability; capture problems; virial theorem. Osculating elements, perturbation equations: effects of gravitational potentials, atmospheric drag, and solar radiation forces on satellite orbits; secular perturbations, resonances.

673 Mechanics of the Solar System (also Astro 571) Spring. 3 credits. Prerequisite: 670 or permission of instructor. Offered in alternate years. Gravitational potentials, gravity fields of the planets; free and forced rotation, Chandler wobble, polar wander; collisions; equilibrium tidal theory, tidal interactions, orbital evolution of natural satellites; resonances; spin-orbit coupling; dust dynamics, radiation pressure, Poynting-Robertson drag, Yarkovsky effect, seismic waves, free oscillations; physics of interiors. Illustrations will be drawn from contemporary research.

[771 Advanced Dynamics Fall. 3 credits. Prerequisite: 670 or equivalent. Offered in alternate years. Not offered 1978-79. Review of Lagrangian mechanics; Hamilton's principle, the principle of least action, and related topics from the calculus of variations; Hamilton's canonical equations, canonical transformations and Hamilton-Jacobi theory; Poisson stability and related topics from topological dynamics; use of group theory in solving vibrations problems with symmetry; Hamilton's principle for continuous systems, applications to shell dynamics.]

[775 Nonlinear Vibrations Fall. 3 credits. Prerequisite: 667 or equivalent. Offered in alternate years. Not offered 1978-79. Review of linear systems, free and forced vibrations. Nonlinear systems, phase plane methods, method of isoclines. Conservative systems. General autonomous systems, equilibrium and periodic solutions, linearization and Lyapunov stability criteria, Poincaré-Bendixson theorem, indices. Quantitative analysis of weakly nonlinear systems in free and forced vibrations, perturbation methods, Krylov-Bogoliubov method. Applications to problems in mechanics.]

776 Stability of Motion Spring. 3 credits. 3 lec. Offered in alternate years. Definitions of Lagrange, Lyapunov, and orbital stability; invariance of these definitions under a change of coordinates; linearized variational equations: Jordan canonical form, Floquet theory, perturbations, Mathieu's equation, Lyapunov's theory of types; nonlinear variational equations: Lyapunov's direct method, validity of the linearized variational equations.

777 Qualitative Theory of Dynamical Systems

Fall. 3 credits. Prerequisite: 775 or equivalent. Offered in alternate years.

Review of planar (single degree-of-freedom) systems. The concept of dynamical systems, local and global analysis. N-dimensional systems, types of solutions, Poincaré maps, stability. Structural stability and generic properties, bifurcations in planar systems. Discrete dynamical systems, maps and difference equations, homoclinic and heteroclinic motions, the Smale Horseshoe and other complex invariant sets. Implications for systems of dimension greater than 3, strange attractors and chaos in free and forced oscillator equations.

Biomechanics**[681 Introduction to Biomechanics, Bioengineering, Bionics, and Robots (also Ele E 621)** Fall. 3 credits. Not offered 1978–79.

A survey, primarily for undergraduates; an introduction to 682, but not necessarily a prerequisite. Problems in the design of robots to operate in ways analogous to physiological and mental functions. Biomedical engineering, artificial intelligence, pattern recognition, natural languages, neural network and brain models. Students select individual or team projects and report on them.]

[682 Current Research Problems in Bionics and Robots Spring. 1–4 credits, as arranged. 681 is introductory but not necessarily prerequisite. Offered in alternate years. Not offered 1978–79.

A graduate-level seminar, concentrating on a few of the topics listed under 681. Faculty and students report on current research in problems of robotics, such as sensors, pattern recognition, perception, and language. Artificial intelligence, adaptive systems, neural networks; brain and behavior models.]

Special Courses, Projects, and Thesis Research**491–492 Project in Engineering Science** 491, fall; 492, spring. 1 to 4 credits, as arranged.

Projects for undergraduates under the guidance of a faculty member.

591–592 Project in Mechanics 591, fall; 592, spring. 1 to 4 credits as arranged.

A minimum of three credits must be completed by each candidate for the M.Eng. (Engineering Mechanics) degree.

798–799 Selected Topics in Theoretical and Applied Mechanics 798, fall; 799, spring. 1 to 4 credits, as arranged.

Special lectures or seminars on subjects of current interest. Topics will be announced when the course is offered.

890–990 Research in Theoretical and Applied Mechanics Fall or spring. 1 to 6 credits (890), 1 to 9 credits (990), as arranged. Thesis or independent research at the M.S. (890) or Ph.D. (990) level on a subject of theoretical and applied mechanics.

Research will be under the guidance of a faculty member.

Program on Science, Technology, and Society

See section on Independent Interdisciplinary Centers and Programs.

School of Hotel Administration

The School of Hotel Administration offers training in the numerous disciplines required for modern management, including accounting, finance, marketing, operations, and human resources development. The School's graduates hold executive positions in a variety of industries, but are especially well represented in the management of hospitality-related enterprises, including the lodging, food service, and travel industries.

Students are encouraged to pursue a broad range of courses, including those in the humanities, as preparation for assuming their places in the business community. Included in the basic curriculum are courses in financial management, food and beverage operations, administration, and physical plant management.

Students receive firsthand training through the operation of the Statler Inn, a practice hotel on the University campus, containing guest rooms, banquet facilities, service restaurants, and cafeterias. To satisfy degree requirements, every undergraduate enrolled in the School of Hotel Administration must complete a minimum of two summer periods of ten weeks each or their equivalent of full-time, supervised employment and file acceptable reports for each work period.

The School's programs for advanced degrees include those of Master of Professional Studies, Master of Science, and Doctor of Philosophy. For more complete information about undergraduate program requirements, see the *Announcement of the School of Hotel Administration*. For further information on graduate degree programs, the reader should consult the *Announcement of the Graduate School* or contact Professor Stanley W. Davis, Director, M. P. S. Program, School of Hotel Administration, Cornell University, Statler Hall, Ithaca, New York 14853.

For the most current and detailed information regarding course offerings of the School of Hotel Administration, the student should consult the supplementary course announcement issued each semester through the School's records office. Enrollment in some classes listed below is limited.

Administration

240 Personal Real Estate Investments Fall or spring. 2 credits. Open only to students who are not in the School of Hotel Administration.

M 10:10-12:05. D. Sher.
A practical course in personal real estate investment. Lectures and case studies cover the advantages and disadvantages of real estate as an investment, and how to maximize gain and minimize risk and possible loss. Subject matter includes (1) the economics of real estate, tax shelters, financial leverage; (2) types of personal real estate investments; (3) risk analysis, cash flow, and return on investment; (4) sources of financing; (5) joint ventures and syndications; and (6) acquisition and development of real estate.

340 Real Estate Feasibility Analysis Fall or spring. 2 credits. Open only to students who are not in the School of Hotel Administration. Prerequisite: 240 or equivalent, or written permission of instructor.
T 11:15-1:10. D. Sher.

Emphasis will be on determining market demand and potential of real estate projects, primarily from the private investor's viewpoint. Market demand and market potential will be treated as part of the scope of the feasibility analysis. Students will review and apply concepts and theories of market stratification

and segmentation and location determination to specific case studies with attention to the impact of real estate feasibility on investment return. Specific areas will include retail/commercial real estate, offices, industrial parks, and housing.

Economics

241 Macroeconomics Fall. 3 credits. Required.
M W 11:15; rec, 1 hour to be arranged.
W. H. Kaven.

Modern economic problems are examined from their historical perspective and as national issues. Aggregate economic system and the determinants of prosperity and recession are concentrated upon. Oriented toward the economic environment of business decisions. Text and case book are used for discussions, along with current business publications.

242 Microeconomics Spring. 3 credits. Required.

M W F 10:10-11:15. W. H. Kaven.
Use of economic analysis in formulating business decisions. Draws upon such concepts as demand, cost, profit, compensation, and pricing, and introduces managerial economics. In addition to text and cases, readings are drawn from current business publications.

243 Principles of Marketing Fall. 2 credits. Hotel elective. Best taken after 241-242.

T 11:15-1:10. W. H. Kaven.
Deals with the economic principles of marketing; special emphasis on the marketing of services. The course combines text, readings, and cases.

244 Franchising in the Hospitality Industry Fall. 2 credits. Hotel elective.

M 4:30-6:25 p.m. D. E. Whitehead.
Study of the specific steps involved in developing a franchise operation from the viewpoint of both the franchisor and the franchisee. Feasibility studies, real estate, plans and project costs, financing, project analysis, corporate structure, and operations are some of the topics to be studied.

245 Tourism Fall. 3 credits. Hotel elective.

T 1:25 and Th 2:30-4:25. M. A. Noden.
A lecture course dealing with the primary characteristics of foreign and domestic tourism. Areas of concern include basic terminology, geographic considerations, development of infrastructure and superstructure in host countries, travel delivery systems, and the social and cultural aspects of tourism. Emphasis is placed on transportation and the travel service industries as well as the socioeconomic effects of tourism on developing countries. Consideration also is given to travel research and marketing.

349 Development of a Hospitality Property

Fall. 3 credits. Hotel elective. Prerequisite: written permission of J. J. Eyster or M. H. Redlin. Limited to 12 upperclass and graduate students.

M 2:30-4:25. D. E. Whitehead.
Students work in seminar groups of two to four to develop a hospitality project. All aspects of development will be covered, from the feasibility study through site acquisition, franchising, construction management, operational preopening, marketing, personnel training, furniture and fixture installation and the actual opening of the hotel, motor inn, or restaurant.

745 Graduate Seminar in Tourism Spring. 2 credits. M.P.S. elective.

F 10:10-12:05. N. B. Rosenberg.
The international tourism industry, its postwar growth, and its economic impact on developed and underdeveloped countries will be reviewed. The integration of government and the private sector in planning, financing, and controlling the development of regional tourism in relation to market demand will be evaluated.

Insurance

246 General Insurance Fall. 3 credits. Hotel elective. Prerequisite: upperclass or graduate standing.

M W F 12:20. K. McNeill.
A comprehensive introduction to the insurance field. Emphasis is on fire insurance, casualty insurance, and multiple peril policies. Topics covered may include: the law of contracts as it relates to insurance; the fire insurance policy and fire insurance forms; business interruption, marine, burglary and crime, and liability insurance; rates and rate making; bonds; negligence and torts; compensation; package policies; adjustment of losses; and the types of insurers.

Law

247 Law and the Woman Employee Spring. 3 credits. Hotel elective. Open to students who are not in the School of Hotel Administration.

M W F 12:20. J. E. H. Sherry.
Designed to enable management to deal with the legal problems of woman employees as they affect the hospitality industry, and to provide the nonlaw student with information regarding the emerging legal rights of women generally. The practical needs of the industry and of women as coequals are examined and treated. Emphasis is placed on an awareness of the psychological, social, and economic factors that affect this area, and the legal changes that are necessary to meet current and future needs. A combination of text, statutory, and case materials is used.

341 Law of Business I Fall. 3 credits. Required. Prerequisite: upperclass standing; sophomores may be admitted if space becomes available.

M W F 10:10. J. E. H. Sherry.
A basic course in business law. The student is introduced to the fundamental purposes, principles, and processes of the law as an agency of social control in relation to business activities. The topics treated include: the origin and development of common, statutory, and constitutional law; the organization and functioning of the judicial system; the formation, validity, enforcement, and breach of contracts; the laws of principal and agent, employer and employee; personal property; and partnerships and corporations. A combination of text and case materials is used.

342 Law of Business II Spring. 3 credits. Hotel elective. Prerequisites: 341 and upperclass or graduate standing.

M W F 10:10. J. E. H. Sherry.
A continuation of 341 for those students who desire more extensive legal training to further their business careers. Emphasis is on the laws pertaining to the Uniform Commercial Code (sales and negotiable instruments); bailments; trust and estates; transfers by will; unfair competition and trade regulation; bankruptcy and insurance.

344 Law of Innkeeping Fall or spring. 3 credits. Prerequisites: 341 or equivalent (may be taken concurrently) and upperclass standing; sophomores may be admitted if space becomes available.

M W F 9:05. J. E. H. Sherry.
A study of the laws applicable to the ownership and operation of inns, hotels, motels, restaurants, and other places of public hospitality. Consideration of the host's duties to guests, lodgers, boarders, tenants, invitees, licensees, and trespassers; the exclusion and ejection of undesirables; liability for personal injuries on and off the premises; the concept of negligence; liability for damage or loss of property; statutory limitations of liability; lien rights; concession agreements; leases; credit and collection practices; arrest and detention of wrongdoers; and miscellaneous statutes and administrative rules and regulations applicable to

public houses. The material is treated from the point of view of the executive who is responsible for policy and decision making.

347-348 Real Estate Law 347, fall; 348, spring. 2 credits each term. Hotel elective. Prerequisite: upperclass or graduate standing. Best taken after 341 or 241-242.

Th 2:30-4:25.

The student is introduced to laws governing the acquisition, ownership, and transfer of real estate, beginning with the purchase and sale of a family residence and continuing with more complex transactions involving hotels, motels, condominiums, cooperatives, syndications, and real estate trusts. Actual transactions are analyzed to pinpoint the advantages and disadvantages to the parties involved. Financing aspects, including construction and building loans, mortgages, and mortgage foreclosures, are treated from the viewpoint of lender and borrower. The legal relations of landlord and tenant are given special attention, and typical hotel and motel leases and related tax considerations are studied thoroughly.

744 Law of Innkeeping for Graduate Students Fall or spring. 3 credits. Required of M.P.S. candidates.

M W F 8. J. E. H. Sherry.

Review of fundamentals followed by in-depth study designed to develop sophistication in dealing with the legal aspects of the hospitality industry.

Real Estate

346 General Survey of Real Estate Fall or spring. 2 credits. Hotel elective. Prerequisites: 241-242 and 221, or equivalent, or permission of instructor.

M 2:30-4:25. D. Sher.

A practical survey of real estate as the capital investment decision in the hospitality industry and related retail industries. Lectures and case studies cover the role and importance of real estate environment, the relationship of real estate to the marketing strategy of a company and its investment decisions; the marketing and merchandising of real estate; the financing of real estate; and the effects of real estate financing on a company's overall corporate financial structure and on its future borrowing ability.

441 Seminar in Real Estate Fall or spring. 2 credits. Hotel elective. Prerequisite: 346 or equivalent, or permission of instructor.

T 2:30-4:25. D. Sher.

This course develops the concepts introduced in Hotel Administration 346 with case studies and field projects.

443 Site Selection Criteria and Computer Models Fall or spring. 2 credits. Hotel elective. Prerequisite: 346.

M 12:20-2:15. D. Sher.

Students develop a computer model for site selection for a hotel chain. During the fall term, the class makes a field study of the hotel chain's existing locations and analyzes the underlying marketing characteristics. During the spring term students study regression analysis, evaluation and correlation of data, and the programming and testing of computer models.

Directed Studies

640 Undergraduate Independent Research in Administration Fall or spring. Credit to be arranged. Hotel elective. Prerequisite: written permission obtained before registration from the faculty member who is to direct the study. Students pursue independent research projects under the direction of a faculty member. Only the first three credits of directed study may be credited

toward hotel electives during the student's undergraduate academic career. Additional directed study, if taken, will be credited toward free electives.

740 Graduate Independent Research in Administration Fall or spring. Credit to be arranged. Graduate students only.

As appropriate, graduate students may enroll in this course for thesis or monograph research or for other directed study. The student must have a specific project in mind. Before registration for the term, written permission must be obtained from the faculty member who will oversee and direct the research. Forms are available in the office of the graduate faculty representative.

Financial Management

120 Basic Principles of Accounting and Financial Management Fall or spring. 2 credits. Open only to students who are not in the School of Hotel Administration.

M 1:25-3:20. D. Ferguson.

A survey of accounting principles, financial statement analysis, and income and payroll taxes. The course is designed for the student who desires general knowledge of the language of business and finance. May be taken with Hotel Administration 322 to include the investment aspects of financial management.

Required Courses

121 Financial Accounting Fall or spring. 3 credits. Required.

Fall: M W 10:10, 1-hour lab to be arranged; J. J. Eyster. Spring: T Th 11:15-1:10, D. C. Dunn. Two preliminary examinations will be given in the evening.

Reporting and measurement approaches for revenues, expenses, assets, liabilities, and owner's equity are studied. Focus is on the corporation rather than the sole proprietorship or the partnership. Income taxes, dividends, earnings per share, capital stock, and the APB opinions will also be covered.

122 Hospitality Accounting Systems Fall or spring. 3 credits. Required. Prerequisite: 121 or equivalent.

Lec, T 9:05; 2-hour lab to be arranged. D. C. Dunn.

A course designed to expose students to the accounting systems found in hotels, motels, and restaurants—as recommended by the American Hotel and Motel Association. Among the topics considered are hotel-motel front office accounting; journals and ledger accounts peculiar to hotel accounting systems; the flow of accounting transactions through such systems; and the preparation and interpretation of hotel financial statements.

125 Finance Spring. 3 credits. Required. Prerequisite: 121 or equivalent.

T Th 9:05 or 11:15.

An objective study of the financial function in a profit-oriented enterprise. Important concepts include cash flow, the time value of money, and capital budgeting. Emphasis is on the analysis of accounting information, problem solving, and decision making.

221 Managerial Accounting Fall. 3 credits. Required. Prerequisite: 121 and 125 or equivalent.

Lec, T Th 10:10; 2-hour lab to be arranged. Two preliminary examinations will be given in the evening. A. N. Geller.

The financial accounting process is reviewed, and followed by the development of managerial accounting. The overall objective is the use of accounting information for managerial planning, control, and evaluation. Particular emphasis is placed on differential accounting and its role in extracting relevant decision variables. Accounting

systems, behavior of costs, budget preparation, standard costs, the analysis of variance from standard costs, and performance reports will also be discussed.

222 Managerial Accounting in the Hospitality Industry Spring. 3 credits. Required. Prerequisites: 121, 122 and 221 or equivalent for undergraduates; 721 or equivalent for graduate students.

M W 10:10; 1-hour lab to be arranged. J. J. Eyster. Concepts and measurement techniques from 221 are applied to hospitality industry situations and case studies. Analyses of annual reports and cost-volume-profit ratios are undertaken and the analyses are summarized and reported in professional management letters written by the students. Other topics are internal control, operational budgeting, and capital budgeting in the hospitality industry. Emphasis is placed on current issues between management and its auditors, and on a critical analysis of present practice.

Elective Courses

223 Front Office Machine Accounting Fall or spring. 1 credit. Hotel elective. Prerequisite: 121 or equivalent. Best taken after 122.

Hours to be arranged (one 2-hour practice period is scheduled for each week). D. C. Dunn. Students learn the operation of the NCR front-office posting machine by completing a series of practical exercises ranging from simple posting of charges and credits to error correction and the night audit.

224 Food and Beverage Control Fall or spring. 2 credits. Hotel elective. Prerequisites: 122 and 132 or written permission of instructor.

W 1:25-3:15. J. F. Tewey. Essentials of food and beverage control from both the operational and accounting standpoints. Practice with typical methods and forms found in the hospitality industry.

321 Hotel Management Contracts Fall. 1 credit. Hotel elective. Open only to juniors, seniors, and second-year graduate students. Limited to 60 students.

M 12:20-2:15. Class meets weeks 2-8 of the semester. J. J. Eyster.

A critical analysis of the negotiation and administration of hotel management contracts. Topics include contract risks and their advantages and disadvantages; owner and operator concerns during negotiations and the administration of the contract; and the future role of contract use.

322 Investment Management Fall or spring. 2 credits. Hotel elective. Prerequisite: upperclass or graduate standing.

T 2:30-4:25. W. R. Farnsworth.

A survey of investment opportunities and the methods of analysis used by business and the individual to determine the best use of investment funds. Special emphasis is placed on the stock and bond markets, including security portfolio management.

323 Financial Analysis and Planning Fall. 3 credits. Hotel elective. Prerequisites: 222 or permission of instructor. Satisfies economics elective.

T Th 8-9:55. J. J. Eyster.

After defining and describing the environment in which a business organization must design its strategy, the necessary techniques of financial analysis and planning are examined. Discussion and case studies involve the following areas of financial management; profit planning and forecasting, capital budgeting techniques, cost-of-capital determination, working capital management, long-term financing, and valuation in mergers and corporate adjustments.

325 Seminar in Hotel Operations Spring. 2 credits. Hotel elective. Prerequisites: 323 or permission of instructor.

F 10:10. P. L. Gaurmier.
Students obtain a working knowledge of the terminology, concepts, and procedures used by hotel management in developing information and making decisions relevant to forecasting and controlling manpower requirements that are consistent with fluctuating business conditions. The approaches designed to maintain operational control and evaluate overall performance within the hotel also are covered. Major topics included are staff planning, budgeting, scheduling and payroll control, forecasting techniques and practices, considerations for operating within the guidelines of collective bargaining, analysis of financial statements, and hotel case studies oriented toward productivity. A required field trip to a participating hotel is part of the study program (estimated cost: \$75).

326 Introduction to Statistical Analysis and Inference Fall. 3 credits. Hotel elective.

Prerequisite: upperclass or graduate standing. Students with any previous exposure to statistics or probability should meet with the instructor before course registration.

T Th 11:15-1:10. D. C. Dunn.
A first course, intended as an introduction to the basic techniques of statistical method, important both to the businessman and to the prospective researcher.

421 Internal Control in Hotels Spring. 2 credits. Hotel elective. Prerequisites: 122; senior or graduate standing or permission of instructor.

T Th 9:05 or 10:10. A. N. Geller.
Discussion of the problems encountered in distributing the accounting and clerical work in hotels so as to provide a good system of internal control. Study of many actual cases on the failure of internal control and the analysis of the causes of the failure. Practical problems and actual techniques of functioning systems of internal control.

422 Taxation: Personal and Corporate Fall. 2 credits. Hotel elective. Prerequisite: senior or graduate standing or written permission of instructor.

M 10:10-12:05. R. M. Chase.
A series of lectures by a guest lecturer who is a member of the tax department of a leading CPA office. An overview and history of tax legislation begins the course and documents the impact of taxation upon business and personal financial management. Specific topics will include personal income tax, corporate, federal, and state taxes, tax incentives, and tax "shelters."

(B&PA) NBA 505 Auditing 3 credits. Hotel elective. Prerequisites: 121, 122, and 221, or equivalent.

The work of the independent public accountant. Practice includes the preparation of audit work papers, internal control in general and the preparation of the auditor's report.

721 Graduate Financial and Managerial Accounting Fall. 4 credits. Prerequisite: graduate standing.

T Th 2:30-4:25; two 1-hour rec to be arranged.
R. M. Chase.
Study of financial and managerial accounting, including report and measurement of revenues and expenses, assets, liabilities, and owner's equity, and analysis of financial statements.

722 Graduate Corporate Finance Fall. 4 credits. Required for M.P.S. candidates. Prerequisites: 721 or equivalent and 726, and graduate standing or written permission of instructor.

T Th 2:30-4:25. A. N. Geller.
An introduction to the principles and practices of business finance, including the development of theory and its application. Topics include securities,

valuation concepts, capital budgeting, cost of capital, capital structure, dividend policy, long-term financing and bank relations, short- and intermediate-term financial management, mergers and consolidations, and the legal aspects of financial management. The course assumes knowledge of algebraic techniques and elementary statistics.

723 Interpretation and Analysis of Financial Statements Spring. 3 credits. Prerequisite: complete accounting curriculum. Open to some seniors with written permission of instructor.

T Th 2:30-4:25. A. N. Geller.
A seminar to discuss the financial accounting issues encountered in reporting the operations of corporate enterprises.

725 Graduate Seminar in Hotel Operations Fall. 2 credits. Hotel elective. Prerequisite: 323 or written permission of instructor. Limited to 40 students.

F 10:10-12:05. P. L. Gaurmier.
Major topics include staff planning, budgeting, scheduling and payroll control, forecasting technique and practice, guidelines for collective bargaining, financial statement analysis, and productivity analysis through case studies. A required field trip to a participating hotel is an integral part of the course (estimated cost: \$75).

726 Graduate Managerial Accounting in the Hospitality Industry Spring. 3 credits. Required of M.P.S. candidates. Prerequisite: 721 or equivalent.

T Th 2:30-4:25. J. J. Eyster.
Factors contributing to the gathering and presentation of accurate data for use by external parties are critically discussed and illustrated through the analysis of annual reports, with emphasis on current issues involving management and its auditors in the reporting and presentation of these data.

Directed Studies

620 Undergraduate Independent Research in Financial Management Fall or spring. Credit to be arranged. Hotel elective. Prerequisite: written permission obtained before registration from the faculty member who is to direct the study. Students pursue independent research projects under the direction of a faculty member. Only the first three credits of directed study may be credited toward hotel electives during the student's undergraduate academic career. Additional directed study, if taken, will be credited toward free electives.

720 Graduate Independent Research in Financial Management Fall or spring. Credit to be arranged. Graduate students only.

As appropriate, graduate students may enroll in this course for thesis or monograph research or for other directed study. The student must have a specific project in mind. Before registration for the term written permission must be obtained from the faculty member who will oversee and direct the research. Forms are available in the office of the graduate faculty representative.

Food and Beverage Management

430 Introduction to Wine and Spirits Fall or spring. 2 credits. S-U grades only. Open only to seniors and graduate students who are not in the School of Hotel Administration. Students registered for this course who fail to attend the first class without notifying the instructor of their inability to attend the class will automatically be removed from the class roster.

W 2:30-4:25. V. A. Christian.

The history of wine and spirits is covered, with the main focus on flavor characteristics, fermentation processes, and brand specifications.

Required Courses

131 Fundamentals of Managing Service Fall or spring. 3 credits. Required.

Th 10:10; one 3-hour lab and one 2-hour lab (every other week) to be arranged.

Restaurant service systems and management are presented. Students participate as service managers and servers in the Statler Inn dining room. Lectures, demonstrations, and practice sessions include plate, platter, cart, and banquet service, and beverage and tableside service.

132 Commercial Food Production Fall or spring. 3 credits. Required. Students are required to attend all labs, and should register for a lab that does not conflict with any required field trips they may have for other courses.

M 12:20; one 4-hour lab and one 7-hour lab on alternating weeks.
Students learn from practical experience, classroom lectures, and demonstrations. Subjects covered on a rotating basis include menu planning, requisitions, pricing, preparation, serving, sanitation, performance evaluation, and scheduling.

231 Meat Science and Management Fall and spring. 3 credits. Required.

T Th 9:05; one 2-hour lab to be arranged.
S. A. Mutkoski.
Deals with the major phases of meat, poultry, and fish service from the hotel, restaurant, club, and institutional standpoints; nutritive value, structure and composition; sanitation; selection and purchasing; cutting; freezing; portion control and specifications; cooking, carving, and miscellaneous topics. Required three-day (Monday-Wednesday) field trip to visit purveyors in New York City (estimated cost: \$60).

232 Operational Food Production Systems Fall or spring. 3 credits. Prerequisite: 132. Students are required to attend all labs, and should register for a lab that does not conflict with any required field trips they may have for other courses.

M 1:25; one 5½-hour lab to be arranged.
Managing the food production of Statler cafeteria and dining room. Each student assumes complete managerial responsibility for the food production system, including menu planning, purchasing, receiving, storing, preparation, and merchandising. Emphasis on operational performance, controls, and guest satisfaction.

Elective Courses

[234 Hospital Food Service Administration] 2 credits. Hotel elective. Prerequisites: 131 and 132. Not offered 1978-79.]

331 Seminar in Convenience Foods Fall. 2 credits. Hotel elective. Prerequisites: 131, 172, 232 and consent of instructor.

W 2:30-4:25. P. Rainsford.
The financial, managerial, and technological aspects of convenience foods. A class project allows the student to compare a conventional food service system to a convenience food service system.

332 T.A. Training, Food and Beverage Management Fall or spring. 1-3 credits. Hotel elective. Prerequisite: written permission of instructor must be obtained before course registration.

Staff.
Students planning to be teaching assistants in the Food and Beverage Department are exposed to recommended techniques of instruction and any other methodology, reading, etc., as the professor in charge of the course may require.

333 Corporate Restaurant Management Fall. 3 credits. Hotel elective. Prerequisite: 232 and upperclass or graduate standing.

T 10:10 and Th 9:05–11. V. A. Christian.
Principles of modern restaurant management, using case studies on such topics as the food and beverage employee, menu planning, merchandising, production standards, purchasing standards, and control systems. A field trip to Washington is required (estimated cost: \$50).

334 Beverage and Entertainment Management Spring. 4 credits. Hotel elective. Prerequisites: 333 or 731, and 337.

T Th 9:05–11. V. A. Christian.
Comparative analysis of wines and spirits, the managerial technology of design and implementation of training programs, writing of beverage and entertainment policy and procedure, and techniques of contract booking and evaluating acts.

337 Survey of Beverages Fall or spring. 2 credits. Hotel elective. Prerequisite: upperclass or graduate standing (hotel students only).

W 7:30–9:25 p.m. V. A. Christian.
The fundamentals of identification, selection, storage, service, and evaluation of wines, spirits, and beers are covered in lectures and tastings.

338 Purchasing Spring. 2 credits. Hotel elective. Prerequisite: upperclass or graduate standing (hotel students only).

Th 2:30–4:25. S. A. Mutkoski.
Study of the managerial aspects of purchasing for a hotel or restaurant facility. Topics covered: establishing a purchasing department; the function of the purchasing agent; purchasing specifications, forms, and controls; and products purchased by a food facility.

634 Special Operational Food Production Systems Spring. 3 credits. Prerequisites: 131–132, 171–172, 231, and written permission of instructor.

M 1:25 and F 8–2.
Students learn advanced managerial and technical skills, including menu planning, production scheduling, and job training methods.

731 Restaurant and Beverage Management Fall or spring. 3 credits. Required of M.P.S. candidates.

T 12:20 and Th 11:15–1:10; four 2-hour labs to be arranged. V. A. Christian.
The principles and techniques of planning, managing, operating, and evaluating a food and beverage operation. Special emphasis is placed on menu planning, wine list design, professional standards, and the managerial approach to purchasing, receiving, storing, issuing, preparation and service. Required field trip (estimated cost: \$60).

732 Food Production Systems Fall or spring. 3 credits. Required of M.P.S. candidates. Prerequisite: 731 or equivalent. Limited to 24 students.

W 2:30–6:30 p.m.; lab, F 2–10.
Students prepare and serve meals in the Statler Inn cafeteria and main dining room, as well as banquets. The fundamentals of a food production system, from menu planning through service, are taught, and applied to give the student confidence in managing a commercial kitchen or dining room. The lecture demonstration provides further exposure to managerial and technical skills.

733 Corporate Food and Beverage Management—Hyatt Fall. 3 credits. Hotel elective. Prerequisites: 731 and 732, and written permission of the instructor. A limited number of seniors who have had 232 may be permitted to enroll.

Th 7–9:30. V. A. Christian.

A seminar in the operation of the food and beverage department of a 1000 room commercial hotel, examining the management, day-to-day operations, and support systems. Lectures will be given by managers, directors, and department heads relating their experiences, problems, and successes. A working field trip of four days to Chicago will be conducted (estimated cost: \$125). Each student will spend two shifts in an area of his or her choice, working with a key staff member or department head.

735 Graduate Meat Science and Management Fall. 3 credits. Graduate elective.

Th 11:15–1:45. S. A. Mutkoski.
Purchasing, receiving, storage, utilization, and cost analysis of meat, fish, and poultry, as well as meat extenders and analogs, will be discussed from the standpoint of commercial food service. This will be done in a seminar-lab combination, with students also required to do independent research on current problems.

Directed Studies

630 Undergraduate Independent Research in Food and Beverage Management Fall or spring. Credit to be arranged. Hotel elective. Prerequisite: written consent obtained before registration from the faculty member who is to direct the study. Students pursue independent research projects under the direction of a faculty member. Only the first three credits of directed study may be credited toward hotel electives during the student's undergraduate career. Additional directed study, if taken, will be credited toward free electives.

730 Graduate Independent Research in Food and Beverage Management Fall or spring. Credit to be arranged. Graduate students only. As appropriate, graduate students may enroll in this course for thesis or monograph research or for other directed study. The student must have a specific project in mind. Before registration for the term written permission must be obtained from the faculty member who will oversee and direct the research. Forms are available in the office of the graduate faculty representative.

General Management

Required Courses

112 Orientation Fall or spring. 1 credit. S-U grades only. Required for freshmen and transfer students.

M 2:30. M. A. Noden.
A survey of the hospitality industry in today's economy. Emphasis on industry growth and development, management problems, and principles of hotel, motel, and restaurant management. Lectures on the role of the School of Hotel Administration and its curriculum in the hospitality industry are included. Visual tour of hotels and other hospitality industry fields is conducted.

Elective Courses

115 Lectures in Hotel Management Fall. 1 credit. Hotel elective. May be repeated for credit each semester.
F 1:25. R. A. Beck.
A series of lectures given by nonresident speakers prominent in the hotel, restaurant, and allied fields.

[212 Housekeeping 2 credits. Hotel elective. D. A. Dermody. Not offered 1978–79.]

213 Club Management Fall or spring. 2 credits. Hotel elective.
Th 11:15–1:10. J. F. Tewey.
Managerial aspects of all types of clubs, from the small city club to large multiple-activity organizations, are covered in lectures given by club

managers, staff, and other authorities in the field. Different club structures are analyzed from the managerial viewpoint, including nonprofit, private, and institutional organizations.

215 Resort and Condominium Management Spring. 3 credits. Hotel elective.

T 1:25 and Th 2:30–4:25. M. A. Noden.
A lecture course in the operation of the resort hotel, including condominiums. Resorts of the various types, seasons, and economic levels are considered. Emphasis is given to the promotion of business, to the provision of facilities and services and guest entertainment, and to the selection, training, and direction of the employed staff. Terminology, rental pool agreements, and S.E.C. regulations, together with developer-management-owner contracts and relationships in condominiums, are reviewed.

217 Principles of Management Fall or spring. 3 credits. Hotel elective. Prerequisite: 211 or equivalent.

W 1:25–3:20 and F 9:05. P. L. Gaurnier.
A basic course designed to examine management processes, concepts, and principles, and to improve personal competence in decision making, problem solving, and communication. Required readings will highlight both classical and modern concepts of management. Students planning to enroll eventually in 412 are urged to take this course, since it will soon become prerequisite for 412.

316 Rooms Division Management Fall. 2 credits. Hotel elective.

F 2:30–4:25. D. A. Dermody.
This course presents an operational view of the front office and housekeeping departments of a hotel, including reservations. Under the direction of Prof. Dermody, the course is taught by personnel of Marriott Hotels.

319 Club Management Seminar Fall or spring. 1 credit. Hotel elective. Open to upperclass and graduate students. Prerequisite: 213. May not be offered 1978–79.

W 11:15. J. F. Tewey.
A discussion class for students who are planning careers in club management. Provides an opportunity to exchange ideas with leading authorities in club management.

411 Hotel Management Seminar Fall. 1 credit. Hotel elective. Prerequisite: senior or graduate standing. Limited to 20 students.

F 10:10. R. A. Beck.
Lecturers from industry who are leading executives in their fields will discuss important developments in the hospitality and travel industries.

412 Seminar in Management Principles Fall or spring. 2 credits. Hotel elective. Prerequisites: 211 or equivalent, senior or graduate standing, and permission of instructor. Limited to 20 students.
T 11:15–1:10. P. L. Gaurnier.

A seminar course designed to examine management processes, concepts, and principles; and to improve personal competence in decision making, problem solving, and communication. Each student prepares a comprehensive analytical report, based on previous work, for class discussion and analysis. Sufficient time is given during the first few weeks of the course to discuss management principles and concepts and thus give the student an understanding of the type of report to prepare.

415 The Small Business Fall or spring. 3 credits. Hotel elective. Prerequisites: senior or graduate standing and written permission of instructor. Limited to 24 students.

T 1:25–3:15 or W 10:10–12:05, and Th 11:15. R. M. Cantwell.
This course deals with managerial problems as related to small business operations. Emphasis will be placed on the acquisition of the new business or

the takeover of an existing business. Preliminary investigation prior to decision making will be explored. Case studies will be used to illustrate relevant points. A team project will be required. Occasional presentations by guest lecturers.

419 Management Organization of Small Business Fall or spring. 3 credits. Hotel elective. Prerequisite: 221 or Ag Ec 323 or equivalent and senior standing; students who are not in the School of Hotel Administration must have written permission of instructor. The objective of the course is to develop a comprehensive knowledge of basic management fundamentals needed to plan, organize, direct, and control the small enterprise. There will be a team term project, selected readings, case studies, and field exercises (estimated cost: \$50).

Marketing

216 Marketing Management Spring. 2 credits. Hotel elective. Prerequisite: 243.

M 1:25-3:15. W. H. Kaven.
The marketing function is studied as a management activity, including: analysis of marketing opportunities; organizing of marketing activity; planning the marketing program; and controlling the market effort. The course is oriented to the decision-making process in marketing. Text, cases, discussions, and visiting lecturers from the hotel industry in the areas of marketing research, pricing, and related subjects supplement instruction.

317 Advertising and Public Relations Fall. 2 credits. Hotel elective. Prerequisite: upperclass or graduate standing.

F 11:15-1:10. H. V. Grohmann and staff.
Fundamentals of advertising, publicity, and public relations and the part each plays in a coordinated business promotion program for different types of hotels and restaurants. The lectures and visual displays depict various advertising techniques as well as current campaigns.

343 Seminar in Selected Topics in Hospitality Marketing Fall or spring. 2 credits. Hotel elective. Prerequisites: 243, 712 or written permission of instructor. May be repeated for credit.

W 2:30-4:25. W. H. Kaven.
Discussion of marketing strategy and its development through opportunity analysis, research, and target market selection. Future seminars will cover the place, product, and pricing variables in the marketing mix (spring 1979); promotional programs, including personal selling, advertising, public relations, and sales promotion (fall 1979); and the integration of place, product, price, and promotion into a marketing plan (spring 1980). Students may enroll for any or all seminars as their interest directs.

413 Seminar in Advertising and Public Relations Fall. 2 credits. Hotel elective. Prerequisites: 317 and senior or graduate standing.

F 2:30-4:25. H. V. Grohmann.
A seminar course dealing principally with case histories of the advertising, publicity, business promotion, and public relations of hotels, resorts, restaurants, and national travel attractions. Students have the opportunity to analyze and create their own advertising programs including names, logotypes, symbols, copy themes, complete marketing plans, and forecasts for properties of their choice.

414 Hotel Sales Spring. 2 credits. Hotel elective. Prerequisite: 216 or equivalent.

T 2:30-4:25. D. A. Dermody.
A practical approach to the selling of hotel space, with particular emphasis on the solicitation and servicing of groups.

417 Integrated Case Studies in the Hospitality Industries Fall or spring. 3 credits. Hotel elective. Prerequisite: written permission of Professor Chase. Limited to 24 seniors.

W 1:25-4:25. R. M. Cantwell and R. M. Chase.
Analysis of case studies involving issues of business strategy, human relations, administration, marketing, and finance. Students will apply course principles by participating in a restaurant management simulation exercise.

712 Seminar in Marketing Spring. 3 credits. Required of M.P.S. candidates. Prerequisite: graduate standing.

T 11:15-1:10 and W 11:15. W. H. Kaven.
This discussion course in marketing management combines the lectures given in 216 with case studies developed and presented by marketing authorities in the hospitality industry.

Information Systems

114 Information Systems I Fall or spring. 3 credits. Required.

M 1:25 and W 1:25-3:15. R. G. Moore.
An introduction to information systems and computing machines. Students learn keypunching and programming skills for application to selected business problems. Use of preprogrammed routines augments and extends the student's own work. Projects involving the hospitality industry are executed on the University's computers.

214 Hotel Computing Applications Spring. 3 credits. Hotel elective. Prerequisite: 114.

T 2:30-4:25 and Th 1:25. R. G. Moore.
This course is planned to acquaint students with some of the diverse applications of computing technology within the hotel industry through case studies by lecturers drawn from industry. In addition to lectures, the students will work on a systems development project.

318 Advanced Programming and System Design 3 credits. Hotel elective. Prerequisites: 114 or 714 or equivalent, upperclass or graduate standing, and written permission of instructor.

T Th 12:20; rec to be arranged. R. G. Moore.
The course will examine, in minute detail, one module of a hypothetical integrated Hospitality Information System. The students will do all phases of system analysis, design, programming, and testing of the selected module. Particular attention will be given to the informational content of reports for both operational decision making as well as management decision making. The course is intended for those students who wish to learn more about system design and computer programming for business applications. Individuals who anticipate working for accounting firms specializing in management advisory services (MAS) in the field of hospitality electronic data processing (EDP) will find the course especially useful. Students will do extensive programming in Business Basic, an easily learned real-time interactive computer language, which is commonly used on business computers today.

714 Computers and Hotel Computing Applications Fall or spring. 3 credits. Required for M.P.S. candidates.

M 2:30-4:25 and W 12:20; rec to be arranged. R. G. Moore.
The introduction of the computing machine/information system to the hospitality industry is examined from several viewpoints; managerial impact, cost justifications, user reaction, and guest satisfaction. The various successes and failures of hotel computing will be analyzed in detail. Students will be given "hands-on" exposure to an actual hotel computing system.

Directed Studies

610 Undergraduate Independent Research in Management Fall or spring. Credit to be arranged. Prerequisite: written consent obtained before registration from the faculty member who is to direct the study.

Students pursue independent research projects under the direction of a faculty member. Only the first three credits of directed study may be credited toward hotel electives during the student's undergraduate academic career. Additional directed study, if taken, will be credited to free electives.

This course is part of the Work-Study Program when taken for twelve credits. Students who enroll in this program have the opportunity to combine managerial instruction with the on-the-job management experience. Application for admission should be made one semester in advance. Instruction is provided by the School's faculty and by the organization participating in the work-study arrangements. Students receive both academic credit and practice credit, and appropriate financial remuneration for the period of the program. All inquiries should be addressed to the Work-Study Coordinator, Statler Hall.

700-701 Graduate Monograph or Thesis Research Fall or spring. Credit to be arranged. Required of M.P.S. candidates. Registration must be approved by the graduate faculty member who is to direct the research.

710 Graduate Independent Research in Management Fall or spring. Credit to be arranged. Open to graduate students in hotel administration only.

Designed specifically for graduate students working on theses or other research projects. Any member of the graduate faculty of the School of Hotel Administration, upon consultation with the student, may be selected to direct a particular problem of special interest to the student.

Management

Human Resources

111 Introductory Psychology Fall or spring. 3 credits. Required.

M W F 9:05. W. Grunes.
An introductory study of basic psychological principles that are involved in understanding human behavior. The course is oriented toward the notion that such understanding is integral to successful hotel management and further applied study. Basic concepts of sensation, perception, learning, motivation, and development are discussed.

211 Management of Human Resources Fall or spring. 3 credits. Required. Prerequisite: 111 or equivalent.

M W 11:15 or 12:20; one 1-hour lab to be arranged. D. A. Dermody.
A practically oriented approach to personnel management, including an introduction to organizational behavior, the selection and placement of personnel, the role of supervision, performance appraisal, wage and salary administration, employee motivation and union-management relations. Class discussion is based on case studies drawn from industry. Lectures are augmented by use of case material and role playing.

311 Union-Management Relations in Private Industry Fall or spring. 3 credits. Hotel elective. Prerequisite: upperclass or graduate standing or permission of instructor.

W 1:25 and Th 4:30-6:25 p.m. F. A. Herman.
Major areas of study will include: the development of the trade union movement in the United States, with emphasis on the history and structure of unions active in all phases of the hospitality industry;

federal and state laws governing the bargaining relationship, including the role of the National Labor Relations Board; collective bargaining; contract administration; and the critical role of conciliation procedures (for example, mediation, arbitration) in keeping industrial peace.

313 T.A. Training, Management Fall or spring. 1-3 credits. Hotel elective. Prerequisite: written permission of instructor must be obtained before course registration. Students planning to be teaching assistants in the Management Department are exposed to recommended techniques of instruction and any other methodology, reading, etc., as the professor in charge of the course may require.

314 Psychology in Business and Industry Spring. 3 credits. Hotel elective. Prerequisites: 111 and 211 or equivalent.

M W F 12:20. S. W. Davis.
The principles of psychology applied to industrial and business systems: personnel selection; placement and training; problems of men at work including evaluation, motivation, efficiency, and fatigue; and the social psychology of the work organization. While 314 is not a prerequisite for 315, it is recommended that this course be taken first if the student plans to enroll in 315.

[315 Seminar in Organizational Behavior and Administration 3 credits. Hotel elective. Prerequisites: 111 and 211 or equivalent; 314 recommended. S. W. Davis. Not offered 1978-79.]

416 Special Studies in the Management of Human Resources Fall. 3 credits. Hotel elective. Prerequisite: 211 and upperclass or graduate standing.

M 1:25 and 7:30-9:25 p.m. D. A. Dermody.
Students work in advanced areas of personnel administration. Cases will be presented by the individuals directly involved, and the students' suggested resolutions will be compared to the actual ones.

418 The Psychology of Advertising Fall. 3 credits. Hotel elective. Prerequisites: three credits of psychology, three credits of marketing, upperclass or graduate standing, or permission of instructor.

M 2:30-5. P. C. Yesawich.
The principles of psychology and their potential application to advertising practices are examined. Areas emphasized include learning, perception, motivation, advertising research, consumer behavior, advertising strategy, and measurement.

[711 Graduate Seminar in Organizational Behavior 3 credits. Hotel elective. Prerequisites: 111, 112, and 314 or equivalent. S. W. Davis. Not offered 1978-79.]

Managerial Communications

Required Courses

265 Effective Communication Fall or spring. 3 credits. Required.
M 9:05-11 and W 9:05 or T 9:05-11 and Th 9:05. F. A. Herman.

A seminar designed to help students (1) express themselves clearly and effectively, and (2) acquire reading and listening skills to understand better the ideas of others. Principles of the communication process are explored, tested and reinforced through classroom interaction, case studies, debates, and individual and group videotaped presentations.

Elective Courses

161 Typewriting Fall or spring. 2 credits. Hotel elective.
M W F 10:10, or T Th F 9:05.
The basic typing needs of college students are met by this course in elementary typewriting.

165 Report Writing Fall or spring. 3 credits. A Freshman Seminar. May be taken as a hotel elective with prior written permission of the instructor. Limited to 20 hotel students.
Lec, T 10:10 or Th 12:20; lab, M T 11:15 or 12:20, T Th 1:25, or Th 10:10-12:05.

Written reports provide the information people and organizations need to form judgments and make decisions. Without a well-conceived plan, logical organization of material, careful data collection, and concise use of language, even the best-intentioned report can fail in its purpose. Course will focus on: strengthening skills in outlining and organizing, providing practice in preparation of both internal and external reports, using and understanding research sources, and developing skill in writing clearly and objectively.

261 Report Typing Fall or spring. 2 credits. Hotel elective. Prerequisite: 161 or equivalent.
T Th 10:10.

A course in electric typewriting designed for those students who can type but who wish to increase speed and accuracy, with emphasis on the typewritten report as a form of communication and study of various forms for business letters.

262 Typewriting and Business Procedure Fall or spring. 3 credits. Hotel elective. Prerequisite: 161. M W F 12:20.

Students who already know the keyboard develop sufficient speed and accuracy to meet business standards for an executive secretary, and learn filing, duplication, and machine transcription.

263 Shorthand Theory Fall or spring. 3 credits. Hotel elective. Prerequisite: typing ability or concurrent registration in 161, 261, or 262. Not offered fall 1978.
M W F 11:15.

The basic theory of Gregg shorthand is completed; dictation and transcription speed are developed to meet business standards for a stenographer.

268 Written Communication Fall or spring. 1 credit. S-U grades only. Hotel elective. Prerequisite: permission of instructor. Hotel students only. Limited to 20 students.

Hours to be arranged.
This minicourse emphasizes principles and techniques of writing, including clarity, style, interest, and collection and presentation of data.

364 Managerial Letter Writing and Dictation Fall or spring. 2 credits. Hotel elective. Prerequisite: upperclass or graduate standing.
Th 11:15-1:10.

Students learn the techniques of good letter composition needed by an executive to achieve effective communication. Procedures for machine dictation and dictation to stenographers are covered. Typing ability is not a prerequisite.

365 T.A. Training, Managerial Communications Fall or spring. 1-3 credits. Written permission of instructor required prior to registration.
F. A. Herman.

Students planning to be teaching assistants in the Communications Department are exposed to recommended techniques of instruction and any other methodology, reading, etc., as the professor in charge of the course may require.

Directed Studies

660 Undergraduate Independent Research in Managerial Communications Fall or spring. Credit to be arranged. Hotel elective. Prerequisite: written permission obtained before registration from the faculty member who is to direct the study.
This course is designed for students engaged in the preparation of special reports and other communications projects. Only the first three credits of directed study may be credited toward hotel electives during the student's undergraduate academic career. Additional directed study, if taken, will be credited toward free electives.

760 Graduate Independent Research in Managerial Communications Fall or spring. Credit to be arranged. Graduate students only.
As appropriate, graduate students may enroll in this course for thesis or monograph research or for other directed study. The student must have a specific project in mind. Before registration for the term written permission must be obtained from the faculty member who will oversee and direct the research. Forms are available in the office of the graduate faculty representative.

Properties Management

Required Courses

251 Property Management Graphics Fall or spring. 3 credits. Required.
M W 9:05; 2-hour lab to be arranged. R. H. Penner.
Basic principles of graphic communications as a management tool for problem solving, including drafting fundamentals and the interpretation of both presentation and technical drawings. Principles of site analysis and site planning, physical plant organization, and internal spatial relationships common to hotel and restaurant properties are stressed.

351-352 Hotel Mechanical and Electrical Systems I and II 351, fall; 352, spring. 3 credits each term. Required. Prerequisite: 251.
M W F 11:15; 2-hour lab to be arranged. J. J. Clark and M. H. Redlin.

Investigation of management problems associated with the mechanical systems of the physical plant. Water, heating, refrigeration, air conditioning, lighting, and electrical systems are given primary emphasis. In addition, systems such as elevators, fire equipment, swimming pools, communications, data processing, laundry, and housekeeping equipment are discussed. The basic engineering theory associated with each of the mechanical systems is taught. Emphasis is also on problems of capital expenditures, operating costs, and of repairs and maintenance.

451 Physical Plant Planning and Construction Fall or spring. 3 credits. Required. Prerequisite: 352.
Fall; M W 11:15-12:30; spring; M W F 12:20; 2-hour lab to be arranged. M. H. Redlin and R. A. Compton.

The feasibility, planning, development, and construction of the physical plant of the hotel food facilities projects are considered and analyzed. Materials and methods of building construction, repair, and maintenance are covered. Emphasis is placed on trade practices, building codes, cost estimation, and management responsibility in working with professional planners.

Elective Courses

[255 Design Graphics Fall or spring. 3 credits. Hotel elective. Prerequisite: 251. R. H. Penner. Not offered 1978-79.]

353 Introductory Food Facilities Engineering

Fall. 3 credits. Hotel elective. Prerequisite: 251 or equivalent.

M W 1:25; 2-hour lab to be arranged. M. H. Redlin and R. A. Compton.

A course designed to familiarize the student with the basic concepts of food facilities design and planning. Studies are carried out to determine space allocation for kitchens, refrigeration, storage, waste disposal, and service areas. Development of basic production work flow in the preparation and service areas is emphasized. The basic requirements for the selection of equipment utilizing industry standards for production capability, quality of construction, and ease of maintenance are covered. Students use laboratory time to plan, design, and write specifications for a small to medium-size production kitchen.

354 Food Facilities Equipment, Layout, and Design

Spring. 3 credits. Hotel elective. Prerequisite: 353 or permission of instructor.

M W 1:25; 2-hour lab to be arranged.

R. A. Compton.

Each student programs, plans, and develops a complete project. This involves study: (1) to research the project program and draw up the prospectus; (2) to select and design equipment; (3) to develop layout studies and complete the master plan (preliminary renderings); (4) to develop working drawings (contract drawings), including equipment and architectural plans, mechanical plans, equipment schedules that are required for bidding, fabrication, construction, and installation; and (5) to budget-estimate and review feasibility studies. Large food service facilities in hotels are emphasized.

[355 Orientation in Safety of Personnel and Property

1 credit. Hotel elective. Prerequisite: 352 or written permission of instructor before course registration. Not offered 1978-79.]

[452 Seminar in Interior Design

Fall. 3 credits. Hotel elective. Prerequisite: 251 or 751.

R. H. Penner. Not offered 1978-79.]

[453 Seminar in Environmental Control

3 credits. Hotel elective. Prerequisite: 352 and permission of the instructor before course registration. J. J. Clark. Not offered 1978-79.]

454 Seminar in Hotel Planning

Fall. 3 credits. Hotel elective. Prerequisite: 351, senior or graduate standing, and written permission of instructor.

Th 10:10; R. A. Compton.

The design and layout for a proposed hotel are thoroughly examined through project assignments; from feasibility study through plans and specifications. Emphasis is placed on site selection, floor plans, guest room layouts, and the selection and arrangement of equipment in all of the various departments.

455 Seminar in Restaurant Planning

Spring. 3 credits. Hotel elective. Prerequisite: 351 and senior or graduate standing.

M W F 9:05. R. A. Compton.

A project course in the analysis and design of restaurant properties. The critical study of existing solutions and how they set the design criteria for both kitchen and dining areas. These guidelines serve as the basis for the student work, which includes general programming, organization, spatial standards, layout, and equipment.

Graduate Courses**751 Project Development and Construction**

Fall. 3 credits. Required of M.P.S. candidates. Prerequisite: graduate standing.

T Th 8:30-9:45; 2-hour lab to be arranged.

M. H. Redlin.

The major elements of project development and construction process are presented and developed from an engineering management viewpoint. Topics

include feasibility studies, functional planning and design, financing techniques, the bidding process, construction contracts, project scheduling, and actual building construction. In addition, techniques for effective graphic communication are developed and included in the design process.

752 Graduate Studies in Electrical and Mechanical Systems

Spring. 3 credits. Required of M.P.S. candidates. Prerequisite: graduate standing.

T Th 8:40-9:55; 2-hour lab to be arranged.

J. J. Clark.

The major electromechanical systems of large buildings and hotels/motels are considered from a capital cost versus operating cost viewpoint. Systems considered include water, heating, refrigeration, air conditioning, lighting, communications, and elevators. Concepts of energy conservation and efficient utilities management, from the original selection of equipment through operating procedures, are emphasized. Students analyze and present case studies, criticize papers and reports, and suggest new systems.

756 Resort Planning and Development

Spring. 3 credits. M.P.S. elective. Prerequisite: 751; upperclass students must have permission of instructor.

T Th 10:10; R. H. Penner and M. A. Noden.

The seminar will emphasize the economic, social, marketing, and legal aspects of new resort development as well as the planning of the physical and recreational facilities. Students can choose to develop an international or United States property, including in the formal presentations appropriate market research, applicable laws, economic pro forma, regional and location analysis, environmental priorities, etc., in addition to design and engineering concepts.

Directed Studies**650 Undergraduate Independent Research in Properties Management**

Fall or spring. Credit to be arranged. Hotel elective. Prerequisite: written permission obtained before registration from the faculty member who is to direct the study.

Students pursue independent research projects under the direction of a faculty member. Only the first three credits of directed study may be credited toward hotel electives during the student's undergraduate academic career. Additional directed study, if taken, will be credited toward free electives.

750 Graduate Independent Research in Properties Management

Fall or spring. Credit to be arranged. Graduate students only.

As appropriate, graduate students may enroll in this course for thesis or monograph research or for other directed study. The student must have a specific project in mind. Before registration for the term, written permission must be obtained from the faculty member who will oversee and direct the research. Forms are available in the office of the graduate faculty representative.

Science**Required Courses****171 Food Chemistry I**

Fall. 3 credits. Required. Prerequisite: high school chemistry.

M W F 8; 1-hour lab to be arranged. P. Rainsford. Principles and concepts of inorganic chemistry and organic chemistry. The chemistry of fats, carbohydrates, and proteins is emphasized.

172 Food Chemistry II

Spring. 4 credits. Required. Prerequisite: 171 or equivalent.

M W F 8; 3-hour lab to be arranged. P. Rainsford.

The chemistry of fats, carbohydrates, and proteins is emphasized in relation to food products and food production techniques. The roles of additives in foodstuffs, colloidal phenomena, food processing, and reconstitution techniques are studied.

173 Sanitation in the Food Service Operation

Fall or spring. 2 credits. Required.

T 1:25; 2-hour lab to be arranged. J. C. White.

The causes and prevention of food poisoning are stressed. Included are the aesthetic, moral, and legal responsibilities involved in presenting sanitary food to patrons.

771 Graduate Food Chemistry

Fall. 4 credits. Required of M.P.S. candidates. Prerequisite: graduate standing.

M W F 10:10; 2½-hour lab to be arranged.

Principles of inorganic and organic chemistry. The chemistry of fats, carbohydrates, and proteins is emphasized in relation to food products and food production techniques. The roles of additives in foodstuffs, colloidal phenomena, food processing, and reconstitution techniques are studied.

Directed Studies**670 Undergraduate Independent Research in Science**

Fall or spring. Credit to be arranged.

Hotel elective. Prerequisite: written permission obtained before registration from the faculty member who is to direct the study.

Students study specific chemical processes involved in modern food preparation. Only the first three credits of directed study may be credited toward hotel electives during the student's undergraduate academic career. Additional directed study, if taken, will be credited toward free electives.

770 Graduate Independent Research in Science

Fall or spring. Credit to be arranged. Graduate students only.

As appropriate, graduate students may enroll in this course for thesis or monograph research or for other directed study. The student must have a specific project in mind. Before registration for the term, written permission must be obtained from the faculty member who will oversee and direct the research. Forms are available in the office of the graduate faculty representative.

New York State College of Human Ecology

Field Study Office

T. Stanton, director; C. Cook, M. Whitham

The Field Study Office was established in 1972 to develop and implement interdisciplinary, field-related programs, as well as to give assistance to faculty and students interested in field study options throughout the College. In addition, the office staff, with the guidance of the interdepartmental field study faculty committee, makes policy recommendations about field learning and evaluates current offerings.

Field study involves incorporating the learning environments of the classroom and library with participation in organizations outside the University where students experience the complexities of social issues firsthand. Field study provides opportunities for students to test their classroom learning, to develop a deeper understanding of critical issues facing their placement settings, and defines the ways that experience and theories clarify each other. The process of meshing theory and practice distinguishes field study from job experience; this distinction is the basis of the rationale for granting field study credit.

Field study courses offered through the five departments in the College generally are related to specialized disciplines and emphasize professional exploration or training. While the offerings of the Field Study Office may provide opportunities to test career options, their focus is on an interdisciplinary approach to social issues. Field study courses are designed to help students develop a framework for thinking more systematically about the nature of social systems and the strategies for meeting human needs. It is expected that students will acquire a better understanding of the assumptions made by different groups with conflicting interests as well as an appreciation of the variety of disciplines needed to solve social problems.

For further information, contact the Field Study Office, New York State College of Human Ecology, Cornell University, 159 Martha Van Rensselaer Hall, Ithaca, New York 14853.

Interdepartmental Courses

Interdepartmental courses for human ecology students may count toward the fifteen credits outside the major, but they must be in addition to the required work in two departments with at least six credits or two courses in one department. In some cases, these courses may be accepted by a department to fill a practicum or major requirement.

200 Preparation for Fieldwork: Perspectives in Human Ecology Fall or spring. 3 credits. S-U grades optional. Intended for students from all five human ecology departments interested in preparing themselves for field experience in departmental or interdepartmental courses, as well as in summer or professional fieldwork. Limited to 25. Permission of the instructor required.

T Th 10:10–12:05. M. Whitham. Introduces students to field skills (such as interviewing, observation, public speaking, and discussion leading) and provides opportunities to practice and develop those skills. Additionally, small student task forces consider case studies highlighting complex issues in the government

regulation of drugs and of youth-oriented service delivery systems. Students work together to define problems, analyze and synthesize data from a variety of sources, and make group presentations.

400 Data Gathering in the Field: Skills for Learning in a Field Study Setting Fall. 1 credit. S-U grades optional. Limited to 25 students.

W 2:30–4:25 from September 13–October 18 (6 workshops). M. Whitham. Workshops to train students in skills that will help them become more effective field learners and better able to cope with the complex demands of a field placement. Topics will include observation, listening, investigative interviewing, understanding nonverbal communication, identifying sources of information in the community, and analyzing verbal presentations. All of the concepts are applied to assignments in the field.

402 Independent Field Learning Fall or spring. Credit to be arranged. S-U grades optional. Registration with permission of department faculty sponsor(s) and approval of the director of the field study program.

Hours to be arranged. Provides opportunity for students to develop field study experience within an interdisciplinary framework, usually under the supervision of faculty from two or more departments.

408 Organizations in the Delivery of Goods and Human Services Spring. 15 credits. Limited to 20. Intended for human ecology upperclass students. Prerequisite: ID 200. Enrollment by permission of T. Stanton.

A full-semester, off-campus field course in the New York City metropolitan area designed to give an in-depth understanding of how contemporary organizations operate and the forces that influence the delivery of goods and human services. The course combines intensive participation in an organization that represents at least one of three perspectives (providers of goods and human services, policymakers and regulators, or community action and consumer groups) with a weekly seminar/workshop that provides the skills, concepts, and theories necessary for understanding and analyzing these organizations and the critical issues they face. Deadline for receipt of applications in the Field Study Office: October 13, 1978.

Interdepartmental Major

See the Interdepartmental Major in Social Planning and Public Policy under the Departments of Community Service Education and Consumer Economics and Housing.

Division of Academic Services

B. Morse, chairman; R. J. Babcock, E. E. Martire, H. J. Pape, M. Thomas, V. Vanderslice, R. West, N. Yaghlian

320 Student Counseling and Advising Fall or spring. 3 credits. S-U grades only. Limited to 15. Permission of the instructor required.

T 1:30–4:30. G. Vanderslice. The course work will include staffing the Peer Counseling Office for two to three hours a week—to answer questions and to provide counseling for other human ecology students concerning their academic pursuits—as well as attending a two-hour seminar each week. Seminars include supervised training in basic counseling skills, analysis and discussion of several different theories of counseling, analysis of organizational and functional issues of peer counseling and its relation to this college, and the

sharing of issues and concerns that arise from the actual peer counseling process. Outside reading that introduces students to various counseling theories will be required as preparation for the seminars.

400–401–402 Special Studies for Undergraduates Fall or spring. Credit to be arranged. S-U grades optional.

Hours to be arranged. Department faculty. For independent study by an individual student in advanced work not otherwise provided in the department; or for study on an experimental basis, with a group of students in advanced work not otherwise provided in the department. Students prepare a multicopy description of the study they wish to undertake. Forms are available from counselors in the Division of Academic Services. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study.

400 Directed Readings For study that predominantly involves library research and independent reading.

401 Empirical Research For study that predominantly involves data collection and analysis or laboratory or studio projects.

402 Supervised Fieldwork For study that predominantly involves participation in community or classroom settings.

600 Special Problems for Graduate Students Fall or spring. Credit to be arranged. S-U grades optional. For graduate students recommended by their chairperson and approved by the head of the department and the members of the staff in charge of the problem for independent, advanced work.

Hours to be arranged. Department faculty.

Community Service Education

Irving Lazar, chairman; H. Y. Nelson, graduate faculty representative; J. Allen, R. J. Babcock, D. J. Barr, S. Blackwell, E. Conway, A. Davey, D. Deshler, C. Farris, J. L. Ford, W. W. Horne, C. C. McClintock, M. Minot, B. J. Mueller, L. A. Noble, C. Reed, R. C. Rist, C. Shapiro, L. Street, S. Witkin, B. L. Yerka

The Department of Community Service Education is primarily concerned with the education of human service professionals—people who can design innovative programs for effecting change, participate in the implementation of such programs, and analyze the impact of those programs on society. The department's undergraduate program includes options to prepare students to teach home economics (Option I), to serve as social workers (Option II), or to engage in educational work with adults in community settings (Option III). In addition, the department, in collaboration with the Department of Consumer Economics and Housing, offers an interdepartmental major in social planning and public policy. Facilities for student use include the instructional resource center, a workbook for preparing material, and multimedia equipment.

In Education (Option I) the curriculum focuses on human development; the family, and consumer decision making and resource management. Students taking this option select one of the following problem areas for concentrated study: consumer education and resource management; housing and design; family development and management; human nutrition and food; textiles, clothing, furnishing, and design; or family and community health. A sequence of professional courses analyzes the teaching-learning process. Students completing Option I are prepared for professional roles as teachers of youth and adults,

educational consultants, and developers of educational materials. (New York State certificate of qualification for teaching home economics in K-12 grades is automatically received upon completion of the option.) Students planning to transfer into this department in order to enter the teacher-education sequence (Option I) should be aware that it is difficult to complete this curriculum in only four semesters. Where the student has not completed some of the required courses (or their equivalents) prior to transfer, a summer session or an additional semester may be necessary.

In Social Work (Option II) the undergraduate program, which is accredited by the Council on Social Work Education, prepares students for entry-level employment in social work and other human service professions. In addition, students who complete this curriculum are eligible to apply to graduate schools of social work for an accelerated one-year M.S.W. program.

Adult and Community Education (Option III) prepares students to appreciate the special learning needs, interests, and concerns of adults and to acquire skills that will enable them to respond appropriately to the problems they encounter. Each student selects an area of concentration within the areas of community planning and development, community health and nutrition, consumer economics and education, gerontology, parents and youth, or family resource management.

In the Interdepartmental Major in Social Planning and Public Policy students have an opportunity to acquire knowledge and skills to assess local and regional needs and to develop and evaluate plans for meeting these needs. Students are given professional training geared to helping state and local agencies implement social programs and develop public policy. The Department of Community Service Education participates in this major jointly with the Department of Consumer Economics and Housing.

Students interested in any of the above areas should consult with department faculty members for current information about programs. Requirements for the department major are also available from the Division of Academic Services. Details of the field experience requirements will be available before preregistration.

The graduate program focuses on the design, implementation and analysis of human service programs. Students in the graduate program are admitted either to the Field of Education or to the Field of Human Service Studies. The two majors, home economics education and community service education, both include the study of program planning and development, program evaluation and evaluative research, and higher education for professionals in human services. For example, doctoral candidates in home economics education interested in college teaching may specialize in teacher education and supervision; similarly, doctoral candidates in community service education may specialize in teaching social work or adult education at the college level. The major in community service education is offered only in the Field of Human Service Studies. The general degrees of M.S. and Ph.D. and the professional degrees of Master of Arts in Teaching, Master of Professional Studies, and Doctor of Education are offered.

Requirements for all graduate degrees and the majors available in the department are stated in the *Announcement of the Graduate School*. Applicants are required to submit scores on the aptitude test of the Graduate Record Examination or on the Miller Analogies Test. In addition, applicants for master's degrees (other than the M.A.T.) are required to have had field experience. In general, applicants for the doctoral degree program are expected to have had two years of paid professional experience in a

human service agency such as a public school, a mental health clinic, a county extension association, or a United Fund agency.

A limited number of assistantships are available in the Department of Community Service Education to provide financial support as well as relevant professional experiences for students. College and University fellowships are also available. In general, priority for assistantships is given to United States citizens.

Students seeking additional detailed information about the graduate program in this department should write to Professor Helen Y. Nelson, Graduate Faculty Representative, Department of Community Service Education, New York State College of Human Ecology, Cornell University, Martha Van Rensselaer Hall, Ithaca, New York 14853.

202 Structure of Community Services Fall or spring, 3 credits. Limited to 65 students.

M W F 10:10. L. Street.

A lecture-discussion course designed as an introduction to the community base of services. The presence or absence of educational, social, and planning services as well as their place and performance are examined in the context of theoretical and empirical community dimensions. Examples of such dimensions include community complexity, differentiation, modernity, ethnicity, and community role.

203 Groups and Organizations Fall or spring, 3 credits. Should be taken after or concurrently with CSE 202.

M W F 9:05. C. McClintock.

A basic course in the social psychology of small groups and human service organizations. Study of group processes will include self and interpersonal perception, roles, norms, communication, power, and leadership. Students will apply what has been learned about small groups to the study of issues in human service organizations (for example, goals, evaluation, structure, technology, organization-client relations, environment, and change).

246 Ecological Determinants of Behavior Fall, 3 credits. Preference given to CSE Option II students. Prerequisites: introductory soc, introductory psych, and permission of instructor.

M W F 2:30. B. J. Mueller and S. Witkin.

A general consideration of the major determinants of human behavior presented from the perspective of social work practice and followed by more detailed discussion of social and psychological determinants. Emphasis is on learning theories as applied to behavior-environment interaction. The role of cognitive factors is also examined. Implications are presented for the applications of behavioral science knowledge to social work practice.

292 Research Design and Analysis Fall or spring, 3 credits. Prerequisites: basic course in psych or soc. Limited to 50 students.

T Th 2:20-3:45. S. Blackwell.

Students should develop skill in analyzing and evaluating research reports. Readings, exercises, and periodic assignments focus on stating hypotheses, designing studies to test hypotheses, measuring variables, and interpreting findings. Major project is a research proposal that is criticized before the final draft is submitted.

300 Special Studies for Undergraduates Fall or Spring. Credit to be arranged.

Hours to be arranged. Department faculty.

For special arrangement of course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. This form, signed by both the instructor directing the study and the head of the department, should be filed at course registration or during the change-of-registration period.

325 Health-Care Services and the Consumer Spring, 3 credits. S-U grades optional. Limited to 40 students; juniors and seniors only.

T Th 2:30-3:45. J. Ford.

Developments in the health field that affect the availability and kinds of health services. Emphasis is placed on interrelationships between institutions and agencies and on the part each can play in prevention, diagnosis, and treatment of disease and disability.

330 Ecology and Epidemiology of Health

Spring, 3 credits. S-U grades optional. Limited to 40 students.

T Th 12:30-1:35. J. Ford.

Ecological and epidemiological approaches to the problems of achieving human health within the physical, social, and mental environment. The course will introduce the student to epidemiological methods and survey the epidemiology of specific diseases.

340 Clinical Analysis of Teaching Fall or spring, 1 credit. CSE majors in Option I have priority.

Prerequisite or corequisite: Educ 411.

T 12:20-2:15 plus additional hours to be arranged. C. Farris.

A laboratory course that provides students with theoretical frameworks for observation, analysis, and practice of various teaching behaviors and their effects upon learners. Course content includes analysis of verbal and nonverbal behaviors, patterns of verbal interaction, motivational techniques, and planning and teaching for cognitive, affective, and psychomotor learning. Opportunity for observation, practice, self-evaluation, and improvement of skills and strategies is provided in microteaching laboratories where students teach small groups of junior and senior high pupils.

370 Social Welfare as a Social Institution Fall, 3 credits. Preference given to CSE Option II students. Limited to 35 students.

M W F 9:05. J. Allen.

A philosophical and historical introduction to social welfare services. The course reviews the social contexts from which programs and the profession of social work have evolved. It discusses the political and ideological processes through which public policy is formed and how policies are translated into social welfare programs. Basic issues in welfare are discussed in the context of present program designs, public concerns, and the interrelationships and support of services in the community.

400-401-402 Special Studies for Undergraduates

Fall or spring. Credit to be arranged. S-U grades optional. Limited to CSE, interdepartmental, and independent majors.

Hours to be arranged. Department faculty.

For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of CSE not otherwise provided in the department or elsewhere at the University. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. This form must be signed by the instructor directing the study and the department chairman and filed at course registration or within the change-of-registration period. In order to ensure review before the close of the course registration or change-of-registration period, early submission of the Special Studies Form to the chairman is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions:

400 Directed Readings For study that predominantly involves campus library research and independent readings.

401 Empirical Research For study that predominantly involves data collection and analysis or laboratory or studio projects.

402 Supervised Fieldwork For study that predominantly involves participation in community or classroom settings.

411 Introduction to Adult Education Fall or spring, 3 credits. S-U grades optional. Limited to 60 students. Preference given to CSE majors.

T Th 10:10-12:05. D. Deshler.
Focuses on the broad aspects of adult education, scope and history of adult education programs, philosophy and principles, perspective of the adult learner, media and methods of instruction, and program development. Opportunities will be provided for observation of adult education programs in community organizations and agencies.

412 Skills and Methods in Community Education Fall, 3 credits. S-U grades optional.

T Th 2:30-4:25. C. Reed.
Opportunity for students to observe community learning activities, to learn community education methods, developing skill in using a variety of these methods. Includes techniques of program planning, community development, citizen participation, public affairs education, program evaluation, presentation, and discussion. Observations in the Ithaca area.

413 The Adult Learner in Microerspective Fall, 3 credits.

W 7:30-10:30 p.m. D. Deshler.
This research course examines a full range of adult learning activities by conducting in-depth interviews with selected adult learners. Their interests, motivations, needs, and special problems will be considered in relationship to adult learning theory. Skills in conducting interviews, analyzing qualitative data, and presenting findings will be developed.

414 Practicum Fall or spring, 6 credits. Section A open only to CSE Option III majors who have completed the prerequisites planned with their adviser; Section B open only to interdepartmental Option I majors. Consent of the option adviser and agency field preceptor required before registration.

Department faculty.
An opportunity for a student to assume a professional role and responsibilities under the guidance of a preceptor in a community service organization. Conferences involving the student, field preceptor, and College supervisor will be arranged in a block, scheduled throughout the semester, or completed in the summer session, depending on the nature and location of the student's fieldwork.

[415 The Adult Learner in Macroperspective Fall, 3 credits. Next offered 1979-80.

D. Deshler.
Focuses on the variety of adult education programs in countries around the world. Literature on comparative adult education, international conferences, UNESCO publications, and international community development will be analyzed in relationship to each student's exploration of adult education in a single country. Description of adult education in other countries will be conveyed by international students.]

416 The Helping Relationship Fall, 3 credits. S-U grades optional.

Lec T 10:10-12:05; in addition each student must sign up for one of the following discussion sections (limited to 20 students each): Sec 1, T 2:30-4:25; Sec 2, Th 10:10-12:05; Sec 3, Th 2:30-4:25. D. Barr.
The first half of the course focuses on theory, research, and experiential exercises in interpersonal relationships. The second half focuses on the ecological aspects of the helping relationship. The design of the course is based on the assumption that feelings and ideas can and should be taught together.

440 Program Planning Fall or spring, 2 credits. Teaching majors in Option I should schedule the semester prior to CSE 441-442.

T Th 8. (In addition, students need to have a block of approximately three hours between 9 and 3 available during the week for several observations and/or participation in educational programs, unless the program of interest meets in the evening.) M. Minot.

The student will (1) analyze the factors that influence program planning and change and (2) apply principles of program development to planning for a group and/or individuals in programs with different purposes and organizational structures. Plans will reflect a knowledge of clients, societal trends, issues in the problem area, the philosophy of the specific program and of education, the psychology of learning, and organizational structures. Plans will be criticized by a panel of professionals.

441 The Art of Teaching Fall or spring, 2 credits. To be scheduled concurrently with CSE 442 and CSE 443. This course is offered during the first seven weeks of the term.

T Th 10:30-12:05. Additional hours are arranged during the week of independent study following student teaching. E. Conway.
An orientation for the student-teaching practicum. Major topics considered are classroom atmosphere, discipline, and management; evaluation of the teaching-learning processes in relation to personal goals and unit objectives; philosophy, creativity, and teaching techniques; and professionalism. Materials for the student teaching practicum are developed.

442 Teaching Practicum Fall or spring, 6 credits. Student teaching full time for last seven weeks of term. To be scheduled concurrently with CSE 441 and CSE 443. Prerequisite: CSE 440.

M. Minot, coordinator, and department faculty.
Teaching experience with student assigned to cooperating public schools. Student teachers are required to live in the school communities and work under the guidance of local teachers and department faculty. Cooperating schools are located in different types of communities, present a variety of organizational structures and have comprehensive programs. Students should indicate their intent to register for this course as soon as possible.

443 Critical Issues in Education Fall or spring, 2 credits. S-U grades optional except for CSE Option I students. Limited to 25 students. Priority to CSE Option I students. No students will be admitted to the class after the first session. This course is offered during the first seven weeks of the term.

F 12:20-2:15. R. Babcock.
An examination of current issues in education. Analysis of historical, philosophical, social, and political factors that affect these issues.

444 Career Environment and Individual Development Spring, 2 credits. S-U grades optional. Limited to 25 students. No students will be admitted to the class after the first session. This course is offered during the second seven weeks of the term.

F 12:20-2:15. R. Babcock.
An analysis of how work, jobs, and careers relate to and shape the behavior of individuals. Topics considered are theories of occupational choice, job satisfaction, structure of the labor force, manpower projection, and career planning. The course provides opportunities for students to examine their own vocational aspirations. Emphasis on how the helping professional deals with clients or students in preparing for, adjusting to, and maintaining jobs and careers.

446 Teaching for Reading Competence: A Content Area Approach Fall, 2-3 credits. S-U grades optional.

M 7:30-9:30 p.m. E. Conway.
The teaching of reading through content areas, intended for future educators and community service

professionals as well as those already working in these fields. The course will focus on (1) need for improvement in reading, (2) evaluation of reading materials, (3) teaching of reading skills basic to various content areas, and (4) development of materials appropriate for the student. Opportunity to use the materials in a field setting, formal or informal, may be arranged if desired.

471-472 Social Work Practice I and II An introduction to social work practice through a field and methods course. Comparison of concepts and skills used in casework, group work, and community work: Field experience in problem-solving activities with individuals, families, groups, or communities. Examination of the value base of social work practice. The class meetings are integrated with two days of field instruction each week. Supervised field placements are made in selected social agencies in Tompkins, Tioga, Chemung, and Steuben counties.

471 Social Work Practice I Fall, 9 credits. Enrollment by permission of instructor before registration. Limited to 25 students. Prerequisites: introductory psych, introductory soc, and grades of C+ or better in CSE 246 and CSE 370.

Lec, M W 10:10-12:05; Labs T Th 12:20-2:15. B. J. Mueller and C. Shapiro.

472 Social Work Practice II Spring, 9 credits. Enrollment by permission of instructor before registration. Limited to 25 students. Prerequisite: grade of B- or better in CSE 471.

M W 10:10-12:05. C. Shapiro.

473 Special Problems and Issues in Social Work Spring, 3 credits. Limited to 25 students. Preference given to CSE Option II students. Enrollment by permission of the instructor before course registration.

M W F 3:35. C. Shapiro.
Building on the CSE core curriculum and the social work practice courses, this seminar will integrate theoretical and practical considerations in the examination of value dilemmas and issues related to professional practice.

474 Program Development in Social Services Spring, 3 credits. Preference given to CSE Option II students. Enrollment by permission of the instructor before course registration. Option II students must schedule concurrently with CSE 472.

M W F 2:30. J. Allen.
This seminar will be coordinated with CSE 472 (Social Work Practice II) and teach program development in the fields in which students have their placements.

475 Organization and Structure for Delivery of Social Services Spring, 3 credits. S-U grades optional. Prerequisites: CSE 370 or Govt 111 or Soc 141.

M W F 9:05. J. Allen.
An examination of the policymaking process and the significance of national policies as they affect the distribution of goods and services, levels of living, and societal interactions. Frameworks for analyzing social policy will be used to evaluate existing service delivery systems and proposals for changes in these systems at the national, state, and local levels. Students should have some field or work experience in a human service prior to or while taking this course.

600 Special Problems for Graduate Students Fall or spring. Credits to be arranged. S-U grades optional.

Hours to be arranged. Department faculty. Independent, advanced work by students recommended by their chairmen and approved by the instructor.

[601 Theories of Community Services Fall. 4 credits. Next offered 1979-80.

An introductory graduate course in theories of community services. The course considers the nature of values and goals in a social system, the nature of goods and services, and the supply and demand side of human services within an ecological framework. The course will expose the student—through readings and contact with local human-service professionals and organizations—to both theoretical and applied aspects of community services.]

603 Groups and Organizations Spring.

3 credits. Open only to extramural students from county departments of social services.

T 7:30-10:30 p.m. Department faculty.
A course in the social psychology of small groups and human service organizations. Study of group processes will include self and interpersonal perception, roles, norms, communication, power, and leadership. Students will apply what has been learned about small groups to the study of issues in human service organizations.

607-608 Professional Improvement I and II

Fall, spring, or summer. Variable credit. S-U grades optional. Enrollment will be determined by various factors, including content, funding, resources, facilities, and instructor. Primarily for extramural (evening) and off-campus instruction.

Series of special-problem seminars, classes, and activities designed for in-service and continuing education of practitioners in helping professions, such as home economics teachers, social workers, public health planners, and adult educators. Specific content of each course will vary with group being served and will include amount of work and class time appropriate to number of credits. May be repeated with the permission of the instructor.

[610 Seminar in Adult Education Spring.

3 credits. S-U grades optional. Next offered 1979-80.

Deals with significant problem areas in adult education. Implications of theory and research in the area will be important considerations. A specific area will be considered each time the seminar is offered, each one announced at preregistration. The seminar may be repeated with permission of the instructor.]

621 Services for Alcohol and Drug Problems

Fall. 3 credits. S-U grades optional.

T Th 12:20-1:35. J. Ford.
A study of the nature and extent of various drug problems including alcoholism. Special attention will be given to the biological, epidemiological, social, and legal approaches to understanding and controlling alcohol and other drug problems. An overview of prevention, treatment, and rehabilitation services will be presented, including implications for program evaluation.

629 Research Design and Analysis Fall.

3 credits. Open only to extramural students from county departments of social services.

T 7:30-10:30 p.m. Department faculty.
Students should develop skill in analyzing and evaluating research reports. Readings, exercises, and periodic assignments focus on stating hypotheses, designing studies to test hypotheses, measuring variables, and interpreting findings.

631 Human Resources in Human Services

Spring. 3 credits. S-U grades optional. Previous experience as a professional in a human service setting required.

W 7:30-10:30 p.m. Department faculty.
Analysis of the human resources involved in the planning, production, delivery, control, and consumption of human services from the perspectives of social policy, organizational

practice, and interpersonal behavior. Includes consideration of volunteer, professional, paraprofessional, nonprofessional, and client/consumer categories. Term project involves empirical investigation of a selected interest area.

637 Social Welfare as a Social Institution Fall.

3 credits. Open only to extramural students from county departments of social services.

W 7:30-10:30 p.m. Department faculty.
A philosophical and historical introduction to social welfare services. The course reviews the social contexts from which programs and the profession of social work have evolved. It discusses the political and ideological processes through which public policy is formed and how policies are translated into social programs. Basic issues in welfare are discussed in the context of present program designs, public concerns, and the interrelationships and support of services in the community.

646 Ecological Determinants of Behavior Fall.

3 credits. Open only to extramural students from county departments of social services.

M 7:30-10:30 p.m. S. Witkin.
An introductory course concerning the identification of some major determinants of human behavior and their interaction. Students will examine (through readings, papers, and discussion) different ecological perspectives on behavior and attempt to integrate these perspectives into a human services framework. For example, the implications of an ecological perspective for the planning and delivery of services will be emphasized.

[660-661 Internship in Planning and Program Development

Fall and spring. Credit to be arranged. Enrollment by written permission of instructor only. Next offered 1979-80.

I. Lazar.
Application of planning and program development skills to current problems in state and regional planning. May involve fieldwork outside the Ithaca community.]

671-672 The Teacher Educator in Home Economics

Fall or spring. Fall, 3 credits; spring, 4 credits.

Class hours, observations, and field experiences to be arranged. Fall, H. Nelson; spring, C. Farris.

671 Opportunity is provided for students to develop understanding of teacher-education practices by observing and participating in the undergraduate program. Participation involves teaching and individual work with students. Additional experiences include observation of student teachers and the supervisory conferences in student teaching centers.

672 Seminar is concerned with basic principles of supervision and their application to the preservice education of home economics teachers. Opportunity is provided for observation and participation in CSE 340, CSE 441, and CSE 442, including some teaching in the courses and the supervision of a student teacher.

[673 Belief and Practice in Educational Interventions

Spring. 3 credits. Next offered 1979-80.

M. Minot.
The professional educator brings a set of beliefs and values and a preferred theoretical orientation to his or her work in schools and other agencies. The educator may find, however, that the agency has institutionalized values and practices at variance with his or her own. This seminar will consider the implications for practice of several prevalent belief systems in education and the problems of discordance between individual beliefs and institutional policies related to educational practice.]

674 Program Development in Social Services

Spring. 3 credits. Open only to extramural students from county departments of social services.

W 7:30-10:30 p.m. Department faculty.
Deals with program development in the fields in which students are or will be working.

675 Organization and Structure for Delivery of Social Services

Spring. 3 credits. Open only to extramural students from county departments of social services.

M 7:30-10:30 p.m. R. Rist.
A framework for assessing and understanding the range of issues posed in the current organization and delivery of various social services. Concepts of social policy analysis will be used to evaluate different social service systems, new models of service delivery being developed, and proposals for change being made at national, state, and local levels. Students should have field or work experience in the human services prior to or concurrent with this course.

679 The Teaching of Home Management in College

Spring. 1-3 credits. S-U grades optional. Permission of instructor required.

Hours to be arranged. A. Davey.
An examination of the ways home management concepts are being taught and an exploration of new teaching approaches.

680 Seminar in Community Service Education

Fall. 1 credit. S-U grades only.

Th 9:05. D. Barr.
An informal seminar for graduate students and faculty. One or two major topics to be considered each term. May be repeated for credit with permission of instructor.

681 Current Issues in Home Economics Education

Fall. 1-2 credits. S-U grades optional.

T 7:30-9:25 p.m. Home economics education faculty.
Different topics and issues related to home economics education will be considered each semester. May be repeated for credit with permission of instructor.

690 Evaluation Fall. 3 credits. For professionals

concerned with behavioral change: extension agents, social workers, educational program directors, high school and college teachers and administrators, and research workers. Students without experience in any of these professional positions are admitted by permission of the instructor.

T Th 10:10-11:25. H. Nelson.
Basic principles of evaluation studies in relation to specific methods of appraising progress toward objectives of behavioral change. Opportunities will be given for constructing and using evaluation instruments.

691 Community Ethnography Spring. 3 credits.

Limited to graduate students or exceptionally well-qualified seniors by consent of the instructor.

W 1:25-4:25. L. Street.
A number of community ethnographies are examined from a standpoint of methods of investigation, substantive results, social theory, orientation of the analyst to setting and subjects, and related issues. Focuses on practical issues such as preparing for fieldwork, entering and withdrawing from the field, notetaking, relating observations to registry or other kinds of data, interning in the field, problems of analysis and report routine, with special reference to all-black towns. Members of the seminar should be familiar with race and ethnic relations theory, be engaged in an ethnographic study, or have the consent of the instructor.

692 Survey Research Methods Fall. 3 credits. Prerequisite: at least one course in research methods or permission of instructor. Next offered 1979-80.

C. McClintock.

A practicum course in which students will be presented with a research problem and will then design, implement, and analyze the results of an appropriate data-collection effort. The course will cover survey design, planning and management, instrument design, sampling, interviewing and other means of data gathering, field quality control, coding, and data processing and analysis. Selected problems and topics will be given special emphasis, including confidentiality and informed consent, assessment of bias due to nonresponse in sampling and data collection, omnibus surveys, and others.]

693 Secondary Analysis of Survey Data Spring. 3 credits. S-U grades optional. Prerequisite: appropriate experience in field research and computer work. Next offered 1979-80.

C. McClintock.

An intermediate-level course focusing on the aggregation of data sets from survey research, with emphasis on studies of planning, design, and evaluation of human services. Relevant to needs assessment, program evaluation, social indicators, and primary or secondary survey work. Course work will include attention to problems and processes of aggregating data vs. findings, acquiring, and documenting data sets, and evaluating research methodology.]

694 Research Design and Analysis Fall. 2-3 credits. Students taking CSE 690 or its equivalent may register for two hours with consent of the instructor. S-U grades only.

M 2:30-5:15. S. Blackwell.

Intended for graduate students with little or no research experience. Parallels CSE 292 in purpose, content, and requirements.

718 Designing Human Service Programs Fall. 3 credits. Permission of instructor is required. Offered during first 7 weeks of semester.

M W 7:30-10:30 p.m. I. Lazar.

An exploration of methods for translating human services research into programs for service to communities and individuals. Operational design, staffing, budget preparation, fund raising, and community auspice development, as well as program evaluation, administration and change, will be discussed. Students will be expected to design a local service program.

719 Developing Systems for the Delivery of Human Services Spring. 3 credits. Permission of instructor required.

M 3:35-6:30. I. Lazar.

This seminar will describe various attempts to build consolidated systems for the delivery of human services at local, state, and federal levels. An assessment of these efforts will be followed by an examination of new system designs and the specification criteria for the measurement of system effectiveness. It will be assumed that students in this course are familiar with the present service structure of typical communities.

773 Internship and Fieldwork in Teacher Education Fall and spring. 2 credits. S-U grades optional. Prerequisites: CSE 671 and CSE 672.

Hours to be arranged. M. Minot and H. Nelson. Involves supervision of student teachers and conferences, as needed, with college supervisor and cooperating teachers in the schools. Provision made for a follow-up visit to a first-year teacher.

775 Administration and Supervision Practicum Spring. 2 credits. S-U grades optional. Permission of the instructor required.

Hours to be arranged. Graduate faculty. Analysis of concepts of administration and supervision in agencies and institutions concerned

with educational aspects of human services through directed observation of state, local, and college programs. (Approximate cost of field trips, \$35.)

790 Seminar in Evaluation Spring. 3 credits. S-U grades optional. Prerequisites: CSE 690 or equivalent and at least one course in statistics.

T 10:10-1:10. S. Blackwell.

Emphasis on methodological problems of evaluative research. Consideration given to alternative design choices appropriate to particular evaluation models, to the constraints imposed on the researcher by the real-world context of program evaluation, and to compromises that result from such constraints.

899 Master's Thesis and Research Fall and spring. Credit to be arranged. S-U grades optional. Registration with permission of the chairperson of the graduate committee and the instructor.

Hours to be arranged. Department graduate faculty.

999 Doctoral Thesis and Research Fall and spring. Credit to be arranged. S-U grades optional. Registration with permission of the chairperson of the graduate committee and the instructor.

Hours to be arranged. Department graduate faculty.

Consumer Economics and Housing

E. S. Maynes, chairman; A. J. Davey, graduate faculty representative; H. B. Biesdorf, W. K. Bryant, P. Chi, S. Clemhout, M. S. Galenson, W. H. Gauger, J. Gerner, A. J. Hahn, M. Lea, C. Meeks, J. Robinson, N. C. Saltford, J. Swanson, K. E. Walker, E. Wiegand

Increasing concern with the welfare of the consumer in society is evident at all levels of government and in private industry. The Department of Consumer Economics and Housing (CEH) offers students an opportunity to study in this developing field. Programs for students majoring in the department focus on social and economic policies as they affect individuals and families; an understanding of economics and sociology, particularly those aspects relating to consumption and to housing problems, is basic. Students who complete their undergraduate work in this department are well prepared for a variety of positions within an expanding field of consumer-related work.

Faculty members in the department represent a broad range of special interests within the field and provide depth through a diversity of backgrounds and experiences. In addition to teaching undergraduate courses, most are involved in research and in teaching at the graduate level. Several teach in the College's public service/extension program operating throughout the state and serve on numerous committees, at both the state and national level, that deal directly with current issues affecting society.

At the undergraduate level, the student is offered two options within the Department of Consumer Economics and Housing: consumer economics or housing.

Consumer Economics is concerned with the economic behavior and welfare of consumers in the private, public, and mixed sectors of the economy. Emphasis is on how consumers allocate their scarce resources, which include time and money. This option requires a strong foundation in those subjects that contribute to an understanding of the market economy and of consumers' rights and responsibilities. Many graduates from the consumer economics option find careers in government agencies providing consumer services, while others choose to work in business and industry in consumer-relations divisions or in consumer-related community programs.

Housing, a major societal problem, is studied through an interdisciplinary approach that includes the methods and models of sociology, economics, and political science. This option focuses on housing consumption and production in the context of the housing market. In addition, the social implications of housing related to household preferences, mobility, and involvement in neighborhood change are emphasized. Attention is given to the development of social science research skills for the analysis and evaluation of housing policies and programs. Recent graduates have taken positions with local, state, and federal agencies dealing with housing problems.

In the **Interdepartmental Major** in Social Planning and Public Policy, students have an opportunity to acquire knowledge and skills to assess local and regional needs and to develop, implement, and evaluate policies and plans for meeting these needs. Students learn to work as professionals to help state and local agencies implement social programs and develop public policy. The Department of Consumer Economics and Housing participates in this major with the Department of Community Service Education.

The department offers programs leading to bachelor's, master's, and doctoral degrees. Students seeking additional detailed information about graduate programs in this department should write to Graduate Faculty Representative, Department of Consumer Economics and Housing, New York State College of Human Ecology, Cornell University, Martha Van Rensselaer Hall, Ithaca, New York 14853.

100 Introduction to Consumer Economics Fall or spring. 3 credits. S-U grades optional. Students who have taken Economics 101 or another introductory macroeconomics course should not register. Enrollment limited to 120.

Fall: M W F 10:10; spring: M W F 11:15.

J. Robinson, M. Galenson.

An introductory course designed to provide a basic understanding of macroeconomics, with particular attention to those areas affecting families. The course will cover national income accounting, income distribution, prices, and monetary and fiscal policy. This will serve as a basis for the study of income redistribution programs and other areas of government action.

147 Housing and Society Fall or spring. 3 credits. S-U grades optional. Enrollment limited to 20 students per section, 5 sections.

Lec, T Th 11:15. Sections: T 1:25 or 3:35; W 1:25; Th 9:05 or 1:25. P. Chi, C. Meeks.

A survey of contemporary American housing issues as related to the individual, the family, and the community. The course focuses on the current problems of the individual housing consumer, their implications for housing the American population, and governmental actions to alleviate housing problems.

148 Sociological Perspectives on Housing

Spring. 3 credits. S-U grades optional. Prerequisite: CEH 147 or equivalent. Enrollment limited to 12 students per section, 5 sections. Information regarding section hours will be available at course registration.

Lec, T Th 10:10. Department faculty.

A theoretical and empirical analysis of housing patterns in the United States from a sociological perspective. Topics include migration patterns, residential mobility, suburbanization, and the structure and function of neighborhoods. Emphasis is on explaining the widespread patterns of segregation in the United States by race, ethnicity, and social class.

233 Marketing and the Consumer. Spring. 3 credits. S-U grades optional. Prerequisite: microeconomics.

M W F 8. N. C. Saltford.

A study of marketing functions, institutions, policies, and practices with emphasis on how they create consumer satisfaction. A marketing project with a nearby consumer products firm and a field trip to New York City to study selected marketing operations are arranged when feasible.

248 Housing Controls and Standards. Fall. 3 credits. S-U grades optional. Prerequisite: Econ 102.

T Th 12:20-1:55. M. Lea.
Analysis of state and local government tax, expenditure, and regulatory activities that affect the housing market. Detailed consideration will be given to property taxation, provision of local public goods, zoning, housing and building codes, and other government policies that deal with housing and neighborhood environment.

300 Special Studies for Undergraduates Fall or spring. Credit arranged.

Hours to be arranged. Department faculty. For special arrangement of course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. The form, signed by both the instructor directing the study and the head of the department, is filed at course registration or during the change-of-registration period.

312 Decision Making in the Family Fall or spring. 3 credits. S-U grades optional. Enrollment limited to 28; preference given human ecology juniors and seniors. Not open to freshmen.

T Th 1:25-3:20, other hours to be arranged.
A. Davey.
Decision making is studied in relation to goal formation and goal attainment within the economic and social context of the family. Factors that expand and limit alternatives are examined. Field trips are included. Students elect a practical application that may include a field experience with a family, a live-in experience in Apartment A, or an independent exploration of some phase of family decision making. Course fee is \$20 per week for the live-in experience (average time is three weeks).

325. Economic Organization of the Household Fall. 3 credits. S-U grades optional. Prerequisite: Econ 102 or equivalent.

M W F 9:05. K. Bryant.
Theories and empirical evidence on how households spend their resources are used to investigate how households alter the amounts and proportions of time and money spent in various activities, their size, and their form in response to changing economic forces.

330 Personal Financial Management Spring. 3 credits. S-U grades optional. Enrollment limited to 200. Preference given to human ecology students.

M W F 9:05. J. Robinson.
The study of personal financial management at various income levels and during different stages of the family life cycle. Topics covered will include the use of budgets and record keeping in achieving family economic goals; the role of credit and the need for financial counseling; economic risks and available protection; and alternative forms of saving and investment.

332 Consumer Decision Making Fall. 3 credits. Prerequisite: Econ 101-102 or permission of instructor.

M W F 2:30. E. S. Maynes.
This course is designed to help students make more effective choices as consumers through an understanding of the economy and the use of relevant economic and statistical principles. The course is normative, stressing how consumers should act in order to achieve their goals.

[341 Fundamentals of Housing Economics Fall. 3 credits. S-U grades optional. Prerequisite: Econ 101-102 or equivalent. Offered 1979-80 and alternate years.

M W F 1:25. J. Gerner.
To give a basic understanding of the structure and operation of the housing market, the economic determinants of housing supply and demand are related to (1) levels of housing consumption and housing standards, (2) the composition of the housing inventory, and (3) levels of and fluctuations in housing production.]

349 Housing Policy and Housing Programs Spring. 3 credits. S-U grades optional. Prerequisites: Econ 101 or equivalent and CEH 147.

T Th 10:10-11:25. M. Lea.
Critical examination of the development and current state of federal and selected state housing policies and policy-related questions and problems. Assessment of the operation of housing programs and strategies devised to further their effective functioning. Considerable attention devoted to the structure and operations of both primary and secondary mortgage markets.

355 Wealth and Income Spring. 3 credits. S-U grades optional for nonmajors. Open to sophomores, juniors, and seniors. Graduate students may elect to audit and write a research paper for one to two credits under CEH 600. Prerequisite: Econ 101-102 or equivalent.

M W F 10:10. J. Gerner.
Examination of contemporary economic problems that affect the welfare of families in the United States. Examples are affluence and poverty; monetary and fiscal policies as these affect families; and efficacy of the delivery of public services in the areas of health, education, and subsidized housing. Where relevant, the historical origin of these problems will be studied.

400-401-402 Special Studies for Undergraduates Fall or spring. Credits to be arranged. S-U grades optional.

Hours to be arranged. Department faculty. For advanced, independent study by an individual student or for study on an experimental basis with a group of students in a field of CEH not otherwise provided through course work in the department or elsewhere at the University. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. This form must be signed by the instructor directing the study and the department chairman and filed at course registration or within the change-of-registration period after registration. In order to ensure review before the close of the course registration or change-of-registration period, early submission of the Special Studies Form to the department chairman is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study:

400 Directed Reading For study that predominantly involves library research and independent reading.

401 Empirical Research For study that predominantly involves data collection and analysis or laboratory or studio projects.

402 Supervised Fieldwork For study that predominantly involves participation in community or classroom settings.

411 Time: Its Meaning and Use in Families Fall. 3 credits. S-U grades optional. Prerequisites: one course in sociology; one course in microeconomics recommended. Enrollment limited to 20.

T Th 12:20-2:15. K. Walker.
Seminar based on historical and contemporary readings. Investigates changes in time use of family

members in relation to social change. Explores meanings of employment work, home work, and leisure in the context of family choices at different stages of the life cycle. Examines use of time as a measure of activities and nonmarket household production. Culminating experience is an individual project or paper relating course concepts to student's professional interests.

413 An Ecological Approach to the Resource Management of Families Spring. 2 credits. Field experience option, one additional credit hour. Consult instructor before registering. Enrollment limited to 20. Offered 1978-79 and alternate years.

M W 12:20-2:15. A. Davey.
Examination of managerial problems faced by families with imbalances in resources. Analysis of techniques of compensating for resource limitation of families in poverty, with health handicaps, with young mothers in labor force, one-parent families, student couples, and retired couples. Suggested for students preparing to work with families in health and rehabilitation programs, social work, geriatrics, secondary and adult education, and financial counseling.

[425 Economics of Recreation and Leisure Spring. 3 credits. S-U grades optional. Prerequisite: microeconomics, a course in sociology recommended. Offered 1979-80 and alternate years.

T Th 8-9:15. W. Gauger.
The course focuses on leisure time use and views recreational activities as consumer goods that are subject to economic decisions on the allocation of time and money. Empirical observations and data will be examined for theoretical insights.]

430 The Economics of Consumer Policy Spring. 3 credits. Prerequisites: Econ 101-102, or permission of instructor.

T Th 8-9:30. E. S. Maynes or K. Bryant (alternate years).
The course acquaints students with the basic approaches to consumer policy and performs economic analyses of specific consumer policy issues. Consumer sovereignty, the consumer interest, and consumer representation are all dealt with, along with economic analyses of current and enduring consumer policy proposals and programs.

441 Housing Finance Spring. 3 credits. S-U grades optional. Prerequisites: Econ 101-102, CEH 147.

T Th 8-9:55. C. Meeks.
Examines the residential financing process, alternative instruments, and sources of credit. Both primary and secondary mortgage markets are discussed as well as the impact of legislation on these markets. Also examined are the implications of the financing process for consumers.

443 The Social Effects of the Housing Environment Fall. 3 credits. S-U grades optional. Prerequisite: CEH 147 or CEH 148.

T Th 2:30-3:50. Staff.
A seminar dealing with the interplay of housing and human behavior. Physical and social deterministic viewpoints are considered. Discussion of substantive issues including the effect of housing on crime rates, health, racial attitudes, and satisfaction. Research skills are developed to analyze and evaluate critically the literature in the field.

465 Consumer and the Law Fall. 3 credits. S-U grades optional. Prerequisite: Econ 101-102 or equivalent.

T Th 2:30-3:45. M. Galenson.
The emphasis will be on the work of federal agencies and on court decisions as these affect consumers. Topics covered will include liability for injury from consumer products; laws covering safety of drugs, labeling, and advertising; and consumer problems arising from ignorance and poverty.

472 Community Decision Making Fall. 3 credits. S-U grades optional. Prerequisite: Govt 111 or equivalent.

T Th 8-9:55. A. Hahn.

Identification and discussion of factors that influence the outcomes of community issues. Topics include political participation, decision-making processes, the interests and resources of key decision makers, and community change. Concurrent participation in community activities is desirable but not required.

480 Welfare Economics Fall. 3 or 4 credits. S-U grades optional. Prerequisite: permission of instructor before preregistration.

M W F 9:05. S. Clemhout.

A study of the social desirability of alternative allocation of resources. Topics include Pareto Optimality, external effects on production and consumption with applications to problems of environmental quality, public expenditure decisions, measurement of welfare, and evaluation of relevant public policy issues.

[485 Public and Private Decision Making] Spring. 3 credits. Prerequisite: an intermediate microeconomic theory course or equivalent.

T Th 12:20-1:35. Staff.

Starting with the free-rider problem and the theory of public goods, the ideas of efficiency, equity, and consistency are applied to the collective choice problem. Constitutional choice is handled in general terms and in the context of the contract doctrine. Efficiency in legislative and bureaucratic institutions is studied and the economic implication of certain judicial principles is investigated. Cost-benefit studies of several institutions and programs are examined.]

600 Special Problems for Graduate Students Fall or spring. S-U grades optional.

Hours to be arranged. Department faculty.

Independent advanced work by graduate students recommended by their chairperson and approved by the head of the department and the instructor.

[601 Research Methods in the Social Sciences] Spring. 3 credits. Prerequisites: a statistics course and permission of instructor. Offered 1979-80 and alternate years.

T 1:30-4:30. E. S. Maynes.

Preparation of first- and second-year graduate students as consumers and producers of research. In the first part of the course, students receive a critical review of a selection of research methods and studies from the relevant social sciences. In the second part, students prepare their own research proposals, often with an eye to later M.S. or Ph.D. thesis development.]

[619 Seminar in Family Decision Making] Fall. 3 credits. S-U grades optional. Prerequisite: graduate standing. Consult instructor before registering. Offered 1979-80 and alternate years.

T Th 10:10-12:05. A. Davey.

Decision-making processes are studied in relation to family goals and goal implementation. Situational factors that place constraints on decision making and resource allocation are investigated. Emphasis is on studying the totality of the decision event.]

[621 Explorations in Consumer Economics] Spring. 3 credits. S-U grades optional. Prerequisite: permission of instructor. Not offered 1978-79.

Hours to be arranged.

With the guidance of the instructor, students will select and investigate independently a substantive current consumer issue. Topic selected must be one that can be studied within both an economic and an institutional framework. Students will present status reports of their investigation to the group regularly for criticism and feedback. A term paper is required.]

626 Economics of Household Behavior I Fall. 3 credits. S-U grades optional. Prerequisite: Econ 311 or concurrent enrollment in Econ 311.

M W F 10:10. K. Bryant and J. Gerner.

Introduction at graduate level to theory and empirical research on household demand, consumption, saving, and market work, with implications for current policy issues. Provides introduction to more advanced treatment of market work, household production, and economics of the family presented in CEH 627.

627 Economics of Household Behavior II

Spring. 3 credits. S-U grades optional. Prerequisites: Econ 311 and CEH 626.

T Th 10:10-11:15. K. Bryant and J. Gerner.

Further examination of theoretical and empirical literature concerning market work, household production, and family formation, as well as policies in these areas. Based on introduction provided in CEH 626:

[630 Family Financial Management] Spring. 3 credits. S-U grades optional. Prerequisite: CEH 330 or equivalent.

Th 12:20-2:15. E. Wiegand.

Family financial management is studied with emphasis on role of financial consultant. Each student works with one or more families. Course is designed to increase awareness and knowledge of characteristics of persons in serious financial difficulties, complexity of factors affecting such situations, desirable relationships between helper and helped, and community agencies and organizations with appropriate resources.]

640 Fundamentals of Housing. Fall. 3 credits.

S-U grades optional. Prerequisite: graduate standing or consent of instructor.

W 3:35-5:15. P. Chi.

An introductory survey of housing as a field of graduate study. Consideration of the spatial context and institutional setting of housing; the structure and performance of the housing market; housing finance; the housing-building industry; the nature and impact of government housing programs; the social and economic effects of housing regulations.

642 Advanced Housing Market Analysis. Fall. 3 credits. S-U grades optional. Prerequisite: Econ 311 or equivalent. Offered 1978-79 and alternate years.

Th 2-5. M. Lea.

The interaction of supply and demand in the housing market studied from a spatial perspective through location theory and the development of metropolitan areas, and from a time perspective involving new construction and residential filtering. Topics to be studied include both theoretical and empirical location models, empirical housing demand and supply studies, optimum city size, property value and rent determination models and housing discrimination studies.

648 Social Demography of Housing Spring. 3 credits. S-U grades optional. Prerequisite: graduate standing or consent of instructor.

Th 2:30-4:25. P. Chi.

This course is concerned with the dynamic relationship between population and the housing market. The size and composition of the population, components of population growth, migration and mobility, and population projections will be analyzed in light of the amount and quality of the housing stock. Students will become familiar with the data available in the U.S. Census of Population and Housing.

[649 Advanced Housing Policy Analysis] Fall. 3 credits. S-U grades optional. Prerequisite: Econ 311 or equivalent. Offered 1979-80 and alternate years.

Th 2-5. M. Lea.

Study of state, local and federal policies affecting housing markets, from theoretical and quantitative

standpoints. Examination of the purpose and impact of various policies including zoning, property taxation, housing finance and rent subsidies, public housing, urban renewal.]

665 Seminar on Consumer Law Problems

Spring. 3 credits. S-U grades optional. Open to CEH graduate students and to others with permission of instructor. Enrollment limited to 20.

T 10:10-12:05. M. Galenson.

A study of areas of current interest to consumers involving the law as developed by regulatory commissions and the courts, with emphasis on the institutional and economic background. The aim is to encourage critical examination of policy issues and their social and economic effects on families.

671 Intergovernmental Relations and Local Community Change Spring. 3 credits. S-U grades optional. Prerequisite: CEH 472, equivalent course in local government and politics, or permission of instructor.

T Th 8-9:55. A. Hahn.

Description and analysis of the intergovernmental system with special attention to the relationships between local communities and state and federal governments.

680 Applied Welfare Economics-Policy Issues

Spring. 3 credits. S-U grades optional. Permission of instructor required.

M W F 9:05. S. Clemhout.

Topics vary from year to year. The objective of the course is to evaluate the economic impact of various policies in conjunction with the efficiency of existing institutions. Policy issues covered include education (effects of automation and so forth), health, and environmental problems (urban development or transportation, for example). Attention is given to the interrelationship of policy and planning within the larger economic and sociopolitical framework.

697 Seminar Fall or spring. Noncredit course.

M 4-5. Department faculty.

Planned to orient students to graduate work in the field, to keep students and faculty abreast of new developments and research findings, to acquaint them with topics in related areas, and to examine and discuss problems of the field.

[726 Consumption Theory] Spring. 3 credits. S-U grades optional. Prerequisite: intermediate economics theory or permission of instructor. Offered 1979-80 and alternate years.

M W 2-3:30. K. Bryant.

Major developments in the theory of household behavior with applications to consumption, saving, physical asset, debt, and liquid asset positions of households; demand and expenditure analyses; economics of consumer information; market work and housework activities of households; economics of household size and form.]

727 Human Capital Fall. 3 credits. S-U grades optional. Prerequisite: intermediate economic theory or permission of instructor; CEH 411 recommended but not required. Offered 1978-79 and alternate years.

M 2:30-4:25. J. Gerner.

This course examines the public sector policies that influence family time allocation decisions. Particular attention will be given to the time allocated by female family members to nonhousehold activities and how these activities are influenced by outside economic forces and by internal family characteristics.

[740 Seminar in Current Housing Issues]

Spring. 3 credits. S-U grades optional. Permission required.

F 9:05-11. Department housing faculty.

Focuses on a selected group of national issues related to housing. The issues evaluated vary from year to year, based on current importance and

student interest. When possible, this course presents present or recent research, with emphases on both content and methodology.]

743 Readings in Housing Spring, 2 credits. S-U grades optional. Registration with permission of instructor.

Hours for discussion of readings to be arranged. Department housing faculty.

758 Seminar for Doctoral Candidates Fall, 2 credits. S-U grades optional.

Department staff. Review of critical issues and thought in consumer economics and public policy questions.

899 Master's Thesis and Research Fall or spring. S-U grades optional. Registration with permission of the chairperson of graduate committee and the instructor.

Department graduate faculty.

999 Doctoral Thesis and Research Fall or spring. S-U grades optional. Registration with permission of the chairperson of graduate committee and the instructor.

Department graduate staff.

Design and Environmental Analysis

R. Steidl, chairman; N. C. Saltford, graduate faculty representative; C. Adams, G. Atkin, F. D. Becker, M. Boyd, D. Buchanan, A. Bushnell, J. Carreiro, L. Gallup, C. E. Garner, J. H. Hanna, B. A. Lewis, W. J. McLean, S. H. Mensch, G. C. Millican, E. R. Ostrander, M. Purchase, A. Rachun, A. Racine, R. Rector, G. Sloan, C. Straight, S. S. Watkins, M. V. White, C. Yackel

The focus of the department is on creating, selecting, and improving the products, materials, and spaces used in work and leisure activities. The diverse faculty backgrounds and teaching approaches lead to multidisciplinary problem solving and development of creative abilities, aesthetic judgment, and analytical thinking.

The department offers an undergraduate major in design and environmental analysis with four specializations: interior and product design, apparel design, textiles, and human and social factors. Contact the department or the Admissions Office of the College of Human Ecology for further information about these areas of specialization and career opportunities.

The department also offers graduate study leading to a master's degree. For information contact the Graduate Faculty Representative, Department of Design and Environmental Analysis, New York State College of Human Ecology, Cornell University, Martha Van Rensselaer Hall, Ithaca, New York 14853.

101 Design I: Fundamentals A Fall or spring, 3 credits. Each section limited to 23.

M W 1:25-4:25; or T Th 10:10-1:10 or 1:25-4:25. M. Boyd, C. Straight.

A studio course introducing the fundamental vocabulary and principles of design and involving experimentation with the development of form through problem-solving approaches. Approximate cost of materials, \$50.

102 Design I: Fundamentals B Spring, 3 credits. Each section limited to 23. Prerequisite: DEA 101.

M W 1:25-4:25 or 7:30-10:30 p.m. M. Boyd, A. Bushnell, J. Carreiro, C. Straight.

A study of visual organization including problems of color and visual perception. Emphasis on the development of visual sensitivity, imagination, and

problem structuring, utilizing simple materials to produce abstract solutions. Approximate cost of materials, \$35.

111 Theory of Design Spring, 3 credits. Enrollment limited to 120; DEA majors given priority. M W F 10:10. J. Carreiro.

Introduction to the field of design for the student in any academic area. The course reviews the spectrum of design activities, examining various movements in the visual arts and differences among designers in philosophical premises, social and functional roles, and cultural positions. Also examined are requirements in the man-made environment as affected by the interaction of people, design, and materials. Lectures and visual material are presented by DEA faculty and visiting design professionals.

115 Drawing Fall or spring, 3 credits. Each section limited to 25.

M W 1:25-4:25, or 7:30-10:30 p.m.; or T Th 1:25-4:25. J. Hanna, S. Mensch.

A studio drawing course. Short demonstrations or lectures on the ideas and techniques of drawing are presented every week. The student is introduced to the functions of line, shape, and value as they apply to design. Drawing from the figure and from inanimate objects, perspective, and conceptual drawing are emphasized. Minimum cost of materials, \$15.

117 Drawing the Clothed Figure Spring, 3 credits. S-U grades optional. Enrollment limited to 25. Prerequisites: DEA 115 or equivalent. Priority given to DEA Option IB and II majors.

M W 10:10-1:10.

Intended to improve students' ability to illustrate two-dimensionally the interaction of draped fabric and the human form and to develop awareness of clothing as a design medium. Emphasis is on development of techniques and skills in selected media necessary for professional communication of design ideas.

135 Textiles I Fall or spring, 3 credits.

Prerequisite or corequisite: Chem 103 or 207.

Fall: lec, M W 10:10; lab, T or W 2:30-4:25 or Th 8-9:55. Spring: lec, M W 9:05; lab, T 8-9:55, or W 2:30-4:25, or Th 8-9:55 or 2:30-4:25. D. Buchanan.

An introduction to the basic properties of textile materials, with consideration of their technology, consumer uses, and economic importance. Behavior of textile materials is observed in a variety of environmental conditions that influence aesthetics, comfort, and performance. This course is designed to provide a basis for further study in textiles, but it also contains sufficiently broad coverage of the subject to be used as an elective course.

145 Apparel Design I Fall or spring, 4 credits.

Each laboratory section limited to 25. Prerequisite: basic sewing skills. Those with formal course work in pattern design may take an exemption exam by contacting instructor the first day of registration.

Fall: lec, T Th 10:10; lab, T Th 11:15-1:10 or 2:30-4:25. Spring: lec and lab, M W 7:30-10:30 p.m. A. Racine.

Intensive study of principles and processes of flat pattern design and fitting techniques with emphasis on development of creative expression. Approximate cost of supplies, \$30 plus fabric for final project. Sewing skills are not taught. For those with limited skills, an autotutorial laboratory must be scheduled concurrently or prior to enrollment. Contact the instructor. Materials for autotutorial laboratories, \$10.

150 Environmental Analysis: Human and Social Factors Fall, 3 credits. Required for DEA majors,

who must complete the course in the freshman or sophomore year. Not open to juniors (except transfers), seniors, or graduate students.

M W F 9:05. F. Becker, G. Sloan.

Introduction to study of relations between physical

environment and behavior of individuals and groups. Perception of space and effects of spatial arrangements on interactions between persons. Significance of human capabilities and limitations as factors in designing person-environment systems. Guidelines for analyzing environmental conditions.

201-202 Design II 201, fall; 202, spring, 6 credits per term. Prerequisites: DEA 101; DEA 115 prerequisite or corequisite with 201; DEA 102 prerequisite or corequisite with 202; or permission of instructor; recommended: DEA 111, 150.

M W 8-11 and T Th 1:25-4:25; or M W 1:25-4:25 and T Th 8-11. A. Bushnell, J. Hanna, or S. Mensch.

A studio course emphasizing the conceptualization of form as a function of the theory and handling of materials. Included are basic drafting, model building, and presentation drawing. The course is structured around a series of design problems, three to five weeks in length, using wood, plastic, metal, glass, ceramics, concrete, and textiles. Where possible, problems include the handling of the actual materials. Minimum cost of materials, \$60 per semester.

230 Science for Consumers Fall, 3 credits. S-U grades optional. Limited to 20 students per lab. Prerequisite: high school or college chemistry or physics. Not open to students who have taken DEA 434.

Lec., T Th 9:05; lab, W 12:20-2:15 or W 2:30-4:25. M. Purchase.

Principles of science related to consumer problems, such as energy conservation in the home, electricity in dwellings, heat transfer, control of temperature, humidity, sound and odors in dwellings, mechanics of equipment, chemistry of cleaning agents, and chemical characteristics of surfaces to be cleaned. Particularly valuable for environmental designers and analysts and students planning to work with consumers as teachers, extension workers, home service personnel, or consultants.

235 Textiles II Fall, 3 credits. Limited to 12 students per lab. Prerequisites: DEA 135 and 2 semesters of chemistry.

Lec. M W 9:05; lab, Th or F 8-9:55.

A study of critical performance characteristics of textiles, and the relation of these characteristics to use of textile articles. Emphasis in both lecture and laboratory is on comfort, durability, and special performance characteristics. Also included is study of the purposes, scope, and limitations of laboratory textile testing, and the relations between laboratory testing and end-use performance.

[240 Clothing Through the Life Cycle Spring, 3 credits. Not open to students who have taken DEA 445. Next offered 1979-80.

S. Watkins.

An introduction to clothing as it affects the physical and psychological well-being of the individual. Emphasis will be placed on the functional aspects of clothing for individuals from infancy through old age and for groups such as the handicapped or those in special occupations. Students will explore the resources available to the designer for solving clothing problems.]

245 Dress: A Reflection of American Women's Roles Fall, 3 credits. Enrollment limited to 40.

W 7:30-10:30 p.m. A. Racine.

An historical survey of changing patterns of American women's dress from the colonial period to present day, as well as the sociocultural forces that affected women's development within the social class structure. The Cornell Costume Collection and illustrated lectures are used to develop an awareness of historic costume, while assigned readings will focus on expected roles. Students will investigate topics dealing with the impact of dress on cultural assimilation of minority women in America.

250 Environmental Psychology: Perspectives and Methods Fall. 3 credits. Prerequisite: DEA 150 or permission of instructor.

T Th 10:10–11:30. F. Becker.

Course focuses on issues central to study of person-environment relationships and the uses of evaluation research in the design process. Graduate students should enroll in DEA 660 concurrently with 250.

251 Historic Design I: Furniture and Interior Design Fall. 3 credits. Prerequisites: DEA 101 and 111. Recommended sequence: DEA 251, 252, and 353.

M W F 11:15. G. C. Millican.

A study of the patterns of historical development and change in furniture and interiors from man's earliest expressions through the eighteenth century as they reflect the changing cultural framework of Western civilization, excluding America.

252 Historic Design II: Furniture and Interior Design Spring. 3 credits. Prerequisites: DEA 101 and 111. Recommended sequence: DEA 251, 252, and 353.

M W F 8. G. C. Millican.

A study of the patterns of historical development and change as revealed through American furniture and interiors, 1650–1885. Design forms are considered individually, collectively, and in their historical context as they express the efforts, values, and ideals of American civilization.

261 Fundamentals of Interior Design Fall. 3 credits. Enrollment limited to 20. Prerequisite: DEA 101.

T Th 1:25–4:25. G. C. Millican.

A studio course that emphasizes the fundamental principles of design applied to the planning of residential interiors and coordinated with family and individual needs. Studio problems explore choices of materials, space planning, selection and arrangement of furniture, lighting, and color. Illustrated lectures, readings, and introductory drafting and rendering techniques are presented. Minimum cost of materials, \$30.

264 Apparel Design II Fall. 3 credits. Prerequisites: DEA 145 and completion of or concurrent registration in DEA 101 and 135; recommended: DEA 115 and 240.

T Th 1:25–4:25. C. Yackel.

A studio course interrelating two techniques for designing apparel: draping and advanced flat pattern. Problems require the student to make judgments regarding the design process, nature of the materials, body structure, and function. Minimum cost of materials: \$40.

300 Special Studies for Undergraduates Fall or spring. Credit to be arranged.

Hours to be arranged. Department faculty.

For special arrangement of course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. The form, signed by both the instructor directing the study and the head of the department, is filed at course registration or during the change-of-registration period.

301–302 Design III 301, fall; 302, spring. 6 credits per term. Prerequisite: DEA 201–202.

M T W Th 1:25–4:25. S. Mensch or J. Hanna.

A studio course emphasizing the conceptualization of form as a function of human and social factors. Environmental analysis concepts and techniques are studied to provide design students with enough understanding to begin a behaviorally based design project. Several short-term problems are explored in the fall semester. More complex problems are undertaken in the spring semester. Minimum cost of materials, \$60 per semester.

[317 Issues in Design Methods and Planning Strategies Spring. 3 credits. Limited to 20. Prerequisites: DEA 111, 150, and 250, or permission of instructor. Next offered 1979–80.

A critical and historical evaluation of the methods, tools, and techniques of the design process. Issues to be covered include the role of the designer in a technological society; psychology of consciousness and the design process; and effects of sociocultural, economic, political, and technological factors on the design activity. Particular emphasis placed on examination and development of alternatives.]

330 Household Equipment Principles Spring. 3 credits. S-U grades optional. Prerequisite: DNS 146 or DEA 135 or DEA 230.

M W 2:30–4:25. M. Purchase.

Principles of operation of appliances for food preparation and preservation, cleaning, laundering, temperature and humidity control, and lighting. Evaluation of features in relation to their functions and cost. Selection, use, and care of household equipment. Individual study related to the student's background and interests.

335 Textiles III: Structure and Properties

Spring. 4 credits. Prerequisites: DEA 235; Phys 101, 112, or 207; and Chem 253 and 251, or 357–358 and 251.

Lec. M W 12:20; lab, T 1:25–4:25. D. Buchanan.

An in-depth study of the structures of textile materials and their component parts, from polymer molecules through fibers and yarns to fabrics, and the techniques of controlling structure to achieve desirable end-use properties. Particular emphasis is placed on properties important to the consumer, including easy care, elasticity, durability, comfort, and aesthetics. Laboratory experimentation illustrates the important interrelationships among structures and properties of polymers, fibers, yarns, and fabrics.

338 Textiles for Interiors and Exteriors Fall. 3 credits. S-U grades optional. Prerequisites: DEA 235 or permission of instructor.

M W 2:30–4:25. V. White.

Through lectures, seminars, and laboratory experiences, students examine interior and exterior environments and their interaction with textiles. Physical and chemical properties of fiber, yarn, and fabric are studied relative to product requirements, for example, product reliability, safety, performance, and aesthetics. Communication at consumer, government, industry interfaces is considered.

[342 Design: Weaving Fall or spring. 3 credits. Limited to 12. Prerequisite: DEA 101; recommended: DEA 102, 115, 135. Next offered 1979–80.

A studio course encompassing the basics of weaving and the functioning of a loom. Using a variety of fibers, yarns, and other materials, students are introduced to design possibilities on the loom. The relationship among color, design technique, and function is considered in weaving a number of experimental samples, as well as several more complicated woven projects. Minimum cost of materials, \$45.]

343 Design: Introductory Textile Printing Fall. 3 credits. Each section limited to 15. Prerequisites: DEA 101 and at least one other studio design course.

M W 1:25–4:25 or T Th 10:10–1:10. C. Straight.

A studio course exploring the print as a design form. Silk-screen printing is the basic process used, but opportunities are provided for designing with other processes. Minimum cost of materials, \$50.

349 Graphic Design Fall or spring. 3 credits. Enrollment limited to 18. Prerequisite: DEA 201 or permission of instructor. Priority given to DEA majors.

Fall: M W 7:30–10:30 p.m.; spring: M W 10:10–1:10. M. Boyd.

The fundamentals of lettering, typography, layout, and presentation techniques. Printing processes and the use of photography and illustration also are covered. Consideration is given to graphics in product and interior design, packaging, exhibit design, and informational systems. Approximate cost of materials, \$25.

350 Environmental Analysis: Person, Activity, Space Fall. 3 credits. Prerequisite: introductory psychology; recommended: DEA 150 and a course in human physiology.

M W F 12:20. G. Sloan.

Implications of human characteristics and limitations on the design and modification of the built environment. Human costs (physical and mental—effort, fatigue, stress) provide guides for reducing the amount of adaptation to man-shaped objects, spaces, and activities. Application of human factor constructs, data, and problem-solving strategies to near environment problems.

351 Selected Topics in History of Costume Fall. 3 credits. S-U grades optional. Recommended: courses in history of art or cultural history.

M W 10:10–12:05. C. Yackel.

A study of the relationship between costume and culture in selected periods of history from ancient times to the present. History is used as a resource for solving contemporary apparel needs. Lectures and class discussion are illustrated with items from the Cornell Costume Collection.

353 Historic Design III: Contemporary Design Spring. 3 credits. Prerequisites: DEA 101 and 111. Recommended sequence: DEA 251, 252, and 353.

M W F 11:15. G. C. Millican.

An historical study of the emergence and development of contemporary design, 1885 to present. An examination of the social, economic, technical, and stylistic forces that shape the design forms of the present. Also a critical analysis of selected works of furniture, fabrics, and interiors.

361 Residential Design Spring. 3 credits. Prerequisite: DEA 201 or 261, or permission of instructor; recommended: DEA 135 and 350.

T Th 8–11. G. C. Millican.

An introduction to residential architectural design. Through the design solution for specific occupant needs, the student is involved with site, orientation, climate, and materials. Drafting room work consists of plans, elevations, perspectives, and presentation of solutions. Lectures, discussions, and required readings. Approximate cost of materials, \$30.

367 Apparel Design III Spring. 4 credits. Prerequisites: DEA 111, 115, 150, 240, and 264; corequisites: DEA 235 and 117.

T Th 10:10–1:10. C. Yackel.

A studio course covering color theory, form study, accessory work, and the use of nontraditional materials for body coverings. Development of the design process as it relates to problem solving will be stressed. Problems focus on the aesthetic and functional nature of dress. The Cornell Costume Collection is used for illustration and inspiration. Minimum cost of materials: \$50.

400–401–402 Special Studies for Undergraduates Fall or spring. Credit to be arranged. S-U grades optional.

Hours to be arranged. Department faculty.

For advanced, independent study by an individual student or for study on an experimental basis with a group of students in a field of DEA not otherwise provided through course work in the department or elsewhere at the University. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. This form must be signed by the instructor directing the study and the department chairman and filed at course registration or within the change-of-registration period after registration. In order to ensure review before the close of the course

registration or change-of-registration period, early submission of the Special Studies Form to the department chairman is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study:

400 Directed Readings For study that predominantly involves library research and independent reading.

401 Empirical Research For study that predominantly involves data collection and analysis or laboratory or studio projects.

402 Supervised Fieldwork For study that predominantly involves participation in community or classroom settings.

430 The Textile and Apparel Industries Fall. 3 credits. Prerequisites: CEH 233, DEA 235, or permission of instructor.

M W F 12:20. N. Saltford.
A critical review of the textile and apparel industries including structure and marketing practices, and government policies that affect industry decisions and operations in such areas as energy, the environment, safety, international trade, and employee benefits and opportunities. The role of trade unions also is explored. A one-day field trip is arranged when feasible.

431 The Textile and Apparel Industries—Field Experience Second week of January intersession, 1 credit. Prerequisite: DEA 430. Offered 1978–79 and alternate years.

N. Saltford.
A one-week field experience in the textile regions of the South. Students have the opportunity to see various textile processes including fiber production, knitting, weaving, dyeing and finishing, and designing. In addition, seminars with executives of each participating firm relate theory to current practice. Students are responsible for trip expenses.

434 Care of Textiles Fall. 2 credits. Prerequisite: DEA 235. Not open to students who have taken DEA 230. Offered alternate years.

Lec, W 10:10; lab, M 10:10–12:05. M. Purchase.
The course will center on the interaction of textiles with soils and stains, cleaning agents, and laundry equipment. Topics will include characteristics of soils, mechanisms for bonding soils to substrates, textile properties and changes related to care processes, functional finishes, wet- and dry-cleaning processes, the supplies and techniques used in cleaning, and instructions for care.

436 Textiles IV: Textile Chemistry Fall. 4 credits. Prerequisites: DEA 235; Chem 253 and 251 or Chem 357–358 and 251.

Lec, T Th 10:10; lab, T Th 11:15–1:10. B. A. Lewis.
An introduction to the chemistry of the major classes of natural and man-made fibers, including their structure, properties, and reactions. Laboratory work will include the qualitative identification of textile fibers, and a consideration of chemical damage to fabrics, finishes, and dyes.

438 Apparel Textiles Spring. 3 credits. S-U grades optional. Prerequisites: DEA 235, 263, or permission of instructor.

M W F 9:05, plus one hour to be arranged.
V. White.
A study of the interrelationships of aesthetics, fashion and function, and other trade-offs of concern to the consumer. Consideration of the use of standards, specifications, and other means of communication at consumer, government, industry interfaces. Individual or team projects. Seminars and lectures with required readings. Lab experiences will include evaluation of articles bearing attached care labels.

445 Apparel Design IV: Theory of Functional Clothing Spring. 3 credits. Prerequisites: DEA 367, 366 (DEA 235 and 445 may be taken concurrently).

T Th 10:10–12:05. S. Watkins.
Application of physical science theory to problems in clothing design. Approach to problems studied requires the student to relate three aspects of apparel design: needs and functions of the human body, structural properties of materials, and apparel forms. Information gained from study and testing of textiles and garment forms is applied to the problems of movement, warmth, impact protection in active sports equipment, and other topics related to comfort and function of clothing.

455 Psychology of the Near Environment Spring. 3 credits. Prerequisites: DEA 150, Psych 101, and either Psych 128, HDFS 115, or an equivalent second course; recommended: a statistics course.

M W F 11:15. E. Ostrander.
An exploration of the interaction of human beings and the immediate nonsocial environment. Interaction is considered in terms of basic psychological processes, including perception, learning, and motivation. Applications of psychological principles are made to consumer products such as clothing and appliances and the settings in which we live, work, and play.

463 Product Design Fall. 3 credits. Prerequisite: DEA 301–302. Next offered 1979–80.

The development and analysis of products for use in either homes or institutional settings. The emphasis of the course is on design related to materials and production methods.]

465 Apparel Design V: Product Development and Presentation Spring. 3 credits. Prerequisites: DEA 117 and 367 or permission of instructor; recommended: DEA 102, 430, 445, Econ 102, CEH 233.

M W 1:25–4:25. A. Racine.
Through studio problems students examine the influence of manufacturing technology and cost on the designer. Projects are developed to various stages, from sketch to finished prototype.

466 Interior Space Planning I Fall. 3 credits.

Prerequisite: DEA 301–302 or permission of instructor. Next offered 1979–80.
Designing of interior environments with an emphasis on programming, spatial organization, materials, furnishings, and lighting. Student projects emphasize professional-level presentations of materials, drawings, and models.]

467 Interior Space Planning II Spring.

3 credits. Prerequisite: DEA 466 or permission of instructor. Next offered 1980–81.
Advanced exploration of a specific complex interior environment project.]

499 Design IV Fall or spring. 1–8 credits. (A 4-credit senior project is required for the DEA Option la major. Credits may be taken in 1 or 2 semesters. Students may elect additional credits in DEA 499, up to a total of 8 credits.) Prerequisite: DEA 301–302.

T Th 8–11. J. Carreiro and department faculty.
A senior thesis, essentially a problem-solving experience with the problem area to be selected by the student and approved by the department faculty. Most projects will be within product design or interior design. However, other interests may be pursued if the department approves the proposal and if the student can find a DEA instructor who will be responsible for the program.

600 Special Problems for Graduate Students Fall or spring. Credit to be arranged. S-U grades optional.

Hours to be arranged. Department faculty.
Independent, advanced work by graduate students recommended by their chairmen and approved by the head of the department and instructor.

[620 Instrumental Analysis Fall. 2 credits. Prerequisite: organic chemistry. Not offered 1978–79.

Th 1:25–4:25 or by arrangement. B. A. Lewis.
An introduction to the theoretical and practical aspects of instrumentation, including spectroscopy, chromatography, electrophoresis, and other selected techniques.]

630 Physical Science in the Home Fall. 2 or 3 credits. S-U grades optional. Prerequisite: college chemistry. 3 credits require laboratory attendance. Consult instructor before registering.

Lec, T Th 9:05; lab, W 2:30–4:25. M. Purchase.
Applied physical science for professionals working with consumers and home appliances. Topics include energy conservation, selected principles from physics applied to household equipment, and the chemistry of cleaning supplies and cleaning processes.

635 Special Topics in Textiles Spring. 3 credits. Prerequisite: DEA 235 or permission of instructor.

Lec, M W 10:10; lab, F 10:10–12:05.
An in-depth study of one or more selected topics such as comfort, formed fabrics, flammability. Relationships of fabric properties and end-use performance as well as test method development will be studied in the laboratory.

636 Advanced Textile Chemistry Spring. 4 credits. Prerequisite: DEA 436. Offered in alternate years.

Lec, T Th 9:05; lab, T Th 10:10–12:05. B. A. Lewis.
The chemistry and physicochemical properties of natural and synthetic rubbers, polyurethanes and other elastomeric materials, high-temperature polymers, and inorganic materials used as textile fibers; and the relationship between their chemistry and functional properties as textile materials. Other topics will include polymerization processes, textile finishing processes, dyes and dyeing, and degradation of textile materials under environmental conditions.

637 Textile Seminar Fall or spring. 1 credit. S-U grades only. Expected every semester of all graduate students in textiles.

T 4:30–5:45. V. White.
Discussion of research in progress and other textile topics of interest by faculty, students, and invited guest speakers.

650 Person-Activity-Environment Relationships

Spring. 3 credits. Prerequisite: DEA 350 or permission of instructor. Recommended: DEA 455. Consult instructor before registering.

T Th 9:05. G. Sloan.
Application of human factor constructs, data, and problem-solving strategies to near environment problems. Human requirements, capabilities, and limitations are studied with reference to design and organization of consumer products, interior spaces, and work. Literature concerns ergonomic or human-factors data and the description and measurement of work and other activities.

[653 Nonverbal Communication: The Role of Objects and Space in Everyday Life Spring. 3 credits. Limited to 20. Prerequisite: introductory psychology or sociology. Instructor's permission required for undergraduates. Next offered 1979–80.

T Th 10:10–11:30. F. Becker.
The course is based on the premise that the psychologist's first task is to discover the problems hidden in the familiar. The course will focus on people's relations to and use of objects and space as symbols affecting group and interpersonal processes in their everyday lives.]

655 Social Psychology of the Near Environment Fall. 3 credits. Prerequisites: elementary psychology and DEA 250 or 350 or 455; or permission of instructor.

M W F 11:15. E. Ostrander.

The impact of the near environment on our behavior as social beings. Ways our environment facilitates or hinders effective functioning, individually or in groups, considered in terms of sociopsychological theory. Frameworks developed for analyzing our social behavior in varied settings. Methodological problems considered.

659 Topics in Human Environments Fall or spring, 1 credit. S-U grades only. Expected every semester of graduate students majoring and minoring in Environmental Analysis—Human-Environment Relations.

M 4:30–5:30. DEA faculty. Seminar on current issues and content in the field of person-environment relations. Discussion by faculty, students, and invited guests.

660 Environmental Psychology: Perspectives and Methods Fall, 1 credit. Permission of instructor required.

Hours to be arranged. F. Becker. Course focuses on person-environment relationships and the uses of evaluation research in the design process. Graduate students should register for DEA 250 concurrently with 660.

[740 Design: Research and Planning Procedures Spring, 3 to 5 credits. S-U grades optional. Enrollment limited to 12. Next offered 1979–80.

Lecture-discussion W 10:10–11:10; additional time to be arranged. J. Carreiro.

An examination of specific methods and procedures in development, writing, and presentation of theses in design and environmental analysis. Included are techniques in problem isolation and development; organizing, writing, and presenting design and research proposals. Of primary concern is development of a common language combining verbal and visual methods of planning our near environment.]

899 Master's Thesis and Research Fall or spring. Credit to be arranged. S-U grades optional. Registration with permission of the chairman of the graduate committee and the instructor.

Hours to be arranged. Department graduate faculty.

Human Development and Family Studies

P. Schoggen, chairman; J. Condry, Jr., graduate faculty representative; H. T. M. Bayer, W. L. Brittain, U. Bronfenbrenner, M. Cochran, J. Doris, H. Feldman, S. Hamilton, J. Harding, B. Koslowski, L. C. Lee, B. Lust, G. McCord, M. Potts, H. N. Ricciuti, B. L. Richardson, R. Savin-Williams, M. Segal, R. Silverstein, G. Suci, J. R. Weisz, M. Whitham

The Department of Human Development and Family Studies is a center for education, training, and research in this field. The size and combination of its programs of instruction, public service, and research provide diverse opportunities for students to prepare for careers requiring bachelor's degrees or to acquire the bases for additional study at the graduate level. Those whose career interests are in the areas of university teaching and research, social work, medicine, law, and clinical psychology need to pursue graduate education. Others who seek positions as research technicians, mental health assistants, and youth counselors may be able to meet their career objectives with the bachelor's degree. The department does not offer teacher certification for elementary or nursery through kindergarten teaching.

During their first semesters, students who major in HDFS are expected to obtain a broad base in the liberal arts on which to build their majors. This foundation is acquired through courses in natural and social sciences and the humanities, often in departments and academic units other than HDFS. Courses within the department vary widely in type and substance. In addition to lectures and discussions, students have the opportunity for research and independent study. All students also are required to observe and to participate in a laboratory or a field setting.

Courses are grouped into three areas: cognitive development, personality-social development, and family and society. A student majoring in the department takes at least one basic course in each area. These courses deal with language and learning; individual, social, personality, and cognitive development; the family in its traditional and contemporary forms; and the consideration of various settings for human development outside the home, particularly day care and nursery school environments. Study deals with people at all levels and stages of life, with special emphasis on the years from infancy through adolescence.

Graduate Study. The Department of Human Development and Family Studies offers graduate programs leading to both master's and doctoral degrees. There are two majors: developmental psychology and human development and family studies. The principal areas of specialization within the department are atypical development, cognitive development, family studies, social and personality development, infancy, early and middle childhood, and adolescence. Students seeking additional detailed information about the graduate programs in this department should write the Graduate Faculty Representative, Department of Human Development and Family Studies, New York State College of Human Ecology, Cornell University, Martha Van Rensselaer Hall, Ithaca, New York 14853.

111 Observation Fall or spring, 3 credits. Limited to 100.

M W F 12:20. Staff. Provides opportunities to observe people and settings in which they behave in order to (a) develop observational skills, (b) increase understanding of behavior and its development, and (c) acquaint students with basic methodological concepts underlying the scientific study of behavioral development. Following an orientation period, students observe in field settings. Discussion groups accompany the observation experience.

115 Human Development: Infancy and Childhood Fall, 3 credits.

M W F 11:15. H. Ricciuti, J. Weisz. Provides a systematic analysis of the forces affecting human development from infancy through childhood. Attention is focused on the interplay of biological factors, interpersonal relationships, social structure, and cultural values in changing behavior and shaping the individual. Special emphasis is given to the social implications of existing knowledge.

116 Human Development: Adolescence and Youth Spring, 3 credits. Limited to freshmen and sophomores except by permission of instructor.

M W 11:15, plus section F 11:15. Staff. Provides a systematic analysis of the forces affecting human development from early adolescence to early adulthood (youth). Attention is focused on the interplay of biological factors, interpersonal relationships, social structure, and cultural values in changing behavior and shaping the individual. Familial, peer group, education, and work contexts for development are discussed. Special emphasis is given to the social implications of existing knowledge.

141 Introduction to Expressive Materials Spring, 3 credits. Limited to 18 freshmen and sophomore students.

T Th 2:30–4:25. W. L. Brittain. Designed to explore the means and materials suitable for creative expression for children of different ages, as well as for adults. Students are expected to acquire competence in evaluating and utilizing various media and in understanding the creative process. Experimentation in paint, clay, chalk, crayon, paper, wire, plaster, wood, and other materials.

150 The Family in Modern Society Fall, 3 credits. Limited to freshmen and sophomores except by permission of instructor.

M W F 1:25. B. Richardson. Contemporary family roles and functions are considered as they appear in United States history, as they change over the life cycle, and as they are influenced by the locales in which families live and the social forces that impinge on them.

216 Contexts for Adolescent Development Spring, 4 credits. Prerequisites: HDFS 111 and 116. Lec T 12:20–2:15; sec Th 12:20–1:10.

R. Savin-Williams. Explores the contexts in which adolescents live—family, peer group, school, and work—with emphasis on their characteristics and the impact that these contexts have upon the development of adolescents. Lectures and readings will be complemented by field study, which may involve observation, interviewing, or participation.

242 Participation with Groups of Children in the Early Years Fall or spring, 3–4 credits. S-U grades optional. Course limit depends upon the availability of placements and of supervision. Prerequisites: HDFS 111 and 115. Limited to 25.

Lec, W 2:30–3:20, plus a seminar W 1:25–2:15 and a half-day of field study for three credits, and two half-days of field study for four credits. Staff. A field-based course structured to integrate practicum, lectures, discussions, readings, and term projects to aid the student in gaining a better knowledge and understanding of children between the ages of 2 and 6. Practicum settings include nursery schools, day care centers, Head Start centers, and Special Children's Center. Students registered for three credits should save one morning (9–12) or one afternoon (1–4) for field settings. Those registered for four credits should save two mornings or afternoons. Mornings are preferred.

[243 Participation with Groups of Children in the Middle Years Fall or spring, 3–4 credits. S-U grades optional. Course limit depends upon the availability of placements and of supervision. Prerequisites: HDFS 111 and 115. Limited to 15. Not offered 1978–79.

Staff. A field-based course structured to integrate practicum, lectures, discussions, readings, and other assignments to aid the student in gaining a better knowledge and understanding of children between the ages of 7 and 12. Practicum settings include elementary schools and youth bureau and after-school programs. Students registered for three credits should save one of the following times for participation (students registered for four credits should save two): 9–12 or 1–4 for a school experience or 2:30–5:30 for an after-school experience.]

[270 Processes of Adaptation and Atypical Development Spring, 3 credits. Prerequisites: HDFS 115, Psych 101, or Educ 110. Not offered 1978–79.

M W F 1:25. J. Weisz. An introduction to atypical development through the study of environmental sources of stress on the growing person. Attention is given to the family, the

neighborhood, the peer group, and the school in order to understand atypical adaptations and development.]

300 Special Studies for Undergraduates Fall or spring. Credit to be arranged.

Hours to be arranged. Department faculty. For special arrangement of course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. The form, signed by both the instructor directing the study and the head of the department, is filed at course registration or during the change-of-registration period.

302 Family and Community Health Fall or spring. 3 credits. Limited to 90.

T Th 8, plus additional section. Sec 1, T 9:05; sec 2, Th 9:05. Staff.

This introduction to health science focuses on research and knowledge related to personal, family, and community responsibility for healthful living, disease prevention, and the environmental problems that affect the quality of health throughout the life cycle. Substantive material includes physical, mental, and emotional functioning, chemical alteration of behavior, family health, personal health care, and health in society. Discussion sections deal with decision making and application of theory in health science.

[312 Social Policy Related to Adolescence

Fall. 3 or 4 credits. Prerequisites: HDFS 216 or 317; skills training course or comparable experience strongly advised. Permission of instructor required to register for 4 credits. Not offered 1978-79.

T Th 2:30-4. Staff. Examines the relationship between public policy, families, and adolescent development. Discussion of the effect on adolescent development of policies directly related to adolescents (employment, juvenile justice, and education) and policies indirectly related to them (transportation, housing, urban development).

Some students will be able to add fieldwork to classroom work in this course, depending upon the availability of placements and appropriate supervision. Students who have taken a skills training course or who have equivalent experience will be given preference. Students doing fieldwork will register for 4 credits.]

[313 Problematic Behavior in Adolescence

Fall. 3 credits. Prerequisites: HDFS 216 or 317. Offered every other year. Not offered 1978-79.

M W F 9:05. Staff. Focuses primarily on juvenile delinquency and other problems of adolescence such as drug abuse, alcohol, pregnancy, suicide, and other social and personal issues. Students interested in adding related field experience should register concurrently for HDFS 410.]

315 Human Sexuality: A Psychosocial Perspective Fall. 3 credits. Limited to 100 juniors and seniors. Prerequisite: introductory course in HDFS, psychology, or sociology, or equivalent social science course.

Lec Th 12:20-1:45; sec 1-3, T 12:20-1:15; sec 4 and 5, T 1:25-2:15. Staff.

The aim of this course is to delineate the major psychological and sociological components of human sexual attitudes and behavior. Two central themes will be addressed: the development of sexual orientation over the life cycle and the evolution of sexual norms and customs within changing social systems. An underlying issue will be the role of moral assumptions and contemporary ethics in generating research and theory on human sexuality in the social sciences. Materials will be drawn from interdisciplinary sources including biology, history, and anthropology.

333 Cognitive Processes Spring. 3 credits.

Prerequisite: HDFS 115 or equivalent.

M W F 11:15. G. Suci. A survey of theories and problems in the development of selected cognitive processes: attention, perception, mediation processes, and language.

334 (324) Piaget's Theory of Cognitive Development. Spring. 4 credits. S-U grades optional.

Lec, W F 1:25-2:15. Discussion and observational time (6 to 12 hours per term) to be announced. Staff.

This introduction to Piaget's theory of intellectual development is open to undergraduate and graduate students. The course is intended to provide students with a basic and critical knowledge of Piaget's theory of intelligence. The course will review Geneva research on object permanence, the development of logic, number, classification, and seriation, as well as formal operations of scientific thinking. Research on representation, for example, through mental imagery and language, will also be discussed, as will current attempts to extend Piagetian theory to educational practice. Related research in these areas also will be considered.

338 The Development of Creative Thinking

Spring. 3 credits. Prerequisites: HDFS 115, Psych 101, or Educ 110. Limited to 40. Not to be taken concurrently with 141.

M W F 9:05-10:10. W. L. Brittain. A study of theories of creativity and a review of the research on creative behavior. Emphasis is on the conditions and antecedents of creative thinking.

342 Models and Settings in Programs for Young Children Fall. 3 credits. Prerequisite: HDFS 115. Offered every other year.

T Th 12:20-1:35. Staff. Surveys a wide range of programs for children between the ages of 2 and 7. Basic theories and beliefs will be linked to programs they have helped create (i.e., Montessori, Piaget, Berlieter, Engleman, Weikart, Caldwell).

[343 Models and Settings in Programs for Children in the Middle Years Fall. 3 credits. Prerequisite: HDFS 115. Offered every other year. Not offered 1978-79.

Surveys a wide range of programs for children in the middle years between the ages of 7 and 12. Study will include fundamental ideas and related programs that have significantly influenced or are influencing the development of children, such as the open classroom, British infant schools, big brother/big sister programs, alternate education, and traditional approaches.]

344 Infant Behavior and Development Fall. 3 credits. Prerequisite: HDFS 115 or equivalent.

T Th 12:20-2:15. H. Ricciuti. Nature and determinants of major developmental changes in infant behavior from birth to two years. Special attention directed to role of major environmental influences on perceptual-cognitive and social-emotional development, and to recent attempts to modify infants' experiences in the interest of facilitating psychological development. Physical growth with reference to biological influences (malnutrition and low birth weight) as they relate to the social environment.

346 The Role and Meaning of Play Spring. 2 credits. Prerequisites: HDFS 111 and 115. Limited to 35.

W 7-9 p.m. G. McCord, R. Silverstein. The role and meaning of play in the lives of children ages 2-7. Seminar discussions will integrate the theoretical and empirical literature on play with practical application in a variety of early childhood settings. Special emphasis given to ways to facilitate play experiences through the structuring of the

environment and the use of materials and equipment. Students will explore and construct early childhood materials in frequent workshops.

347 Human Growth and Development: Biological and Social Psychological Considerations (also NS 347) Spring. 3 credits. Prerequisites: Bio S 101 or 109 or equivalent; HDFS 115 or Psych 101, and NS 115 or equivalent.

M W F 1:25. J. Haas, H. Ricciuti. A review of major patterns of physical growth from the fetal period through adolescence, with consideration given to biological and socioenvironmental determinants of growth, as well as to physical and psychological consequences of variations in growth patterns. Normal patterns of growth will be examined, followed by an analysis of major sources of variations in growth (normal and atypical).

348 Specialized Participation in Preschool Settings Spring. 3 credits. Prerequisites: HDFS 242 and permission of instructor. Limited to 10 students concurrently taking HDFS 346.

Time to be arranged. Staff. An advanced supervised fieldwork experience at the Cornell Nursery School, consisting of two half-days plus an hour staff meeting per week. Designed for students who have mastered basic guidance skills with preschool children. The focus will be on developing more refined teaching techniques with learning materials.

352 Contemporary Family Forms in the United States Spring. 3 credits.

Th 2:30-4:25, plus case study. H. Feldman. Variations in family formation, organization, and functioning will be investigated with an emphasis on research findings about each of the family types. Family forms will range from the rural communal family to the more contemporary urban. The functions of each family form will be considered as they apply to the individual, the family, and to the society.

354 The Family in Cross-Cultural Perspective Fall. 3 credits. S-U grades optional. Prerequisites: HDFS 115 or 116, Psych 101 or Educ 110, and HDFS 150 or R Soc 100, or equivalent.

M W F 10:10. Staff. The sociological study of the family, with particular reference to the relationships between the family and society and between the family and its individual members. Special emphasis is placed on the role of the family in child development. Extensive use will be made of cross-cultural and comparative materials.

358 Theories of Adult Interpersonal Relationships Fall. 3 credits. S-U grades optional.

Th 2:30-4:25; plus case study. H. Feldman. Selective theories of the basic disciplines in social psychology, sociology, and psychology will be reviewed and their pertinence to understanding of adulthood examined. Students will generate hypotheses about these theories and test one of them through either a library or empirical paper. A notebook-journal will be kept to interrelate the concepts and to suggest practical justifications.

360 Personality Development in Childhood Spring. 3 credits. Prerequisites: HDFS 115 or Psych 101, plus one other course in HDFS or Psychology.

M W F 10:10. L. C. Lee. Study of relevant theoretical approaches to and empirical findings regarding the development of the child's personality. The influence of parents and other environmental factors on the child will be examined. Topics to be covered will be attachment, autonomy, identification, moral development, and social behavior.

[361] The Development of Social Behavior

Spring. 3 credits. Limited to 100. Prerequisite: HDFS 115 or Psych 128. Not offered 1978-79.

M W F 10:10. J. Condry.

Issues in the development of social behavior are viewed from the perspective of theory and research. An attempt is made to apply our understanding of social behavior to education, childbearing, and group behavior. Likely topics include bases of social behavior in early childhood, the role of peers, the development of aggressive behavior, the development and functioning of attitude and value systems, conformity and deviation, and the function and limits of experimental research in the study of social development.]

365 The Study of Lives

Fall. 3 credits.

Prerequisites: HDFS 115, 116, 270 or equivalent.
M W F 11:15. J. Harding.
The study of personality development through the analysis of individual life histories. Biological, sociological, and psychodynamic influences will be given approximately equal emphasis. There will be extensive discussion of the development of motives, decision making, and personal relationships. The term paper will be a psychological analysis of a specific individual based on a published biography or autobiography.

371 Behavioral Disorders of Childhood

Spring. 3 credits. Prerequisites: Psych 101 or Educ 110, and a course in personality development (270 or other).

M W F 12:20. J. Weisz.
Considers major functional disorders of childhood, ranging from transient and adjustment reactions through the psychoses, with reference to theories of development and related approaches to prevention and remediation in one-to-one family and institutional settings.

[372] Intellectual Deviations in Development

Fall. 3 credits. Prerequisites: HDFS 115 and a personality course. Not offered 1978-79.

M W F 12:20. J. Doris.
Considers major forms of organic and familial retardation, perceptual and motor handicaps, and learning disabilities, with reference to problems of development, prevention, and remediation.]

380 Aging in America

Spring. 2 credits.

Prerequisite: one social science course.
M W 9:05. J. Harding.
This course is a general introduction to social gerontology in the American context. Some attention is given to biological and psychological aspects of aging. Considerable attention is paid to such problems as occupational retirement, bereavement, and the decline of physical health. The course also surveys social planning for the elderly and the provision of special medical, economic, and social services.

397 Experimental Child Psychology

Fall. 4 credits. Prerequisites: one course in statistics and permission of instructor.

T Th 10:10-11:40, plus additional hours for laboratory work. L. C. Lee.
A study of experimental methodology in research with children. Includes lectures, discussions, and practicum experiences covering general experimental design, statistics, and styles and strategies of working with children. The course is intended primarily for students interested in entering graduate programs involving further research training.

398 Junior Honors Seminar

Spring. 3 credits. Permission of the department honors chairperson required for registration. Enrollment limited to students in the honors program.

Hours to be arranged. Staff.
The seminar will be devoted to readings, reports, and discussion of selected major issues in human development and family studies.

400-401-402-403 Special Studies for

Undergraduates Fall or spring. Credits to be arranged. S-U grades optional.

Hours to be arranged. Department faculty.
For advanced, independent study by an individual student or for study on an experimental basis with a group of students in a field of HDFS not otherwise provided through coursework in the department or elsewhere at the University. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. This form must be signed by the instructor directing the study and the department chairman and filed at course registration or within the change-of-registration period after registration. In order to ensure review before the close of the course registration or change-of-registration period, early submission of the Special Studies Form to the department chairman is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study:

400 Directed Readings For study that predominantly involves library research and independent study.

401 Empirical Research For study that predominantly involves data collection and analysis or laboratory or studio projects.

402 Supervised Fieldwork For study that predominantly involves participation in community settings.

403 Teaching Apprenticeship For study that includes assisting faculty with instruction.

410 Field Experience in Adolescent Development Fall or spring. 3-9 credits. S-U grades optional. Prerequisite or corequisite: HDFS 313, skills training course or equivalent experience, and permission of instructor. Number of students limited by availability of fieldwork placements. May be repeated for credit with permission of instructor, but 9 credits are the maximum number that may be accumulated in this course.

Lec M 7:30 p.m. and field study. M. Whitham.
Designed to give students experience in various settings (such as social, legal, educational, and helping agencies) working with typical and atypical adolescents.

431 Learning in Children Fall. 3 credits.

W 12:20-2:15. Laboratory and field experience to be individually arranged. M. Potts.
Consideration of the theoretical and research literature in conceptualization, reasoning, strategy formation, problem solving, language learning, etc. Application is made to the assessment and facilitation of specific learning processes through laboratory and fieldwork.

432 Intellectual Development and Education Spring. 3 credits.

T Th 2:30. M. Potts.
This course will define basic cognitive processes that underlie education (e.g., linguistic processes which underlie language comprehension and production; numerical processes which underlie mathematics; reasoning processes which underlie logical inference, classification, and seriation); and will review basic and current research on the development and learning of these processes in young children. In addition, the course will consider the implications of theories of development to various approaches to education. (For example, it will consider the relevance of Piagetian developmental theory to standard and alternative education models.)

437 Creative Expression and Child Growth

Fall. 4 credits. Limited to 25. Saturday morning should be free in order to provide time for participation with children.

T Th 10:10-11:30. W. L. Brittain.

Aimed at an appreciation and understanding of the creative process in art, music, dance, and drama in relation to the development of children.

451 Innovative Programs of Parent Intervention and Community Action

Spring. 3 credits. Permission of the instructor required before preregistration. Limited to 10.

T 2:30-4:25. Additional laboratory and field experiences to be individually arranged. H. Bayer.
Consideration of the theoretical bases and the empirical consequences of programs intended to change styles of parental behavior, whether by manipulation of individual action or of societal alternatives; parent intervention, social action.

470 Field Experience in Atypical Development

Fall. 1-3 credits. S-U grades only. Open only to students concurrently registered in HDFS 371 or 372.

T 2:30-4. Staff.

490 Historical Roots of Modern Psychology

Spring. 4 credits. Prerequisites: 3 courses in behavioral science or consent of instructor.

M W F 12:10-1:10. P. Carlson.
This course will survey the major historical antecedents of contemporary psychology, including the philosophical tradition (from Aristotle through the Enlightenment), the medical-therapeutic tradition, and the rise of modern science and experimental psychology. Scholars from throughout the University will give presentations in their own specialties. Students will do concentrated work in their own areas of interest. Those who are registered in a college offering this course must register for the course through their own college.

499 Senior Honors Thesis Fall or spring. Credit to be arranged. S-U grades only. Registration with permission of thesis adviser.

Department faculty.

Topics Courses**415 Topics in Adolescent Development****435 Topics in Cognitive Development****445 Topics in Early Childhood Education and Development****455 Topics in Family Studies****465 Topics in Social and Personality Development****475 Topics in Atypical Development****485 Topics in the Ecology of Human Development**

Fall or spring. 2-4 credits. Prerequisites and enrollment limits vary with topic being considered in any particular term. Permission of the instructor required.

Days and hours to be arranged. Department faculty.

This series of courses provides an opportunity for advanced undergraduates to explore an issue, theme, or body of research in the areas of departmental concentration. Topics vary each time the course is offered. Descriptions are available at the time of course registration. Although the courses are usually taught as seminars, a subject may occasionally lend itself to lecture, practicum, or other format.

The Graduate Program

Human development and family studies graduate courses are open to undergraduates only with instructor's permission.

210 Human Development and Family Studies

These courses will be taught annually

601 Research Design and Methodology Spring. 3 credits.

T Th 2:30-4:25. B. Koslowski.
Seminar will consist of three components: (1) discussion of representative literature on problems of research design, methodology, and data collection; (2) analysis of methodological issues involved in empirical studies employing different kinds of research designs and methods, both in laboratory and field settings; and (3) a practicum component in which students will formulate research designs for their own problems, to be evaluated and criticized at each stage of development and pretesting.

602 Research Design and Data Analysis Fall. 3 credits. Prerequisite: HDFS 601.

Hours to be arranged. Department faculty. Students will carry out research projects designed in HDFS 601. While working with individual faculty members on these projects, the seminar will meet as a group to review and criticize progress reports of each other's research. The seminar also will discuss, through appropriate literature, problems involved in data analysis, interpretation, explanation, causal imputation, and writing research findings in publishable form.

603 Development in Context Fall. 3 credits.

T Th 2:30-4:25. U. Bronfenbrenner.
This seminar examines issues of theory, substance, and research design related to human development in the actual contexts in which people live. Emphasis is placed on the interaction of processes (biological, psychological, and social) and social systems in the course of development in a variety of settings. The seminar is recommended for graduate students entering the field.

700-706 Special Studies for Graduate Students Fall or spring. Credits and hours to be arranged. S-U grades at discretion of instructor.

Department faculty.
Independent, advanced work by graduate students recommended by their special committee chairman with approval of the instructor.

700 Directed Readings For study that predominantly involves library research and independent study.

701 Empirical Research For study that predominantly involves collection and analysis of research data.

702 Practicum For study that predominantly involves field experience in community settings.

703 Teaching Assistantship For students assisting faculty with instruction. Does not apply to work for which students receive financial compensation.

704 Research Assistantship For students assisting faculty with research. Does not apply to work for which students receive financial compensation.

705 Extension Assistantship For students assisting faculty with extension activities. Does not apply to work for which students receive financial compensation.

706 Supervised Teaching For advanced students who assume major responsibility for teaching a course. Supervision by a faculty member is required.

899 Master's Thesis and Research Fall or spring. Credit to be arranged. S-U grades only. Registration with permission of thesis adviser. Department graduate faculty.

999 Doctoral Thesis and Research Fall or spring. Credit to be arranged. S-U grades only. Registration with permission of thesis adviser. Department graduate faculty.

These courses will be taught at least every other year

617 Adolescence Spring. 3 credits.

T Th 10:10-12:05. Staff.
Current issues in the theoretical and empirical literature on adolescent development.

631 Cognitive Development Fall. 3 credits.

T Th 12:20-2:15. B. Koslowski.
Overview of cognitive development, with special emphasis on current research and theoretical issues in language, perceptual, and thought processes.

640 Infancy Spring. 3 credits.

Th 10:10-12:35. H. Ricciuti.
Major theoretical issues and relevant empirical research on perceptual-motor, cognitive, and affective development in the first two years of life.

641 Early Childhood Education Fall. 3 credits.

M 12:20-2:15. M. Potts.
In-depth study of specific issues in the theoretical and empirical literature of early childhood education.

650 Family Spring. 3 credits.

T Th 12:20-2:15. Staff.
The uses of sociological theories and research in the study of the family, with particular reference to the relationship between the family and society and between the family and its individual members.

660 Personality and Socialization Spring. 3 credits.

W 2:30-4:25. J. Condry.
Major issues in personality development and socialization, with special emphasis on theoretical models and empirical issues.

670 Atypical Development Fall. 3 credits.

W 1:25-4:25. Staff.
Overview of current theories and empirical research on functional and organic disorders in childhood.

Topical Seminars

Seminars, offered irregularly, with changing topics and instructors. Content, times, credit, and instructors to be announced. Seminars offer concentrated study of specific theoretical and research issues.

618 Seminar in Adolescence Topics include peer relations or parent-child relationships in adolescence.

633 Seminar on Language Topics include acquisition of meaning in infancy, precursors of language in early infancy, and language development in bilingual children.

635 Seminar in Cognitive Development Topics include language development in infancy, mathematical thought in childhood, and cognitive development in the context of early childhood education.

645 Seminar on Infancy Topics include the role of emotions in early development, infant stimulation and early experience, tests, and assessment of infant development.

646 Seminar in Early Childhood Education Topics include early child care and education, analysis of models and settings, evaluation, and early childhood in a cross-cultural context.

655 Seminar in Family Studies Topics include the marital dyad, the family in poverty, and the single-parent family.

665 Seminar in Personality and Social Development Topics include socialization in infancy, peer relations, and sex role development.

675 Seminar in Atypical Development Topics include learning disabilities, therapeutic interventions in atypical development, child abuse and maltreatment, and family factors in the etiology of functional disorders.

685 Seminar in Human Development and Family Studies Topics include development of self-concept, sex-role identity, observational methods, and play interviews in developmental research.

690 Seminar on Ecology of Human Development Topics include the institutional setting as a determinant of behavior, the poor family, and the identification and measurement of ecological variables.

Nutritional Sciences

See page 222.

Independent Interdisciplinary Centers and Programs

Africana Studies and Research Center

See p. 127.

Center for International Studies

The Center for International Studies, 170 Uris Hall, supports and coordinates Cornell's programs of international and comparative studies. By serving as a focal point for ideas, information, and advice about the University's wide range of international offerings, the center contributes to their further development. The center places particular emphasis on strengthening inquiry into issues that cut across disciplinary, professional, and regional concerns, and on providing a continuing source of innovation and experimentation in international studies. The center and its constituent programs promote interdisciplinary teaching and research in international and comparative studies. These programs are:

Area Programs

- China-Japan Program (140 Uris Hall). See p. 131. Committee on Soviet Studies (140 Uris Hall). See p. 137.
- Latin American Studies Program (190 Uris Hall). See p. 133.
- South Asian Program (130 Uris Hall). See p. 138.
- Southeast Asia Program (120 Uris Hall). See p. 54.

Problem-Oriented Programs

- International Population Program (372 Uris Hall)
- Participation and Labor-Managed Systems (490 Uris Hall)
- Peace Studies Program (180 Uris Hall)
- Policies for Science and Technology in Developing Nations (170 Uris Hall)
- Rural Development Committee (170C Uris Hall)
- Western Societies Program (170 Uris Hall)

Professional School Programs

- International Agriculture (261 Roberts Hall)
- International Business and Public Administration (526 Malott Hall)
- International and Comparative Labor Relations (294 Ives Hall)
- International Legal Studies (404 Myron Taylor Hall)
- International Nutrition (127 Savage Hall)
- International Planning (200 West Sibley Hall)

Program on Science, Technology, and Society

The Program on Science, Technology, and Society (STS) is an interdisciplinary unit that promotes teaching and research on the interaction of science and technology with political and social institutions. The program draws its students, faculty, and research staff from departments in all colleges of the University. Topics of special concern include science, technology, and public policy; biology and society; technology assessment; citizen participation

in technical decision-making; arms control and national defense policies; energy policy; environmental law and ethics; and biomedical ethics. These and other subjects are studied through courses, graduate and faculty seminars, workshops, and research projects.

In cooperation with University academic departments and centers, the STS Program participates in the development of interdisciplinary courses at both the graduate and undergraduate levels. Courses developed by the program are designed to both synthesize and contrast the perspectives of several academic disciplines on the relationships between science, technology, and the institutions of modern society. The program sponsors the undergraduate Biology and Society major in the College of Arts and Sciences and offers a science policy "stream" within the graduate minor Field of Public Policy. Limited support is available to graduate students whose studies fall within the program's scope. Such support can be in the form of full or partial fellowships, research or teaching assistantships, or grants to cover research expenses.

STS courses are normally cosponsored by University academic departments. The titles and numbers of these courses are listed below. For course descriptions and details, refer to the entries located among the listings of the respective cosponsoring departments. Further information on these courses and the STS Program, as well as a list of STS-related courses offered throughout the University and information concerning individualized courses of study and graduate student support, can be found in a booklet available from the program office, 628 Clark Hall (256-3810).

Biology and Society I: The Biocultural Perspective (Anthropology 301 and Biological Sciences 301)

Biology and Society II: Biology, Society, and Ethics (Anthropology 302 and Biological Sciences 302)

Biomedical Ethics (Biological Sciences 205 and Philosophy 245)

Environmental Ethics (Biological Sciences 206 and Philosophy 246)

Biology and Culture (Biology and Society 400-401, College Scholar 425-426, and Society for the Humanities 425-426)

Federal Regulations: Establishment and Enforcement (Biology and Society 402)

[Science, Technology, and Development (Business and Public Administration NCE 510 and Government 630) Not offered 1978-79.]

Science, Technology, and Public Policy (Business and Public Administration NPA 504 and Government 426)

The Impact and Control of Technological Change (City and Regional Planning 540, Economics 302, and Government 302)

The Politics of Technical Decisions I (City and Regional Planning 541, Government 628, and Business and Public Administration NPA 515)

The Politics of Technical Decisions II (City and Regional Planning 542, Government 629, and Business and Public Administration NPA 516)

The Computerized Society (Computer Science 305)

Social Implications of Technology (Engineering CEE B305)

Seminar in Technology Assessment (Engineering CEE B416 and College Scholar 464)

Environmental Law (Engineering CEE B615)

Technology, Society, and the Human Condition (Engineering M&AE 302)

[Seminar in American Culture: Literature and Technology (English 468) Not offered 1978-79.]

Urban Affairs Laboratory (Government 312)

Defense Policy and Arms Control (Government 484)

Social History of Western Technology (History 380)

[Problems in the History and Philosophy of Biology (History 386 and Philosophy 386) Not offered 1978-79.]

Science, Technology, and Law (Law 582)

[The Politics of I.Q. (Psychology 443) Not offered 1978-79.]

Sociology of Science and Technology (Sociology 255)

New York State School of Industrial and Labor Relations

Collective Bargaining, Labor Law, and Labor History

R. Donovan, chairman; G. Brooks, D. Cullen, C. Daniel, R. Doherty, H. Finch, M. Gold, J. Gross, K. Hanslowe, G. Hildebrand, R. Keeran, M. Kelly, T. Kochan, G. Korman, D. Lipsky, R. McKersie, J. Morris, P. Ross, J. Windmuller

100 History of Industrial Relations in the United States

Fall or spring. 3 credits.
C. Daniel, R. Keeran, G. Korman, J. Morris.
This review of the history of industrial relations in the United States emphasizes developments in the twentieth century. The course concentrates on the American worker, both union and nonunion, labor movements, and the environmental forces that have shaped industrial relations in the United States. Readings will be selected from scholarly accounts and original sources.

101 Special Studies in the History of Industrial Relations in the United States

Spring. 3 credits.
Prerequisite: 100 for ILR students; no prerequisite for out-of-college students.
C. Daniel, H. Finch, R. Keeran, G. Korman, or J. Morris.
Several instructors will offer undergraduate classes, each on a particular aspect of the history of industrial relations in the United States. Students will choose among classes that may vary from year to year and include such topics as the following: industrial relations in the Age of Jackson and in other periods of American History such as the Gilded Age, the two World Wars, or the Great Depression; the role of industry and organized labor in politics; and radicalism and dissent in the American labor movement.

200 Collective Bargaining

Fall or spring. 3 credits.
D. Cullen, T. Kochan, D. Lipsky, P. Ross.
A comprehensive study of collective bargaining, the negotiation and scope of contracts, the day-to-day administration of contracts, the major substantive issues in bargaining, including their implication for public policy, and the problem of dealing with industrial conflict.

201 Labor Relations Law and Legislation

Fall. 3 credits.
M. Gold, J. Gross.
A survey of the law governing labor relations. The legal framework in which the collective bargaining relationship is established and takes place is analyzed. Problems of the administration and enforcement of collective agreements are considered, as are problems of protecting individual employee rights in the collective labor relations context. Also serves as an introduction to the legal system and method, and to legal and constitutional problems of governmental regulation of industrial and labor relations.

301 Labor Union Administration

Fall or spring. 3 credits. Prerequisites: 100 and 201.
G. Brooks, C. Daniel, R. Keeran, G. Korman, J. Morris.
A review of the operations of American unions, including a general theoretical framework, but with major emphasis on practical operating experience. The course will consider the formal government of unions; organizational or institutional purposes and objectives and how these are achieved; underlying

structure and relationship among members, locals, and national organizations; the performance of the primary functions of organizing; negotiating; contract administration; and the effect of the Landrum-Griffin Act.

303 Research Seminar in the Social History of American Workers

Fall. 4 credits. Open, with permission of instructor, to upperclass students who have demonstrated their ability to undertake independent work.
G. Korman.
An examination of a different subject each year.

304 Seminar in the History, Administration, and Theories of Industrial Relations in the United States

Fall or spring. 4 credits. Prerequisite: permission of instructor.
C. Daniel, R. Keeran, G. Korman, J. Morris.
Designed to explore the social, economic, and political background of industrial relations in the history of the United States. Examines a different subject each year.

306 Research Seminar in the American Labor Movement and Politics

Spring. 3 credits. Open, with permission of instructor, to upperclass students who have demonstrated ability to undertake independent work and who have taken 101.
J. Morris.

Students will be free to choose any research topic, using any disciplinary approach (such as law, history, behavioral or political science), within the subject matter area. Group meetings will be devoted to (1) discussion in depth of special problems such as compulsory membership and union political spending, the adequacy of the law governing union political action, and labor's partisan ties with the Democratic party, and (2) exchange of research problems and reports. Some time normally devoted to group meetings will be scheduled for individual consultations.

307 Industrial Relations Biographies

Fall. 4 credits. Open to juniors and seniors.
J. Morris.
The objective of this reading course is to study American industrial relations history through the lives of some of the outstanding men who have helped make it—men of business, government, and the law as well as leaders of labor and their allies among the intellectuals. While economic forces, institutional developments, and social values are important in shaping history, so also is the role of individual personality. The class will read and discuss biographies and autobiographies. In some cases the written record will be supplemented with tapes and films. There will be written assignments but emphasis will be on the weekly discussion.

380 Famous Trials in American Labor History

Spring. 4 credits. Open to juniors and seniors. Prerequisite: 100.
J. Morris.
A course on some of the famous criminal trials involving union leaders, radicals, and ordinary workmen who were unknown before they faced the bar. Among the defendants or cases from which selection will be made with charges that range from fraud to murder, are Jimmy Hoffa, Sacco and Vanzetti, Mooney and Billings, the Centralia tragedy and trial, the great IWW trials of World War I, the case of Joe Hill, the Haymarket anarchists, the trial and execution of the Molly Maguire leaders, and the triple case of Moyer, Haywood, and Pettibone.

381 Jewish Workers in Europe and America, 1789-1948

Spring. 4 credits. Open to sophomores, juniors, and seniors.
G. Korman.
This course in comparative history examines the complex experiences of the Yiddish speaking immigrant workers and their families. A special subject of interest will be the extraordinary history of the Jewish working class between 1924 and 1948.

401 Collective Bargaining Structures

Fall. 3 credits. Prerequisite: 200.
D. Lipsky.
An examination of the conduct of collective bargaining with emphasis on the size and scope of the bargaining unit and the locus of decision making in collective negotiations. The relation between bargaining structure and product market structure, public policy, and union structure will be studied. Industry and case studies of various bargaining structures, including pattern bargaining, coalition bargaining, and multiemployer bargaining will be used to illustrate general principles. Wage patterns and the economic effects of bargaining structures also will be examined. A seminar course.

407 Contemporary Trade Union Movement

Spring. 3 credits. Prerequisites: 100 or 502 (702) or permission of instructor.
C. Daniel, R. Keeran.
An examination of the contemporary history, administration, policies, and problems of American trade unions. Each semester the course will focus on particular aspects of the labor movement.

498 Internship

Fall or spring. 4-6 credits.
Designed to grant credit for individual research under direction of a faculty member by mature upperclass undergraduate students who have been selected for an internship. All requests for permission to register for 498 must be approved by the faculty member who will supervise the project and the chairman of the faculty member's academic department before submission for approval by the Committee on Academic Standards and Scholarship.

499 Directed Studies

Fall or spring. 3 credits.
For individual research, conducted under the direction of a member of the faculty, in a special area of labor relations not covered by regular course offerings. Registration normally limited to seniors who have demonstrated ability to undertake independent work. Eligible students should consult with a counselor in the Office of Resident Instruction at the time of course registration to arrange for formal submission of their projects for approval by the Academic Standards Committee.

500 (700) Collective Bargaining

Fall or spring. 3 credits. Open only to graduate students. It is recommended that 501 (701) Labor Relations Law and Legislation be taken prior to or concurrently with 500 (700).
D. Cullen, T. Kochan, D. Lipsky.
A comprehensive study of collective bargaining with special emphasis on philosophy, structures, process of negotiations, and administration of agreements. Attention also will be given to problems of handling and settling industrial controversy, the various substantive issues, and important developments and trends in collective bargaining.

501 (701) Labor Relations Law and Legislation

Fall or spring. 3 credits.
M. Gold, K. Hanslowe.
A survey and analysis of the labor relations law which examines the extent to which the law protects and regulates concerted action by employees in the labor market. The legal framework within which the collective bargaining takes place is considered and analyzed. Problems of the administration and enforcement of the collective agreement are considered as are problems of protecting the individual member-employee rights with the union.

502 (702) Labor Union History and Administration

Fall or spring. 3 credits.
C. Daniel, R. Keeran, G. Korman, J. Morris.
A presentation of the history of labor in America with emphasis upon post-Civil War trade union development. Includes an analysis of the structure and functions of the various units of labor organization, ranging from the national federation to the local union, and some consideration of special problems and activities, such as democracy in trade

unions and health and welfare plans, as well as of various types of unions, such as those in construction, maritime trades, entertainment, transportation, and basic industry.

600 Advanced Seminar in Labor Arbitration Spring, 3 credits. Open to juniors, seniors and graduate students who have taken 602 or equivalent. Prerequisite: permission of instructor.

J. Gross, K. Hanslowe.

An advanced seminar in labor arbitration emphasizing the practical aspects of current labor arbitration techniques and problems. Subjects considered will range from laboratory exercises in the presentation of an arbitration case, the preparation of prehearing and posthearing briefs, and the writing of an arbitration opinion and award, to the investigation and evaluation of the experience of labor arbitrators with selected case problems arising in state and federal employment and public education as well as in the private sector.

601 Integration of Industrial Relations Theories Fall or spring, 3 credits. Open to second-year graduate students and seniors.

T. Kochan.

The major purpose of this course is to explore the similarities and differences among the (1) normative premises, (2) theoretical frameworks, (3) substantive issues, and (4) methodological approaches found in the various areas of study in industrial relations. The areas that will be studied include (1) collective bargaining and union-management relations, (2) organizational behavior and personnel, and (3) labor economics and manpower policy. An effort will be made to explore the potential for integration among these various areas by discussing some issues or problems that cut across the traditional lines of study.

602 Arbitration Fall or spring, 4 credits. Prerequisite: for undergraduates, 200, for graduates 500 (700).

J. Gross.

A study of the place and function of arbitration in the field of labor-management relations, including an analysis of principles and practices, the law of arbitration, the handling of materials in briefs or oral presentation, the conduct of an arbitration hearing, and the preparation of an arbitration opinion.

603 Governmental Adjustment of Labor Disputes Fall or spring, 3 credits. Prerequisites: for undergraduates, 200, for graduates 500 (700).

D. Cullen, T. Kochan.

An examination of the various governmental techniques for dealing with labor disputes in both the private and public sectors, including mediation, fact-finding, arbitration (both voluntary and compulsory), the use of injunctions, and seizure. The course will also examine the application of these techniques under the Railway Labor Act, Taft-Hartley Act, and various state acts.

604 Readings in the Literature of American Radicalism and Dissent Fall or spring, 3 credits. Open only to seniors and graduate students.

R. Keeran.

Each term concentration will be on a different historical aspect of American radicalism and dissent. Some examples of areas and writers who might be selected for study are: agrarian reform—Thomas Skidmore, George Henry Evans, and Ignatius Donnelly; anarchism—Josiah Warren, William D. Haywood, Emma Goldman, and Paul Goodman; communism—John Reed, Jay Lovestone, and William Z. Foster; economic dissent—Henry George, Thorstein Veblen, and Francis Everett Townsend; equal rights for Negroes and black nationalism—William E. B. DuBois and Marcus Garvey.

605 Readings in the History of Industrial Relations in the United States Fall, 3 credits. Open only to seniors and graduate students. Prerequisites: for seniors, 100 and 101; for graduates 502 (702).

C. Daniel, R. Keeran, G. Korman, J. Morris. A seminar covering, intensively and in historical sequence, key documents, studies, legislative investigations, and memoirs concerning American industrial relations systems. Primarily designed to aid students in orienting themselves systematically and thoroughly in the field. Among the authors and reports covered are E. P. Thompson, John R. Commons, Norman Ware, Lloyd Ulman, the Abram Hewitt hearings, the Henry W. Blair hearings, the United States Industrial Commission, Philip Taft, Paul F. Brissenden, and the United States Commission on Industrial Relations.

606 Theories of Industrial Relations Systems Fall or spring, 3 credits. Open only to seniors and graduate students. Prerequisites: for seniors, 100 and 101; for graduates, 502 (702).

C. Daniel, R. Keeran, G. Korman, or J. Morris. An examination of the leading theories concerning the origins, forms, organization, administration, aims, functions, and methods of industrial relations systems. Among the theories studied are those formulated by Karl Marx, Mikhail Bakunin, Georges Sorel, Vladimir Lenin, Lujo Brentano, Beatrice and Sidney Webb, Herbert Croly, Antonio Gramsci, Selig Perlman, Frank Tannenbaum, the Guild Socialists, Karl Polanyi, Clark Kerr, Frederick Harbison, John Dunlop, and Charles A. Myers.

608 Special Topics in Collective Bargaining, Labor Law, and Legislation Fall or spring, 3 credits. Prerequisites: for undergraduates, 201; for graduates, 502 (702).

Staff.

The areas of study will be determined each semester by the instructor offering the seminar.

609 Public Policy and Labor Relations Fall, 3 credits. Prerequisites: one term of labor law and some course work in statistics.

T. Kochan, D. Lipsky.

This seminar examines the application of public policy in labor relations, with particular emphasis on the empirical, nonlegal analysis of the impact of national and state laws on the behavior of managements, unions, and workers. Several important public policy questions will be examined in the course: What is the real impact of duty to bargain requirements on the behavior of the parties in negotiations? How effective are NLRB remedies in actually changing the behavior of the parties? What are the determinants of certification of election outcomes? What evidence is there on the impact of right-to-work laws on union organizing and bargaining?

680 Problems in Union Democracy Fall or spring, 3 credits.

M. Gold, P. Ross.

Unions are considered as an example of private government, and union democracy is examined by standards and customary practices in both public and private governments. Included are such elements as elections, self-government by majority, rights of minorities, the judicial process including impartial review, local-national relationships, constituency and representation, the legislative process, and executive power and functions. The regulation of private government by the state will be considered.

681 Labor Relations Law Spring, 3 credits. Prerequisite: 201 or 501 (701) or equivalent. An advanced course in labor law, concentrating on problems of administering the National Labor Relations Act, the Landrum-Griffin Act, Title VII of the Civil Rights Act of 1964, as amended, the Fair Labor Standards Act, as amended, the Equal Pay Act, the

Age Discrimination in Employment Act, the Occupational Safety and Health Act, and state workmen's compensation and unemployment insurance systems.

682 Seminar in Labor Relations Law and Legislation Fall or spring, 3 credits. Permission of instructor required. Limited enrollment.

K. Hanslowe.

The seminar will emphasize legal problems in public employment and other areas of labor relations affecting the public interest.

683 Special Topics in the History, Administration, and Theories of Industrial Relations Fall or spring, 3 credits. Prerequisites: for undergraduates, 100 and 101; for graduates, 502 (702).

G. Brooks, C. Daniel, R. Keeran, G. Korman, or J. Morris.

The areas of study will be determined each semester by the instructor offering the seminar.

684 Employment Discrimination and the Law Fall or spring, 4 credits. Prerequisite: 201 or 501 (701) or equivalent.

M. Gold.

An examination of legal problems involving employment discrimination based upon race, color, religion, sex, national origin, or age. The impact of developing principles of law on preemployment inquiries and testing, seniority and promotions, and other personnel policies, practices, and procedures will be discussed. The requirements of affirmative action under Executive Order 11246, as amended, will be analyzed. Special attention will be given to the role of state law in resolving employment discrimination claims and the procedural framework for raising and adjudicating such claims before administrative agencies and the courts.

685 Collective Bargaining in Public Education Spring, 3 credits. Permission of the instructor required. Limited enrollment.

R. Doherty.

The seminar will consist of a study of the legal, financial, administrative and educational problems raised by collective bargaining in the public schools. Major attention will be directed at existing statutes covering the employment arrangement for public school employees, the content and the administration of collective agreements, the ideological postures of teacher organizations, and the resolution of negotiating impasses. Individual and group research projects will be required.

686 Collective Bargaining in the Public Sector Fall or spring, 3 credits. Prerequisites: 201 and 200 for undergraduates; 500 (700) and 501 (701) for graduate students.

R. Donovan, T. Kochan, P. Ross.

An examination of the development, practice, and extent of collective bargaining between federal, state, and local governments and their employees. The variety of legislative approaches to such matters as representation rights, unfair practices, scope of bargaining, impasse procedures, and the strike against government are considered along with implications of collective bargaining for public policy and its formulation.

687 Current Issues in Collective Bargaining Fall or spring, 3 credits. Prerequisite: 200 or 500 (700).

D. Cullen, D. Lipsky, R. McKersie, P. Ross.

An intensive study of the most significant current issues and problems facing employers and unions in their relations with each other, with particular emphasis on the substantive matters in contract negotiations and administration of the provisions of collective bargaining agreements. A major research paper is usually required.

703 Theory and Research in Collective Bargaining Spring. 3 credits. Open to graduate students who have had 500 (700) and 723 or their equivalents. A statistics course beyond the level of 710 desirable.

T. Kochan, D. Lipsky.
This is a second-level course in collective bargaining that builds on the institutional research covered in 500 (700). The existing literature in the area of collective bargaining is appraised for its theoretical and empirical content. Efforts are made to explore the appropriate role for theory and empirical analysis in moving research in collective bargaining toward a more analytical perspective, and to identify and appraise the underlying paradigms used to study collective bargaining related issues.

707 Research Seminar in Public Sector Collective Bargaining Spring. 3 credits. Prerequisites: basic familiarity with statistical analysis (correlational and multivariate techniques) and interest in theoretical and empirical research on issues related to public sector labor relations.

T. Kochan, P. Ross.
(1) Discussion of the role of theory in collective bargaining research. Issues such as what is a theory, how is a theory constructed and made operationally testable, and what kinds of theoretical frameworks have been used in public sector research will be addressed. (2) Determination of what alternative research strategies have been used and might be used in collective bargaining research. (3) Evaluation of existing theoretical and empirical research in the public sector. (4) Analysis of current and future research needs. Each student will be required to submit a seminar paper.

708 Industrial Relations in Health Care Institutions Spring. 3 credits.

G. Brooks, P. Ross.
A study of the laws, institutions, and practices that characterize this rapidly changing field, and of the special complexities of the nonprofit sector as they appear in health care. Attention will be given to the character of the unions in the industry, to the problems of collective bargaining that flow from the nature of the industry and its work force, and to the contractual relations that have developed. The principal economic problems that have complicated the collective bargaining relationship also will be discussed. Where appropriate, distinctions will be made among public, nonprofit, and proprietary institutions.

799 Directed Studies Fall or spring. Credit to be arranged. For individual research conducted under the direction of a member of the faculty.

Economic and Social Statistics

P. McCarthy, chairman; I. Blumen, I. Francis, P. Velleman

210 Statistics (Statistical Reasoning) Fall or spring. 3 credits.
An introduction to the basic concepts of statistics: description of frequency distributions (averages, dispersion, and simple correlation) and introduction to statistical inference. Prerequisite to certain of the specialized courses on applications of statistics offered in various departments.

211 Economic and Social Statistics Spring. 3 credits. Prerequisite: 210.
Application of statistical techniques to the quantitative aspects of social studies. A programming language will be taught and students will use the computer throughout the course. Continuing from 210 with topics in statistical description and inference, the course will include multiple regression and correlation, a discussion of index numbers, elements of time series analysis, and the design of sample surveys.

310 Design of Sample Surveys Spring. 3 credits. Prerequisite: one term of statistics.
Application of statistical methods to the sampling of human populations. A thorough treatment of the concepts and problems of sample design with respect to cost, procedures of estimation, and measurement of sampling error. Analysis of nonsampling errors and their effects on survey results (for example, interviewer bias and response error). Illustrative materials will be drawn from such fields as market research and attitude and opinion research.

311 Statistics II Fall. 4 credits. Prerequisite: 210 or permission of instructor.
An intermediate nonmathematical statistics course emphasizing the concepts associated with statistical methods. Includes a treatment of estimation and tests of hypotheses with reasons for choice of various methods and models. Application to problems involving percentage, means, variances, and correlation coefficients with an introduction to non parametric methods, analysis of variance, and multiple regression and correlation.

410 Techniques of Multivariate Analysis Fall. 3 credits. Prerequisite: 311.
The techniques of multivariate statistical analysis, the associated assumptions, the rationale for choices among techniques, and illustrative applications. No mathematical prerequisite but some matrix algebra and related mathematics will be introduced. Includes regression, correlation, principle components, multivariate tests on means, variances and covariances, relations between sets of variates, and discriminatory analysis.

411 Statistical Analysis of Qualitative Data Spring. 3 credits. Prerequisites: 311, I. Blumen.

An advanced undergraduate and beginning graduate course. Includes treatment of association between qualitative variates, paired comparisons, rank-order methods, and other nonparametric statistical techniques, including those related to chi-squared.

499 Directed Studies For course description, see p. 212.

510 (710) Introductory Statistics for the Social Sciences Fall or spring. 3 credits.

P. Velleman.
A nonmathematical course for graduate students in the social sciences without previous training in statistical method. Emphasis will be placed on discussion of technical aspects of statistical analysis and on initiative in selecting and applying statistical methods to research problems. The subjects ordinarily covered will include analysis of frequency distributions, regression and correlation analysis, and selected topics from the area of statistical inference.

610 Seminar in Modern Data Analysis Fall. 3 credits. Prerequisite: 311 or equivalent.

P. Velleman.
A survey of modern data analysis methods concentrating on analysis of "badly behaved" data. Topics will depend upon the interests of those present, but will probably include: exploratory data analysis methods, use, and foundations; robust methods (measures of location and scale, robust regression, data smoothing); computer as a data analysis tool. The course will cover many practical methods. Data of interest to participants will be used to demonstrate applications.

711 Seminar in Statistical Methods Spring. 3 credits.

I. Francis.
A seminar on the philosophical problems of drawing inferences from observational data and the use of computer programs in the statistical analysis of

behavioral social science data. Exact contents may vary from term to term. A detailed description will be available before registration.

712 Theory of Sampling Fall. 3 credits. Prerequisite: calculus and at least one semester of mathematical statistics.
A companion course to 310, Design of Sample Surveys, stressing the development of the fundamentals of sampling theory. Attention will be paid to recent progress in the field. Occasional illustrative material will be given to indicate the application of the theory.

799 Directed Studies For course description, see above.

International and Comparative Labor Relations

J. Windmuller, chairman; M. Clark, W. Galenson, G. Hildebrand, W. Whyte

330 Comparative Industrial Relations Systems I Fall or spring. 3 or 4 credits.

W. Galenson or J. Windmuller.
An introductory course concerned with the contemporary structure, institutional arrangements, and philosophy of the labor relations systems of several countries in advanced stages of industrialization. Countries to be examined include: Great Britain, France, Germany, Sweden. Also included is a comparative examination of current developments in industrial democracy, incomes policies, labor disputes, and the ties between unions and political parties.

331 Comparative Industrial Relations Systems II Spring. 3 or 4 credits.

W. Galenson or J. Windmuller.
A study of the industrial relations systems of non-Western countries in various stages of economic development and under various political arrangements. The emphasis will be on the role of government and trade unions in industrial relations.

430 European Labor History Fall. 3 credits.

J. Windmuller.
The development of trade unions in major European countries, especially Great Britain, France and Germany between 1850 and 1950. Different patterns of labor organization, the main ideological currents, political party-trade union links, the growth of industrial relations systems, and the evolution of public policies toward the labor will be emphasized.

499 Directed Studies For course description, see p. 212.

530 (730) Comparative Industrial Relations Systems I Fall or spring. 3 credits. Prerequisite: for non-ILR graduate students, permission of instructor.

W. Galenson or J. Windmuller.
An introductory course concerned with the contemporary structure, institutional arrangements, and philosophy of the labor relations systems of several countries in advanced stages of industrialization. Countries studied include Great Britain, France, Germany, Sweden, and others. Also included is a comparative examination of current developments in industrial democracy, incomes policies, labor disputes, and the ties between unions and political parties.

531 (731) Comparative Industrial Relations Systems II Spring. 3 credits. Open to graduate students.

W. Galenson or J. Windmuller.
A study of the industrial relations systems of non-Western countries in various stages of economic development and under various political arrangements. Emphasis will be on the role of government and trade unions in industrial relations.

630 Seminar in International and Comparative Labor Problems Spring. 3 credits. Prerequisite: 330 (530), or 331 (531), or permission of instructor. J. Windmuller.

This seminar is intended for students with some background in international and comparative labor relations. It provides an opportunity for organized reading and research on one or two central themes which will change from year to year. In recent years emphasis has been on labor aspects of the multinational corporation, worker participation in management, and international labor movements.

799 Directed Studies For course description, see p. 214.

Labor Economics

R. Ehrenberg, chairman; R. Aronson, R. Butler, G. Clark, G. Fields, G. Hildebrand, R. Hutchens, O. Mitchell, R. Smith, J. Svejnar

140 Development of Economic Institutions Spring. 3 credits. Non-ILR students must have permission of instructor.

G. Clark.
Designed to give the student an understanding of the historical development of our economic institutions and the nature of the problems incident to economic change and development as part of the background for understanding and analysis of important present-day issues. Attention is focused on the agricultural, commercial, and industrial revolutions, tracing their development from their beginnings in Western Europe to the present.

240 Economics of Wages and Employment Fall or spring. 3 credits. Prerequisite: Econ 101-102 or equivalent.

An introduction to the characteristics of the labor market and to analysis of wage and employment problems. Among topics studied are the composition of the labor force, job-seeking and employment practices, methods of wage determinations, theories of wages and employment, economic effects of unions, the nature and causes of unemployment, and programs to combat joblessness and poverty.

340 Economic Security Fall. 3 credits.

R. Hutchins, R. Butler.
History, philosophies, and the economic and social effects of social security measures. Analysis of programs offering protection against economic loss due to industrial accident, temporary and permanent disability, illness, old age, premature death, and unemployment, as well as private and voluntary efforts to provide security, and the problems of integrating public and private programs. An examination is made of proposals for amending or modifying economic security measures, including guaranteed income proposals.

341 Protective Labor Legislation Spring. 3 credits. Open to juniors and seniors.

A survey of the nature of the problems and the basis for state and federal legislation in fields such as discrimination in employment, migratory labor, industrial health and safety, minimum wages and maximum hours, and child labor. Special attention is given to the problem of maintaining a proper balance among the efforts of industry, organized labor, and government in the development of labor standards. Proposals for amending existing legislation will be discussed.

343 Problems in Labor Economics Spring. 4 credits. Prerequisite: Econ 101-102; ILR 240 recommended.

G. Hildebrand.
An advanced course concerning the institutional organization of labor markets, economic analysis of their operation, and major policy questions involved. Principal topics include wage and employment

theory, determinants of wage level and structure, technological change, unemployment, income distribution, inflation, and incomes policy.

344 Comparative Economic Systems: Soviet Russia Spring. 4 credits.

G. Clark.
A comparative analysis of the principles, structure, and performance of the economy of Soviet Russia. Special attention will be devoted to industry and labor.

346 Economics of Collective Bargaining Spring. 3 credits.

D. Lipsky.
Economic aspects of the negotiation, terms, and effects of union-management agreements at the individual firm, industry, regional, and national levels. Topics examined include forces influencing contract demands and terms; employer adaptation to higher wages and benefits; interindustry differences in competitiveness, firm size, and markets; regional location of industry; international competition; government regulations; labor supply; inflation, recession, and unemployment.

347 Capitalism and Socialism Fall. 4 credits. Prerequisite: permission of instructor. Enrollment limited.

G. Hildebrand.
A reading seminar in some of the basic literature of the subject.

440 Health, Welfare, and Pension Plans Spring. 3 credits. Open to juniors, seniors, and graduate students.

An analysis and appraisal of private health, welfare, and pension plans. Consideration of the origin and development of employer, union, and joint programs; a critical examination of the financing, administration, and general effectiveness of the plans.

441 Income Distribution Fall. 3 credits. Open to upperclass and graduate students.

G. Fields.
The sources and distribution of income in the United States. Examination of theories, facts, and value judgments, regarding labor, entrepreneurial, and capital shares, personal incomes, and policies influencing their distribution.

498 Internship Fall or spring. 4-6 credits. For course description, see p. 212.

499 Directed Studies For course description, see p. 212.

540 (740) Labor Economics Fall or spring. 3 credits. Required of graduate students majoring or minoring in labor economics and income security and M.I.L.R. candidates. Prerequisite: Econ 101-102 or equivalent.

R. Aronson, R. Smith.
Economic issues in the employment and compensation of labor. Topics discussed include labor force growth and composition, structure and functioning of labor markets, unemployment, wage theories, wage levels and structures, the economic influence of unions, income distribution, and the problem of poverty.

541 (741) Social Security and Protective Labor Legislation Fall. 3 credits. Normally required of graduate students majoring or minoring in labor economics and income security and required of M.I.L.R. candidates.

The fundamental aspects of employee protection and income security. Emphasis will be placed upon state and federal minimum wage and hour laws, antidiscrimination legislation, employee benefit programs, social insurances, and public welfare programs. The underlying causes of the legislation,

the legislative history, the administrative problems and procedures, and the social and economic impact of the legislation will be studied.

640 Economics of Manpower Fall. 3 credits. Prerequisite: 540 (740) or equivalent; open to qualified undergraduates.

R. Aronson.
Survey of the economic background and selected issues in manpower policy and planning. Labor market processes and behavior involved in the development and implementation of manpower programs are treated systematically. Special topics will be arranged in accordance with student interests.

641 Comparative Economic Systems: Soviet Russia Fall or spring. 3 credits. Prerequisite: 344.

G. Clark.
Preparation and discussion of individual papers on selected topics concerning the Soviet economy.

642 Work and Welfare: Interactions Between Cash Transfer Programs and the Labor Market Fall. 3 credits. Prerequisite: some familiarity with microeconomics.

R. Hutchens.
Emphasizes policy issues in analyzing the relationship between the labor market and cash transfer programs such as social security, public assistance, and unemployment insurance. Explores the role of unemployment and wages in determining the level and distribution of cash transfers. Investigates the connection between cash transfers and labor supply. Topics include determinants of cash transfer demand and supply, the negative income tax experiments, and program incentives for withdrawal from the labor force (for example, incentives for early retirement implicit in Old Age Insurance). A paper on a specific program will be required.

643 Special Topics in Labor Economics Fall or spring. 3 credits.

Devoted to new policy issues and to recent literature in the field. The specific content and emphasis will vary from year to year in response to the interests of the faculty member teaching the course.

644 The Economics of Occupational Safety and Health Spring. 3 credits.

R. Smith.
The course analyzes the problem of occupational injuries and illnesses in the United States. The first section concentrates on the legal requirements, judicial interpretations, and legal implications of the Occupational Safety and Health Act. Focus will then shift to such questions as the need for, and appropriate goals of, the act; the stringency of safety standards considered in a benefit-cost framework; the difficulties in enforcing the act; and estimates of the impact of the act.

645 Economics of the American System of Private Enterprise (also Economics 355/555) Fall. 4 credits.

G. Hildebrand.
A critical examination of the private sector of the United States economy; its history, some leading current relevant issues, and its relation to theoretical and philosophical interpretations of the market economy.

646 Professional and College-Trained Manpower: Labor Market Issues and Analysis Spring. 3 credits.

R. Aronson.
Explores the nature and behavior of labor markets for highly qualified manpower, including the principal human service and technological professions. Focuses on the supply-demand relationships in these markets and the social, political, and economic institutions affecting the compensation, development, and utilization of professional and technical workers.

647 The Economics of Evaluation Spring. 4 credits.

R. Ehrenberg.
An introduction to the methodologies used by economists to evaluate the impacts of social action programs and legislation. General evaluation methodology, cost-benefit analysis, and econometrics are discussed. Case studies are considered to illustrate the uses of these techniques, to acquaint the student with major current government programs and legislation, and to estimate these programs' economic impacts. Throughout, the primary analytic framework used by the instructor is elementary microeconomics.

648 Economics of the American System of Private Enterprise (also Economics 356/556) Spring. 4 credits.

G. Hildebrand.
Continuation of 645, although 645 not prerequisite to 648.

649 Seminar on Investment in Man Spring. 3 credits. Prerequisite: 740 or equivalent.

R. Butler, G. Fields.
This seminar will cover activities that influence future monetary and psychic income by improving the resources in people. The investments covered include schooling, on-the-job training, medical care, migration, and the search for information on prices and incomes, with main emphasis on education and health. A last section covers educational planning.

744 Seminar in Labor Economics Fall. 3 credits.

R. Ehrenberg.
Reading and discussion of selected topics in labor economics.

745 Seminar in Labor Economics (also Economics 642) Spring. 3 credits.

W. Galenson.
Reading and discussion of selected topics in labor economics in the fields of theory, institutions and policy.

799 Directed Studies For course description, see p. 214.**940 Workshop in Labor Economics** Fall or spring. 3 credits.

Designed for Ph.D. students who have started to write their dissertations. Focus will be on the formulation, design and execution of dissertations. Preliminary plans and portions of completed work will be presented to the workshop for discussion.

Organizational Behavior

L. Williams, chairman; H. Aldrich, S. Bacharach, L. Gruenfeld, T. Hammer, N. Rosen, R. Stern, H. Trice, W. Whyte

120 Society, Industry, and the Individual I Fall. 3 credits.

R. Stern.
The relationship between industry and the economy as a whole and its implications for other social institutions in American society (including stratification, politics, and American values) is discussed. The course also deals with the nature of industrial organizations and of complex organizations in general, emphasizing authority relations, goals, the division of labor, and bureaucracy.

121 Society, Industry, and the Individual II Spring. 3 credits.

L. Williams.
Deals with the relationship between the individual and the organization and such basic psychological processes as need satisfaction, perception, attitude formation, and decision making. It describes and

examines the individual as a formal and informal group member. Within this area, particular emphasis is placed on leadership, problem solving, and conflict resolution.

221 Social Issues and Social Theory in Industrial Society Spring. 3 credits.

H. Aldrich.
A survey of the literature on organization-environment and interorganizational relationships.

222 Studies in Organizational Behavior Fall. 3 credits. This course is intended as a sequel to 120 and 121. Open to sophomores, juniors, and seniors.

R. Stern.
Various types of organizations—voluntary associations, business firms, and government agencies—will be discussed in light of some contemporary theories of organizations. The theories will be critically reappraised in relation to the case material presented, which will emphasize issues of corporate social responsibility.

320 The Psychology of Industrial Engineering Fall. 4 credits.

T. Hammer.
A study of the human factors in the industrial engineering of work, work places, tools, and machinery. The course will examine the aspects of individual and social psychology that operate in the work setting and that should be taken into account in the design of jobs. These include limitations of the human sensory system; individual difference in skills, abilities, motives, and needs; group dynamics; intrinsic motivation; job satisfaction; conflict.

322 Cross-cultural Studies of Organizational Behavior Fall. 3 credits. Prerequisite: 120–121 or equivalent introductory courses to the behavioral sciences including sociology and social psychology.

Comparisons of organizations in terms of cultural similarities and differences. Organizational processes in both industrially advanced and developing societies will be examined. Varying attitudes toward work, achievement, and authority will be compared. The implications of these differences for the transfer of technological and organizational change will be highlighted. Sociological and social-psychological theories and constructs provide the framework for discussion.

323 Introduction to the Study of Attitudes Fall. 4 credits. Open to juniors and seniors.

T. Hammer.
Designed to acquaint the student with what is known about (1) origins of human attitudes, (2) the determinants of attitude change, and (3) the measurement of attitude differences. Studies employing clinical, experimental, and survey techniques will be discussed. Each student will design, execute, and analyze a research study of his or her own.

324 Organizations and Deviant Behavior Spring. 3 credits. Prerequisite: one or more courses in both sociology and psychology.

H. Trice.
Focus is on the relationship between organizations and deviant behavior. Covers (1) the nature and etiology of psychiatric disorders, particularly schizophrenia, the psychoneuroses, and psychosomatic disorders; (2) organizational factors related to these disorders and to the more general phenomena of role conflict and stress; (3) an examination of alcoholism as a sample pathology, in terms of personality characteristics and precipitating organizational factors; (4) evaluation of organizational responses to deviance; (5) the nature of self-help organizations such as Alcoholics Anonymous; and (6) the structure and functioning of the mental hospital.

326 Sociology of Occupations Fall. 3 credits. Prerequisite: one or more courses in sociology.

H. Trice.
Focuses on (1) the changing character of American occupations within the context of social change; (2) occupational status—differences in income, prestige, and power and the resultant general phenomenon of social stratification; (3) vertical and horizontal occupational mobility; (4) recruitment and socialization into occupational roles; (5) the process of professionalization; and (6) comparison of personnel occupations with the career and organizational patterns of other occupations. A major sociological theme is the relationship between occupational structure and workplace structure.

327 Psychology of Industrial Conflict Fall. 4 credits.

N. Rosen.
An application of frustration theory to the analysis of conflict and stress in organizations and society. Comparisons are made between industrial relations, race relations, international relations, and other settings. Readings include behavioral research findings from a variety of studies in industry. Relevant contributions from experimental, social, and clinical psychology also are considered.

328 Cooperation, Competition, and Conflict Resolution Spring. 4 credits. Prerequisite: two courses in social psychology or equivalent.

An examination of theory and empirical evidence relating to the resolution of interpersonal, intergroup, and international conflict. Specific attention will be devoted to studying factors that contribute to the development of cooperative or competitive bonds between parties to a conflict. The following topics will be studied: the availability and use of threat, the credibility, intensity, and costs of threat; fractioning and escalating conflict. Personality and situational factors that regulate conflict intensification will be stressed.

329 Sociological Analysis of Organizations Fall. 3 credits. Prerequisites: 120 and 121 or equivalent.

S. Bacharach.
This course will attempt to introduce students to the basic issues involved in the sociological analysis of organizations. It will trace organizational theory from Max Weber to the most recent research. Among the themes to be discussed are: internal structure of organizations, communications in organizations, decentralization, organizational change, organizational technology, and organizational environment.

370 The Study of Work Motivation Fall. 3 credits. Open to juniors and seniors with permission of instructor.

T. Hammer.
Designed to acquaint the student with the basic concepts and theories of human motivation with implications for organizational change and job design. Focus is on theories of worker motivation and on research approaches and results as these apply to individuals and groups in formal organizations. Readings are predominantly from the field of organizational psychology, supplemented by relevant contributions from experimental, social, and clinical psychology. Each student will design, execute, and analyze a research study of his own.

371 Individual Differences and Organizational Behavior Fall. 4 credits. There are no formal prerequisites for this course. However, some acquaintance with the substance and methods of behavioral or social science will be helpful.

L. Gruenfeld.
This is a course in personality, culture, and organizational behavior. A framework for the study of personality in culture is presented and differences in age, sex, social class, and national character are examined. The relationship between culture and

personality is examined to illustrate the influence of the ecological, technological, and economic environments on the formation of personality.

420 Group Processes Fall. 3 credits.

N. Rosen.

An advanced undergraduate and beginning graduate course emphasizing group development. Readings and discussion will be concerned with interpersonal attraction, conformity, interaction process, leadership, group effectiveness, norms, etc. Laboratory experiences in group tasks will be provided.

421 Social Organization of the Urban Community Fall. 4 credits.

H. Aldrich.

An examination of the social organization of the urban community, focusing on ethnic and racial ghettos, the police, and business, industrial, political, and educational organizations. The urban community will be treated as a group of specialized activity systems, with a view toward studying the interrelation among the various systems. Special attention will be given to community conflict such as civil disorders. Students will be expected to take part in a research project dealing with an urban issue and to write a term paper based on the project.

422 Groups in Work Organizations Fall.

4 credits.

N. Rosen.

This is an applied social psychology course which emphasizes the building, maintenance, and renewal of purposive groups working in formal organizations. The course deals with models and variables that interact with group cohesion and performance. Structural, environmental, task, motivational, and interpersonal variables are considered. This is not intended as a sensitivity training lab; the course work is substantive and includes observation and analysis of live work groups in the field.

423 Evaluation of Social Action Programs Fall. 3 credits.

H. Trice.

A consideration of the principles and strategies involved in evaluation research; experimental research designs, process evaluation, and adaptations of cost benefits and cost efficiency to determine the extent to which intervention programs in fields such as training and therapy accomplish their goals. Consideration made of the adaptation of these strategies to large social contexts, such as child guidance clinics, mental health clinics, and programs in the poverty areas such as Head Start. The course uses a field work format and also emphasizes assessment of program implementation.

425 Sociology of Industrial Conflict Spring.

4 credits.

R. Stern.

The focus will be on the variety of theoretical and empirical evidence available concerning social, economic, and political causes of industrial conflict. The manifestations of conflict such as strikes, labor turnover, absenteeism, and sabotage, and the influence of the environments in which they occur will be emphasized.

426 Theories of Industrial Society Fall.

4 credits. Prerequisite: 120 and permission of instructor.

S. Bacharach.

This course will deal with some of the critical issues in social theory to be found in the works of Durkheim, Marx, Pareto, and Weber. Specifically, we will discuss their views of man's relation to society as compared to the views of such literary figures as Balzac, Beckett, Camus, Flaubert, Goethe, Sartre, Stendhal, and Zola.

427 The Professions: Organization and Control Fall. 4 credits.

R. Stern.

The professions (including medicine, law, and several others) are the cases used in this course to examine issues of occupational organization and control. Professional associations attempt to set standards of ethics and practice, regulate educational programs, maintain specific images, and control the supply of entrants to professions. How do such associations function and how successful is their attempt at regulation of professional conduct? How might the potential transformation of some professional associations into union-style organizations be interpreted? These issues are considered in the context of the role of professions in contemporary society.

498 Internship Fall or spring. 4-6 credits. For

course description, see p. 212.

499 Directed Studies For course description,

see p. 212.

520 (720) Organizational Behavior I Fall.

3 credits.

L. Williams.

Survey of concepts, theories, and research from the fields of organizational and social psychology as these relate to the behavior of individuals and groups in organizations. Job attitudes, motivation, performance, leadership and power, group formation, perception, and organizational climate. A preliminary course for advanced work in organizational behavior.

521 (721) Organizational Behavior II Spring.

3 credits.

S. Bacharach.

Formal organizations will be studied from the perspectives of classical organization theory, human relations theory, and comparative and cross-cultural analysis. Also consideration in some detail of the contemporary theories and quantitative approaches to organizational structure. Intended to be preliminary to more intensive work in organizational behavior.

620 Theories of Organizational Change, Innovation, and Evaluation Spring. 4 credits.

Prerequisite: two organizational behavior courses at the 300 level, or advanced courses in sociology or psychology.

H. Trice.

This seminar examines the dynamics of individual, structural, and environmental factors operating in organizational change in general, and in the implementation and use of innovations within formal organizations in particular. The role of evaluative research in assessing the effectiveness of the implementation of innovations and in determining organizational effectiveness will be analyzed. Several case studies of organizational change in government, unions, and private industry will be examined. The emphasis is upon conceptual frameworks for analyzing organizational change and mounting evaluative research on innovations. Readings are interdisciplinary and include sociology, psychology, and political science.

621 Growth of the World Capitalist-Industrial System Spring. 4 credits. Prerequisite: permission

of instructor. Limited enrollment.

H. Aldrich.

This course will examine the origins of the world-scale capitalist system from the sixteenth century through the beginnings of large-scale industrialization in the U.S. in the late nineteenth century. Emphasis will be on concepts and methods for world-systems analysis, rather than on detailed historical knowledge of a specific era. The relevance of world-systems analysis for current international sociopolitical phenomena, including underdevelopment and the rise of multinational

corporations, will be discussed. Students will be expected to play a major role in leading class discussions, as well as choosing topics for discussion.

622 The Organization and its Environment

Spring. 3 credits. Prerequisites: two organizational behavior courses at the 300 level, or advanced courses in sociology or psychology.

H. Aldrich.

A survey of the literature on organization-environment and interorganizational relationships. Emphasis will be on two tasks: developing typologies of interorganizational relations, and exploring methods of measuring or quantifying such relations. Students in the seminar will be expected to write a research paper in which they apply an organization-environment or interorganizational perspective to a particular set of organizations.

623 Critical Issues in Social Theory Spring. 4 credits.

S. Bacharach.

This course will attempt to examine a variety of critical issues in the analysis of the relationships of man and society. We will attempt to delineate what are now and historically have been the persistent points of controversy. Among the readings to be considered will be *The Structure of Social Action* by Talcott Parsons; *Towards a General Theory of Action* by Parsons and Shils; *Knowledge and Human Interest* by Habermas; *Conflict Sociology* by Randall Collins; *Elementary Forms of Religious Life* by Emile Durkheim; and *Character and Social Structure* by Hans Gerth and C. Wright Mills.

627 Leadership in Organizations Spring.

3 credits. Prerequisites: two organizational behavior courses at the 300 level, or advanced courses in sociology or psychology.

N. Rosen.

A seminar designed to examine theories and research findings from the behavioral sciences that are relevant to leadership and the influence process in groups and organizations. Personality, situational factors, intergroup processes, interpersonal perception, as well as motivation to lead and to follow, will be discussed. The implications for leadership training, organization development, and action research will be explored.

628 Cross-cultural Studies of Organizational Behavior

Fall or spring. 3 credits. Prerequisite: 520 (720) or 521 (721) or equivalent.

L. Gruenfeld.

An advanced seminar that will deal with cross-cultural studies in values, interpersonal relations, and organizational structure. The appropriateness of various organizational strategies to certain cultural and subcultural contexts will be considered. Problems relating to authority, decision making, achievement motivation, and change will be highlighted.

629 Seminar on Personality and Organization

Fall. 3 credits. Prerequisites: 520 (720) and 521 (721) or permission of instructor.

L. Gruenfeld.

A seminar that attempts to integrate available research and focuses on both personality and organizational variables. Investigations in the field of culture and personality will be examined for their utility in the understanding of organizational functioning. The relationship of personality to economic development also will be examined. Each participant will be encouraged to write a term paper on the interrelationship of technology and values.

670 Sociological Study of Power Fall. 3 credits.

S. Bacharach.

This course will come to grips with the empirical, conceptual, and theoretical issues involved in the study of power. Power will be analyzed within the context of an interaction paradigm and thus, while the major emphasis of this course will be on the

examination of power dispersion in organizations and communities, relevant social-psychological literature also will be drawn upon. Among the various works to be considered are those of Gamson, Blau, and Dahl.

671 Government Bureaucracies in Social and Economic Development Fall. 4 credits.

W. Whyte.

The course focuses on the dynamics of behavior within government organizations and between government officials and the public, with special emphasis upon government programs designed to improve the condition of poor people. Readings will deal with developing nations and with the United States. Special attention will be given to manpower and rural and urban community development programs.

672 Urban Politics and Public Policy Fall. 3 credits.

S. Bacharach.

Deals with the relationship between community processes and structures and public policy outputs. Specifically, it will focus on such issues as the limitations of the classic elitist/pluralist debate and the recent controversy concerning centralization or decentralization of local government and the delivery of social services. Treatment of these will stress the value of applying sociological theory to questions of public policy. A primary concern will be the integration of organizational and community theory.

673 Cross-cultural Explorations of Individual Differences Fall. 3 credits.

A data-bank analysis of the relationship between socioeconomic status, socialization values, ethnicity, and various indices of individual differences such as interpersonal trust, propensity to take risks, self-concept, cognitive style, and job preferences.

674 Social Regulation and Control of Institutions Fall. 3 credits. Prerequisites: two organizational behavior courses at the 300 level, or advanced courses in sociology or psychology.

R. Stern.

Interorganizational relations will be examined in terms of networks of control agents and target objects. The dynamics of control relationships based on political bargaining, the distribution of power, economic rewards and costs, and historical circumstances will be examined in the context of their evolution through organizational adaptation to the environment. Subject matter will include theories or organizational change and application of a control perspective to the institutions of American business, government regulations, athletics, and education.

675 Theories of Industrial Society Spring. 2 or 4 credits. Prerequisites: two organizational behavior courses at the 300 level, or advanced courses in sociology or psychology.

S. Bacharach, R. Stern.

A concentrated examination of the sociology of industrial conflict. The seminar focuses on classic formulations of conflict theory in sociology, then examines historical and current empirical work on the social, political, and economic causes of industrial conflict. Forms of conflict to be studied include strikes, turnover, absenteeism, and sabotage. Some discussion of the implications of various types of worker management of firms for industrial conflict will be included. Theories of organizations and communities will deal with the parallel development of the organization and community literature. Emphasis will be placed on similarities in theoretical constructs and methodological dilemmas.

676 Systems of Labor Participation in Management Fall. 4 credits.

W. Whyte.

The course examines the theory and practice of labor participation in systems ranging from informal

shop level participation to self-management. Attention also is given to projects involving the restructuring of work and efforts to improve the quality of working life. Readings and lectures will cover the cases drawn from various countries, with emphasis upon the United States, Europe, and Latin America.

678 Theories of Work Motivation Spring. 3 credits.

T. Hammer.

Theories of motivation will be studied as these relate to the design of work settings. The focus of the course will be two-fold: to increase the students' understanding of the theoretical and empirical bases of work motivation and to analyze the applications of the theories to the issues of task design, job enrichment, reward systems, and organizational structure.

722 Theories of Organization Fall or spring. 3 credits, graduate; 4 credits, undergraduate. Open to undergraduates who have had 371 with permission, and graduates who have had 520 (720) and 521 (721).

L. Gruenfeld.

Deals with a set of readings in two subject areas discussed by the professor in previous courses: (1) organizations as political systems, and (2) conceptions of organizations, societies, and individuals in terms of a conceptual framework which distinguishes between community and society. The theme that holds these two sets of readings together focuses on behavior in coercive and utilitarian organizations as distinguished from behavior in communal and voluntary organizations.

723 Behavioral Research Theory, Strategy, and Methods I Fall. 4 credits. Designed to meet the needs of M.S. and Ph.D. candidates majoring in organizational behavior, but other graduate students may enroll.

L. Williams.

Material studied in 723 and 724 will include: (1) theoretical, conceptual, and ethical questions; (2) survey research and attitude scaling procedures; (3) laboratory research methods; (4) participant observation and interview methods; (5) use of documents and qualitative data analysis. Will provide students with important philosophical background for doing research and expose them to a well-balanced, interdisciplinary set of quantitative and qualitative research tools.

724 Behavioral Research Theory, Strategy, and Methods II Spring. Credit variable. Permission of the instructor required. Must be taken in sequence with 723 except by petition. Designed to meet the needs of M.S. and Ph.D. candidates majoring in organizational behavior but other graduate students may enroll.

T. Hammer.

See 723 for course description.

725 Analysis of Published Research in Organizational Behavior Fall. 3 credits. Prerequisites: 520-521 (720-721), and one year of statistics.

N. Rosen.

An advanced research methods course which examines critically published research papers in terms of research design and method as well as theory in the field of organizational behavior.

726 Organizational Behavior III Spring. 3 credits. Prerequisite: 520-521 (720-721) or equivalent.

S. Bacharach.

A team-taught comparison of different disciplinary approaches to organizational analysis and models. Emphasis will be placed on integrating different disciplinary approaches to selected organizational phenomena such as change and innovation, decision making and information processing, reward structures, or conflict resolution.

728 Seminar on Work Motivation Spring. 2 or 4 credits. Prerequisite: 520-521 (720-721).

T. Hammer.

Two independent but sequence-connected mini-courses.

(1) *Theories of Work Motivation*: 6½ weeks. 2 credits. This course will provide an overview of basic concepts of human motivation with implications for theory and research. The purpose is to provide the students with a basic understanding of theoretical issues involved in work motivation and knowledge of basic research approaches as these apply to individuals and groups in formal organizations.

(2) *Seminar on Job Design*: 6½ weeks. 2 credits. In the seminar, theories underlying the design of jobs will be examined together with empirical research available in the job design area. The course will cover early theories and research in job design, from scientific management and later developments, with particular attention paid to the recent emphasis on job design through job enlargement and job enrichment.

799 Directed Studies For course description, see p. 214.

Personnel and Human Resource Management

W. Wolf, chairman; T. DeCotiis, G. DeLaCruz, L. Dyer, J. Farley, F. Foltman, W. Frank, F. Miller, S. Muller, R. Risley, W. Wasmuth

260 Personnel Management Fall or spring. 3 credits.

G. DeLaCruz.

Focuses on the management of personnel in organizations. Deals with manpower planning, recruiting, selection, wage and salary administration, training, performance appraisal, and the administration of personnel department activities. Special attention is paid to government manpower policy and its implications for personnel management.

261 Manpower and Public Policy Spring. 3 credits. Open to sophomores, juniors, and seniors.

F. Foltman, S. Muller.

The course concentrates on the macroeconomic facets of the United States manpower policies and programs: their history, development, implementation, evaluation, impact, theoretical foundation, and future.

262 Urban Problems and Manpower Programs Fall. 4 credits. Prerequisite: 261 or equivalent, or permission of instructor.

R. Risley.

A seminar concerned with selected urban problems and manpower service programs developed to cope with them. Consideration is given to both public and private programs: their organization and comparative methods of operation. Each student is required to conduct a study of a selected organization involving field research.

363 Techniques and Theories of Training in Organizations Fall. 3 credits.

F. Foltman, W. Frank.

A course directed toward (1) examination of basic psychological formulations of learning relevant to the training of personnel in organizations; (2) review of the methods available for use in organizational training.

364 Communication in Organizations Fall. 3 credits.

W. Frank.

Devoted primarily to the study and analysis of organizational communication. Emphasis will be placed on the examination of the communication

process, models, meaning and language, channels and networks, and interpersonal and intergroup issues.

366 Women at Work (also Women's Studies 366)

Fall. 4 credits. Prerequisite: 260 or equivalent.

J. Farley.

This course examines various aspects of female occupational roles in twentieth-century United States. Historical, social, and legal factors that influence women's choice of careers, work socialization and training, and subsequent labor market experience are considered. Working women's entry-level jobs, opportunities for advancement, and income are compared to men's.

367 Organization Development: Strategy and Practice Fall. 3 credits. Open to graduate students.

F. Foltman.

The study of models, theories, and methods used in changing entire organizations or major organizational subunits. Consideration will be given to current methods and strategies for improving individual or group performance including laboratory training, consultancy, sensitivity training, grid training, and other planned interventions. Organization development approaches are compared and contrasted with classical individual training models.

368 Manpower and State Legislative Process

Spring. 4 credits. Upperclass students with permission of instructor.

R. Risley.

This course is designed to provide students with an understanding of the legislative process in New York State and current issues in the area of manpower and related topics being considered by the legislature. Each student will be required to work with a legislator to research an assigned topic and prepare appropriate legislative memoranda as a major part of the course work.

462 Occupational Analysis and Manpower Planning Spring. 3 credits. Prerequisite: 260 or equivalent.

F. Miller.

The course combines a practicum aspect—intensive practice in job analysis observations and interviews—with systematic study of how occupational information so obtained can be used in manpower planning at the level of the community or the work organization.

464 Personnel Problems Fall. 3 credits.

Staff.

This course provides students with an opportunity to meet practitioners and to link personnel theory with current practice.

465 Manpower Issues and Applications Fall. 3 credits. Prerequisites: 261, 661, 240, or equivalent.

S. Muller.

Provides an overview of economic and social issues involved in national manpower policies and their applications to particular industrial or occupational labor markets. Students will study an industry or occupation of their choice, to show how labor is allocated within this market, what the social impacts of these processes are, and how existing public and private manpower policies affect these outcomes.

466 Women in Blue Collar Occupations (also Women's Studies 466) Spring. 3 or 4 credits.

J. Farley.

This course will focus on women's participation in blue collar occupations in the United States. Sources of evidence will include census data, evidence from social science surveys, and personal accounts. Students enrolled for 4 credits will participate in a class project.

498 Internship Fall or spring. 4–6 credits. For course description, see p. 212.

499 Directed Studies For course description, see p. 212.

560 (760) Personnel Management Fall or spring. 3 credits.

T. DeCotiis, L. Dyer.

A survey course covering the major areas of manpower and organizational management as they relate to human behavior in work organizations. Consideration is given to such aspects of personnel work as job attitudes, motivation, manpower planning, recruitment and selection, training, management development, organization development, and compensation. Emphasis is on the application of theory and research to the solution of personnel problems.

659 Career Planning and Development Fall. 3 credits.

F. Foltman.

Consideration of the individual's career planning and development as well as career planning and development from the organization's perspective.

660 Seminar in Personnel or Human Resource Management Fall or spring. 3 credits.

Staff.

A "floating" seminar designed to give faculty and students an opportunity to pursue specific topics in detail. Topics vary from semester to semester. Interested students should consult current course announcements for details.

661 Public Policy and Development of Human Resources Fall. 3 credits.

F. Foltman.

Analysis of the need for development of human resources, trends in work force requirements and implications for public policy, the role of government and educational institutions in providing development programs, and the effectiveness of such programs. Examination of the rationale, organization, and administration of specific programs, such as apprenticeship, vocational and technical schools, technical institutes, university programs, and others.

662 Management Training Simulation: Public Policy Issues in Social Agencies Fall. 3 credits. Prerequisite: 260 or equivalent.

W. Wasmuth.

The seminar will be conducted through the technique of simulation applied to a rehabilitation workshop and a hospital. Although the substantive material relates to health services management, simulation as an approach to training managers has wider and growing importance to all types of organizations. Students are provided with realistic problem-solving situations involving boards of directors, community resources, public policy issues, and state and federal agencies.

663 History of Contemporary Management Thought Fall. 3 credits.

W. Wolf.

A critical review of the works of the major contributors in terms of the development of their ideas and their impact. Tape recorded interviews with Barnard, Simon, Drucker, Urwick, and others will be studied.

664 Management and Leadership Development Fall. 3 credits. Prerequisite: 260 or equivalent.

T. DeCotiis, L. Dyer.

Consideration is given to both individual and organizational determinants of managerial effectiveness and methods used to influence these. Topics include defining and measuring managerial effectiveness, motivation theory, staffing at the managerial level, individual training and development, and organization analysis and development.

665 Case Studies in Personnel Administration Fall. 3 credits.

T. DeCotiis, W. Wasmuth.

A seminar devoted to an analysis of personnel management activities and their impact on organizational objectives and administration. Cases, incidents, and field data, derived from a variety of institutional settings, will provide a framework for examining and explaining the various roles played by personnel managers. When it is appropriate, attention will be given to the evolution and formalization of personnel activities within growing small business organizations.

666 Administrative Theory and Practice

Spring. 3 credits. Prerequisites: for advanced undergraduates, 120–121 or its equivalent and permission of instructor; for graduate students, 520 (720) or permission of instructor.

W. Wolf.

A general survey of the theory and practice of administration. Attention focuses on organizational differentiation and its implication for managerial practices. Taught around cases and field studies. Topics include theories and approaches to administration, organizational diagnosis, managerial practices, and organizational dynamics.

667 Current Issues and Research in Human Resources Development Fall or spring. 3 credits.

F. Foltman.

A graduate seminar centering on selected issues and relevant research involved in the development of managerial and work-force skills (particular emphasis to be determined with the seminar group). Papers and class discussions might concentrate on such topics as management development, impact of technological change on training programs, development of scientific and professional personnel, or labor union education.

668 Manpower Planning, Selection, and Utilization Fall. 3 credits. Prerequisites: 260 or equivalent and one year of statistics; working knowledge of factor analysis, item analysis, regression analysis, and ANOVA.

T. DeCotiis, L. Dyer.

An analysis of the staffing process as applied to employing organizations. Topics examined include sources of manpower, methods used to assess individual differences, methods used to assess organizational job requirements, problems associated with man-job matching, career planning, employee separations, and the relationship between the staffing process and other organizational processes.

669 Administration of Compensation Spring. 3 credits. Prerequisite: 260 or equivalent.

G. DeLaCruz.

The development and administration of wage and salary programs. Major emphasis is given to the role of compensation in attracting, retaining, and motivating employees. Topics investigated include motivation theory, factors influencing compensation levels, job evaluation, forms of compensation, including incentive plans and fringe benefits, special issues of managerial compensation, and problems of compensation control.

690 Top Management Personnel Strategies and Policies Spring. 3 credits.

W. Wolf.

This course presents personnel management policies and strategies from the perspective of top management. It does so by bringing to the class vice presidents of personnel of major United States corporations and providing the students with an opportunity to get to know these men and to find out what they and their companies are doing. Areas covered include the job of the top personnel officer, formal and informal organization relative to managing the personnel function, current issues, and problems of top-level personnel managers.

220 Interdepartmental Courses

691 Human Resource Planning Spring. 4 credits. Prerequisites: 260 or 560 (760) or the equivalent and one course in statistics.

L. Dyer.

This seminar focuses on the process of human resource planning as practiced by public and private employers. Included are such topics as: forecasting human resource needs, programming, techniques to meet forecasted needs, and methods of controlling an organization's supply of human resources. The seminar is organized around a computer simulation game in which students make policy and program decision over a "two year" period for a fictional organization. Decisions are evaluated on the basis of their contributions to the organization's human resource and profit objectives.

692 The Appraisal and Diagnosis of Organizations Fall. 3 credits. Prerequisite: 120 and 260.

W. Wolf.

This seminar focuses upon the understanding of organizations in a holistic framework. It deals with the process of diagnosis, techniques for gathering data, analysis of the functional areas of management, and interpretation and synthesis of findings. Field study and laboratory training are emphasized. The point of view taken is that of the administrator and/or consultant.

693 Design and Administration of Training Programs Fall. 3 credits. Prerequisite: 260 or equivalent.

F. Foltman, W. Frank.

An analysis and exploration of the training and retraining function as applied in business, government, and industrial organizations. Consideration is given to learning theory as well as to the concept framework and practical approaches with which learning activities are developed at the workplace at all levels.

694 Seminar on the Theory and Practice of Organization Development Spring. 3 credits.

W. Wolf.

This seminar focuses on organization practices for self-renewal and conflict management. The point of view taken is that of a third party interventionist and the course focuses upon techniques for diagnosis and treatment of organizational problems. Topics include: the third party's role and entry dynamics; clinical diagnosis of functioning organizations; confrontation; goal setting; mirror exercises; force field analysis; team building exercises; structural changes and job design issues. Emphasis is on experiential learning.

695 Local Government Manpower Planning and Administration Spring. 4 credits. Students should have previous academic courses and/or experience in local government or manpower programs.

R. Risley.

A seminar devoted to the study of local government manpower planning and administration. Students will study federal and state functions and the activities of local governments, particularly counties in New York State, in the implementation of manpower programs.

696 Personnel Administration and Government Regulations Fall. 3 credits.

R. Risley.

A survey and analysis of government regulations affecting manpower administration and personnel management in nongovernment organizations, examining the framework within which management must operate. Government agencies' methods of enforcement of such regulations and the firm's responsibilities for failure to comply with these legal requirements will be considered.

697 Sex Roles and Career Patterns (also Women's Studies 697) Spring. 3 or 4 credits. Prerequisite: graduate standing or six credits of personnel and human resource management or women studies, or permission of instructor.

J. Farley.

An examination of the extent to which sex-role expectations affect career patterns of women and men in twentieth-century United States.

698 Manpower Programs for the Unemployed

Fall. 3 credits. Prerequisites: 261 or 262 or permission of the instructor.

S. Muller.

Study of the design and delivery of local manpower programs for the unemployed and "hard-to-employ." The following general areas will be analyzed: the present delivery system, decentralization and subcontracting, analyzing the job requirements of the local labor market and the needs of the unemployed, utilization of career and training resources at the local level, evaluation, and recycling.

699 The Debate Over Full Employment. Spring. 3 credits. Prerequisites: 261, 661, or 240, 560 (760); or permission of the instructor.

S. Muller.

This course will focus on alternative points of view regarding what constitutes a satisfactory level of employment consistent with social justice and economic stability, as well as the pros and cons of various policies aimed at maintaining "satisfactory" employment levels. Class discussions will concentrate on such topics as the 1946 Employment Act, the proposed "Equal Opportunity and Full Employment" (Humphrey-Hawkins) Bill, the relationship between national employment policy and social problems, and the relative success of various European manpower programs.

761 Occupational Aspects of Manpower Studies

Spring. 3 credits. Prerequisite: 760 or equivalent.

F. Miller.

After learning how job analysis is done and how it contributes to conventional personnel practices, the seminar will consider individual and community needs for systematic information about occupations. Special attention will go to problems experienced by youth, especially minority youth, and women of all ages in getting information about and access to rewarding careers in organization and professions.

799 Directed Studies For course description, see p. 214.

650 Manpower and Collective Bargaining Problems in the Construction Industry Spring. 3 credits. Open to seniors and graduate students, and non-ILR students with permission of the instructor.

D. Cullen, F. Foltman.

The seminar will examine selected manpower and collective bargaining problems in the construction industry, such as supply and demand of construction manpower; the Negro and the building trades; skilled manpower forecasting and planning; skill requirements; education and training; personnel management policies and practices; the wage-price issue; the closed shop; featherbedding; jurisdictional disputes; and problems of bargaining structure. Individual research is required.

Interdepartmental Courses

150 Labor Problems in American Society Fall or spring. 3 credits.

R. Aronson, O. Mitchell.

A survey for students in other divisions of the University. An analysis of the major problems in industrial and labor relations; labor union history, organization, and operation; labor market analysis and employment practices; industrial and labor legislation and social security; personnel management and human relations in industry; collective bargaining and the settlement of industrial disputes; and the rights and responsibilities of employers and employees.

151 Personnel Management for Managers Fall or spring. 3 credits. Not open to ILR students.

F. Miller, W. Frank, W. Wasmuth.

A study of the personnel function in work organizations with special emphasis on the responsibilities of managers and supervisors. After reviewing evidence from behavioral science research on factors affecting work behavior, we look at such major personnel areas as recruitment, selection, and placement; training; compensation and benefits, and discipline.

Law School

First-Year Courses

- 500 Civil Litigation and Professional Responsibility
- 501 Constitutional Law
- 502 Contracts
- 503 Criminal Justice
- 504 Practice Training I
- 505 Practice Training II
- 506 Property
- 507 Torts

Second-Year Elective Courses

- 510 Accounting for Lawyers
- 511 Commercial Law
- 512 Commercial Paper and Banking Transactions
- 513 Enterprise Organization
- 514 Evidence
- 515 Federal Income Taxation
- 516 Process of Property Transmission
- 517 Trusts and Estates I
- 518 Trusts and Estates II

Second- and Third-Year Elective Courses

- 519 Administrative Law
- 520 Advanced Civil Procedure
- 521 Antitrust Law
- 522 Civil Liberties
- 523 Comparative Law
- 524 Conflict of Laws
- 525 Contemporary Legal Theory
- 526 Copyright, Trademark, and Patent Law
- 527 Criminal Procedure
- 528 Debtor-Creditor Law
- 529 Early Development of Anglo-American Common Law
- 530 Environmental Law
- 531 Estate and Gift Taxation
- 532 Family Law
- 533 Federal Courts
- 534 Institutional Investors
- 535 International Law
- 536 Jurisprudence and the Legal Process
- 537 Labor Law

- 538 Land Financing
- 539 Land-Use Planning
- 540 Law Practice Dynamics
- 541 Law, Society, and Morality
- 542 Local Government
- 543 Natural Resources
- 544 New York Practice
- 545 Remedies
- 546 Securities Regulation
- 547 Social Security Law
- 548 Supervised Writing or Teaching
- 549 Taxation of Business Enterprises
- 550 Trial Practice
- 551 Trial Techniques I and II
- 552 Unfair Trade Practices
- 553 Welfare Law

Problem Courses

- 555 Antitrust Policy Seminar
- 556 Arbitration and Public Policy
- 557 Corporate Practice
- 558 Criminal Trial Process Clinic
- 559 Decedents' Estates Practice
- 560 Economic Regulation Clinic
- 561 Energy Regulation Seminar
- 562 Environmental Seminar
- 563 Ethics of Corporate Practice
- 564 Evidence Codification and Reform
- 565 Family Law Clinic
- 566 Federal Corporation Law
- 567 Fiduciary Administration
- 568 Income Maintenance Law
- 569 International Business Transactions
- 570 International Environmental Law
- 571 International Tax Planning
- 572 Juvenile Justice
- 573 Labor Relations Law Seminar
- 574 Law and Medicine
- 575 Legal Aid Seminar I
- 576 Legal Aid Seminar II
- 577 Organized Crime Control
- 578 Problems in Environmental Law
- 579 Problems in Legislation
- 580 Problems of Urban Development

- 581 Professional Morality and Ethics
- 582 Science, Technology, and Law

Division of Nutritional Sciences

Malden C. Nesheim, director; Marjorie M. Devine, associate director for academic affairs; E. Elizabeth Hester, graduate faculty representative; Mary Morrison, division honors representative; J. Appgar, G. Armbruster, R. E. Austic, A. Bensadoun, C. A. Bisogni, T. C. Campbell, G. R. Combs, W. L. Dills, J. L. Gaylor, J. D. Haas, J. P. Habicht, L. R. Hackler, R. Holmes, B. Hopkins, R. Klippstein, L. P. Krook, S. Kumanyika, M. C. Latham, D. A. Levitsky, B. A. Lewis, M. Mapes, D. B. McCormick, N. Mondy, C. Olson, M. Pimentel, W. G. Pond, J. M. Rivers, D. A. Roe, D. Sanjur, R. Schwartz, M. L. Scott, V. Utermohlen, E. Valetin, D. VanCampen, P. J. VanSoest, K. Visnyei, R. G. Warner, R. H. Wasserman, E. K. Woodruff, L. D. Wright, R. J. Young, D. B. Zilversmit

The Division of Nutritional Sciences is an intercollege unit, administered jointly by the College of Human Ecology and the College of Agriculture and Life Sciences. The division coordinates and unifies undergraduate teaching, graduate training, research, and extension activities related to nutritional sciences. Students are admitted to the undergraduate major through the College of Human Ecology. Students in the College of Agriculture and Life Sciences may develop a nutritional science concentration in consultation with an appropriate adviser through the General Studies Program and must meet the requirements established by the division. Courses in the division may be used to meet graduation requirements in both the College of Human Ecology and the College of Agriculture and Life Sciences.

Nutritional sciences constitutes a broad area of study that draws upon diverse disciplines to develop an understanding of the interrelationships among food, nutrition, and health. Division programs focus on the generation of new knowledge through research and the use of knowledge to alleviate human problems. Major areas of study involve: (1) nutrition: the physiological and biochemical dimensions of nutrition in relation to human health; (2) food science: the quality, acceptability, and use of food by human beings; and (3) applied nutrition: the application of knowledge of nutrition, dietetics, and food science to the nutritional well-being of individuals from all age groups and socioeconomic levels.

The division offers programs leading to the bachelor's, master's, and doctoral degrees. Graduate study in nutritional sciences is administered by the graduate Field of Nutrition.

Programs for Undergraduate Majors in the Division

The core of the undergraduate major focuses on human nutrition and requires preparation in appropriate areas of physical and biological sciences and professional courses in nutritional sciences. All majors take basic course work in chemical and biological sciences, mathematics, and appropriate social sciences. Some choice is possible among required basic sciences. This common core of basic disciplines provides the foundation for a concentration of professional courses in nutrition, food, or community nutrition. These options are described below. The undergraduate program is designed so that a student may prepare for a first-level position in the

profession, a dietetic internship, or graduate study in the fields of nutrition, food science, medicine, community nutrition, and the biological sciences. Further, a nutritional science concentration may be combined with other majors in the two colleges.

The nutrition option builds on the basic science core to give a solid foundation in theoretical and applied aspects of nutrition. Emphasis is placed on laboratory work. This option is designed for students who are motivated in the biological sciences and who wish, with further training, to enter careers in nutrition research, nutrition service professions, or medical sciences.

The food option provides students with a background in basic and applied sciences. It develops understanding about the composition and treatment of food that affect its quality, acceptability, and use. Students completing this option may enter graduate programs related to the science of food or nutrition or they may enter first-level positions in food testing, product development, and quality control as well as educational programs in government, industry, or industry-supported organizations.

The community nutrition option provides a strong background in basic and nutritional sciences. In combination with carefully selected courses in the social sciences, this option enables the professional nutritionist to help people translate knowledge about nutrition and food into practice. It is designed for students whose interests are directed toward public service professions. Students may continue study in graduate school or enter first-level positions in extension teaching, community nutrition programs, food regulatory agencies, or government and business information services.

By appropriate selection of electives, students wishing to specialize in **dietetics** may meet the academic requirements of the American Dietetic Association (ADA). These are similar but not identical to the major requirements.

Details of the minimum requirements for the major and various concentrations as well as ADA requirements may be obtained from the division's Undergraduate Office, 335 Van Rensselaer Hall.

Students majoring in the division should consult with a division faculty member about concentrations and course selections for particular career interests. In general, more work will be necessary in the sciences and division courses for specific career goals than the minimum listed for a major.

An honors program is offered by the division leading to a B.S. degree with honors in nutritional sciences. Students in the honors program are given the opportunity to do independent study. Criteria for selection of students include scholastic achievement in the sciences and professional courses, cumulative grade point average, and motivation for independent study. Decisions on admission to the program are made by a faculty committee near the end of the spring semester of the sophomore year. Other students, including students transferring into the division major at the junior level, will be considered for admission upon written request. The deadline for entry into the program is the beginning of the second semester of the junior year. A description of the program can be obtained from the division's Undergraduate Office or from the division's honors representative.

Courses Recommended for Nonmajors

Courses are open to all students of the University. For nonmajors, nutritional science courses strengthen preparation for careers in biological sciences, medicine, agriculture, and food science as well as those related to human services such as education and social service. Introductory courses in nutrition (NS 115) and food (NS 146) are available to the nonmajor as well as special interest courses (NS 222, NS 325). Students with college courses in chemistry, biological sciences, and nutritional

sciences may elect advanced courses, such as NS 231, 246, 431, and 446. Graduate students in other fields who want basic work in nutrition should consult with a faculty member.

Graduate Program

The breadth and depth of faculty interests make it possible for students with a wide variety of interests to be accommodated. Graduate students pursuing the M.S. or Ph.D. degree may concentrate in human nutrition, general nutrition, animal nutrition, international nutrition, food, and nutritional biochemistry. A Master of Nutritional Science (MNS) degree is offered in clinical nutrition. This program involves both academic and clinical training. Research and teaching assistantships and fellowships are available to qualified graduate students. Students who want detailed information about graduate programs in the division should write to the Graduate Faculty Representative, Division of Nutritional Sciences, Cornell University, Martha Van Rensselaer Hall, Ithaca, New York 14853.

115 Ecology of Human Nutrition and Food Fall or spring. 3 credits. S-U grades optional.

Prerequisites: *Fall*: high school biology; junior and senior students with advanced biological science background must have permission of the instructor. *Spring*: A one-semester college biology course or permission of the instructor.

M W F 9:05. M. Devine.

An introduction to the field of human nutrition and food that focuses on the mutual relationships between man and his biological and physical environment. Includes study of human nutritional needs, problems encountered in providing food to meet nutritional needs, relationships among man's physiological needs, his sociocultural system, his food, and the significance of these relationships to the attainment of health.

146 Introductory Foods Fall or spring. 3 credits. Limited to 16 per section. S-U grades optional.

Prerequisite or concurrent registration in NS 115 and permission of instructor.

Lec, Fall M 1:25; Spring M 10:10. Lab, W F 10:10-12:05; or T Th 10:10-12:05 or 2:30-4:25.

M. Pimentel.

Criteria for evaluating the practice of the science of food and nutrition. Laboratory includes an introduction to the physicochemical properties of food and the relationship of these properties to preparation, techniques and food quality. Some meal preparation, focusing on human nutritional needs and the management of money and time, is included.

222 Maternal and Child Nutrition Spring. 3 credits. S-U grades optional. Prerequisites: NS 115 and a college biology course.

M W F 11:15. V. Utermohlen.

Involves a study of the nutritional requirements in pregnancy, lactation, and growth through adolescence. Topics include the relationship between maternal diet and pregnancy outcome; analysis of different methods of infant feedings; nutritional status of pregnant women, children, and adolescents in the United States; and the interrelationships between nutrition and mental development.

246 Introduction to Physicochemical Aspects of Food Fall or spring. Limited to 18 per section. 4 credits. S-U grades optional. Prerequisites: NS 146 and a college course in organic chemistry or biochemistry.

Lec, T Th 9:05; lab, T Th 10:10-12:35 or M W 2-4:25. E. E. Hester.

A study of (a) the colligative properties of solutions; (b) colloidal systems—sols, gels, foams, and emulsions; (c) physical and chemical properties of the major groups of foods, the effect of basic methods of food preparation and preservation on these properties, and their relation to food quality,

especially color, flavor, and texture. Laboratory experience in comparative cookery provides an introduction to the experimental study of food and illustrates the functions of ingredients and effect of treatment on food quality.

300 Special Studies for Undergraduates Fall or spring.

For special arrangement of course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. The form, signed by both the instructor directing the study and the associate director for academic affairs, is filed at course registration or during the change-of-registration period.

301 Nutritional Aspects of Raw and Processed Food (also Food 301) Spring. 3 credits.

Prerequisite: NS 115 or permission of instructor.

M W F 9:05. Instructor to be named. Deals with those principles that relate processing procedures to the nutritional value of food.

302 Orientation of Field Study in Extension

Fall. 2 credits. S-U grades only. Enrollment limited to 10. Prerequisites: NS 231 and permission of instructor.

F 1:25-3:25, plus hours to be arranged for field trips to nearby counties as students' schedules permit. R. Klippstein.

Working closely with the extension faculty, each participant will prepare and test an educational tool suitable for a selected lay audience in a county extension program setting. Experiences will include visits to field sites, determination of the characteristics and needs of the selected audience, and preparation of program materials using a variety of media. Opportunity to use the materials in a county extension program will be arranged. Self and group evaluation will be practiced.

325 Sociocultural Aspects of Food and Nutrition

Fall. 3 credits. Prerequisites: NS 115, a college course in anthropology or sociology.

M W F 2:30. D. Sanjur. Perspectives will be developed for understanding the environmental and sociocultural determinants affecting the formation of eating patterns. Emphasis is on ethnicity and food habits, both in a national and international context.

331 Physiological and Biochemical Bases of Human Nutrition Spring. 3 credits. S-U grades optional. Prerequisites: Bio S 330 or 331 and NS 115 or equivalent.

M W F 10:10. C. Campbell and M. C. Nesheim.

The course focuses on the biochemical and physiological bases for human nutrition requirements. Includes treatment of energy metabolism, food intake regulation, protein amino acids, minerals, vitamins, and determination of nutritional status.

332 Laboratory in Nutrition. Fall. 2 credits.

Limited to 16 students per section. Prerequisites: NS 231, NS 232, Chem 251-253 or equivalent, Bio S 331 or concurrent registration, and permission of instructor. Will be offered only in 1977-78 for students who have taken NS 232 but not 332 (3 credits) or Bio S 430.

Lec, T 8; labs, W or Th 1:25-4:25.

332 Laboratory in Nutrition Spring. 3 credits.

Limited to 16 students per section. Prerequisites: permission of the instructor and NS 331 or concurrent registration. Not open to students who have taken NS 232.

M W 1:25-4:25 or T Th 1:25-4:25. M. Stipanuk. Introduction to principles and procedures of experimental design, analytical techniques, and data analysis in human nutrition. Emphasis on methods of analysis of nutrients and metabolites in

food, tissues, and body fluids. Application of these methods in assessing physiological and biochemical responses to alterations of nutrient intake in animal and human studies.

346 Consumer Food Issues Fall. 2 credits. S-U grades optional. Prerequisites: junior or senior standing, NS 115 and NS 246 or permission of instructor.

W 7:30-9:25 p.m. C. Bisogni.

An examination of selected consumer food issues as related to legislation, regulations, product labeling, nutrition, and food safety. Students will investigate relevant research and the impact of proposed solutions on consumers and the food supply.

347 Human Growth and Development: Biological and Social Psychological Consideration (also HDFS 347) Spring. 3 credits.

Prerequisites: Bio S 101 or 109 or equivalent; HDFS 115 or Psych 101 and NS 115 or equivalent.

M W F 1:25. J. Haas and H. Ricciuti.

A review of major patterns of physical growth from the fetal period through adolescence, with consideration given to biological and socioenvironmental determinants of growth, as well as to physical and psychological consequences of variations in growth patterns. Normal patterns of growth will be examined, followed by an analysis of major sources of variations in growth (normal and atypical).

361 Biochemistry and Human Behavior (also Psych 361) Fall. 3 credits. Prerequisites: Bio S 101-102, Chem 103-104, Psych 123, or permission of instructor. Not offered 1978-79.

M W F 11:15. D. Levitsky.

A survey of the scientific literature on the role of brain and body biochemical changes as determinants of human behavior. The topics covered will include action and effects of psychopharmacologic agents, biochemical determinants of mental retardation, biochemical theories of psychosis, and effects of nutrition on behavior. A fundamental knowledge of human biology and chemistry is essential.]

378 Management Principles in Food Service Operation Spring. 4 credits. S-U grades optional.

Prerequisites: NS 246 and Ag Ec 220 or HA 211 or ILR 151 or ILR 360 or equivalent, or permission of instructor.

M W F 12:20. R. Holmes.

Application of management principles to food service operations involved in production, distribution, and service of quality food in quantity. Includes layout, design, menu planning, and food cost control. Field trips: estimated cost \$5.

398 Honors in Nutritional Sciences Fall.

1 credit. S-U grades only. Open only to students admitted to the division honors program.

Th 2:30. Division faculty; coordinated by chairperson of honors committee. Research design. Delineation of honors' research problem in consultation with a faculty adviser.

400-401-402 Special Studies for Undergraduates

Fall or spring. Credit to be arranged S-U grades optional.

Division faculty.

For advanced, independent study by an individual student or for study on an experimental basis with a group of students in a field of nutritional sciences not otherwise provided through course work in the department or elsewhere at the University. Students prepare a multicopy description of the study they wish to undertake on forms available from the Division of Academic Services. This form must be signed by the instructor directing the study and the associate director of academic affairs of the division and filed at course registration or within the change-of-registration period after registration. In order to ensure review before the close of the course

registration or change-of-registration period, early submission of the Special Studies Form to the associate director for academic affairs is necessary.

400 Directed Readings For study that predominantly involves library research and independent reading.

401 Empirical Research For study that predominantly involves data collection and analysis or laboratory or studio projects.

402 Supervised Fieldwork For study that predominantly involves participation in community or classroom settings.

441 Nutrition and Disease Fall. 3 credits. S-U grades optional. Prerequisites: NS 331 and a physiology course.

M W F 10:10. J. Rivers.

Study of the physiological, biochemical, and clinical anomalies in certain diseases and the principles underlying nutritional prevention, therapy, and support. Independent survey of the research literature in this field.

442 Diet Formulation and Analysis Fall. 2 credits. S-U grades optional. Limited enrollment.

Prerequisites: NS 246, coregistration in NS 441 or equivalent background, and permission of the instructor.

M 2:30-4:15. Instructor to be named.

Development of skills in formulation, manipulation, and analysis of therapeutic diets. Various sources of information pertaining to food composition and diet planning will be used.

445 Community Nutrition and Health Spring. 3 credits. S-U grades optional. Prerequisites: NS 331 or permission of the instructor. NS 325 recommended.

Lec M W F 1:25; disc W 2:30-4:30. S. Kumanyika. Study of human nutrition and health problems from a community perspective; programs and policies related to nutrition at local, state, and federal levels; approaches and techniques of effective application and dissemination of nutrition knowledge in communities.

446 Physicochemical Aspects of Food Fall. 3 credits. S-U grades optional. Prerequisite: NS 246 and a college course in biochemistry, which may be taken concurrently.

M W F 9:05. G. Armbruster.

The relation of food quality to (a) rheological properties of food systems, (b) oxidation and reduction reactions, and (c) enzymatic and nonenzymatic browning. Physical and chemical factors accounting for the color, flavor, and texture of natural and processed foods.

447 Physicochemical Aspects of Food, Laboratory Fall. 1 credit. S-U grades optional.

Enrollment limited to 16. Prerequisite or concurrent registration: NS 446.

T 1:25-4:25. G. Armbruster.

Laboratory experiments designed to illustrate the effect of varying ingredients and treatment on the quality of food products. Objective testing methods are used to determine food quality characteristics.

448 Physicochemical Aspects of Food, Laboratory Fall. 1 credit. S-U grades optional.

Enrollment limited to 16. Prerequisite or concurrent registration: NS 446.

Th 1:25-4:25. G. Armbruster.

Laboratory experiments designed to illustrate (a) the physicochemical behavior of colloidal systems, (b) chemical reactions of some food components, and (c) effects of temperature, pH, moisture, inorganic salts, and enzymes on physicochemical changes in natural foods, food components, and food mixtures.

456 Experimental Foods Methods Spring. 3 credits. Enrollment limited to 16. Prerequisites: NS 446 and NS 448; a course in statistics recommended.

Lab T Th 1:25-4:25. G. Armbruster. Application of the scientific method in the design and performance of experimental food problems and in the interpretation and evaluation of results. Evaluation of the use of instruments, and chemical and sensory methods in the measurement of food properties. Independent laboratory problems.

457 National and International Food Economics Spring. 3 credits. S-U grades optional. Prerequisites: college course in economics and junior standing or permission of instructor.

M W F 9:05. Instructor to be named. Examination of individual components essential for a macrounderstanding of the United States and world food economies. Bioenergetic and economic principles of food production needed to explain the potential for food supplies. Consideration of nutritional, social, and economic factors that influence the consumption of major food groups. Examination and evaluation of the effectiveness of various food policies and programs in altering food consumption patterns. Analysis of the world food economy.

488 Applied Dietetics in Food Service Systems Fall or spring. 3 credits. Limited to 30 students per semester. S-U grades optional. Prerequisite or corequisite NS 378 and permission of instructor before course registration.

Lec, M 8; lab, M-F 2:30-8 p.m. K. Woodruff. Laboratory will be arranged through Cornell Dining Services. Students will gain experience in care and use of institutional equipment, job analysis, volume food production, applied sanitation, recipe development and evaluation, as well as other management skills required to operate a food service program.

498 Honors in Nutritional Sciences Spring. 1 credit. Open only to students admitted to the division honors program.

Th 2:30. Division Faculty; coordinated by chairperson of the honors committee. Informal presentation and discussion of current topics in food and nutrition in which all members participate. Written reports on topics discussed may be requested. Students may register for NS 499 concurrently.

499 Honors Problem Fall and spring. Open only to students in the division honors program.

Hours to be arranged. Division faculty. An independent literature, laboratory, or field investigation. The work should be spread over two semesters.

600 Special Problems for Graduate Students Fall or spring. Credit to be arranged. S-U grades optional.

Hours to be arranged. Division faculty. For graduate students recommended by their chairperson and approved by the instructor in charge for independent, advanced work. Experience in research laboratories in the division may be arranged.

601-604 Advanced Nutrition Series A series of nutrition courses offered jointly by the Division of Nutritional Sciences and the Departments of Animal and Poultry Science. Prerequisites: courses in nutrition, physiology, and biochemistry, including intermediary metabolism; or with permission of instructor.

601 Proteins and Amino Acids in Nutrition (also AnSc 601) Spring. 3 credits. Prerequisites: courses in physiology, biochemistry, and nutrition or consent of the instructors.

M W F 11:15. R. E. Austic, M. Morrison.

Advanced course in amino acid and protein nutrition with emphasis on the dynamic aspects of protein digestion, amino acid absorption, protein synthesis, amino acid metabolism, and nitrogen excretion. Discussion will include nutritional interrelationships, amino acid and protein requirements, assessment of nutritional status, evaluation of protein quality, bioavailability of amino acids, and techniques of amino acid analyses. Emphasis is on basic principles and their application to animal and human nutrition.

602 Lipids, Fall. 2 credits.

T Th 11:15. A. Bensadoun. Advanced course on biochemical, metabolic, and nutritional aspects of lipids. Emphasis is placed on critical analysis of current topics of lipid methodology; lipid absorption; lipoprotein secretion, structure, and catabolism; mechanisms of hormonal regulation of lipolysis and fatty acid synthesis; and cholesterol metabolism and atherosclerosis.

603 Nutritional Energetics Spring. 2 credits. Register in AnSc 603.

M W 10:10. J. T. Reid.

[604 The Vitamins Fall. 2 credits. Register in AnSc 604. Not offered 1978-79.

T Th 10:10. M. L. Scott and G. F. Combs, Jr. Lectures on nutritional aspects of the vitamins, including recent developments in nutritional and biochemical interrelationships with other nutrients and metabolites.]

606 Carbohydrate Chemistry Spring.

2 credits. S-U grades optional. Prerequisite: organic chemistry; biochemistry recommended.

T Th 11:15. B. A. Lewis. The chemistry and physicochemical properties of carbohydrates (including sugars), polysaccharides, and their complexes with lipids, proteins, and other food components. The functional role of the carbohydrates in food systems and their nutritional implications will be discussed as well as applications of carbohydrates in food processing.

[611 Molecular Toxicology Fall. 2 credits. S-U grades optional. Prerequisite: 1 year 400-level biochem or equivalent. Offered alternate years. Not offered 1978-79.

T Th 10:10. C. Campbell. A study of fundamental biochemical mechanisms of absorption, transport, metabolism, and excretion of drugs, carcinogens, and toxicants. Emphasis on oxidative and conjugative pathways of metabolism and of environmental and nutritional factors that influence toxicant metabolism and disposition. Methods of evaluating *in vivo* and *in vitro* metabolism. About one-half formal lectures, one-half study sessions of current research papers.]

612 Methods of Assessing Physical Growth in Children Spring. 2 credits. S-U grades optional. Prerequisite: graduate standing or permission of instructor.

Lec, T 1:25; lab, Th 1:25-4:25. J. Haas. A laboratory course to train students in methods and techniques used to assess the physical growth and development of growing children. The methods explored will be those which are applicable for field or community studies and will cover anthropometry, body composition, skeletal age, maturity indicators, physical fitness, and physiological responses to environmental stress.

616 Readings in Food Fall. 2 credits.

Prerequisite: 446 or permission of instructor. F 11:15, or time may be arranged. N. Mondy. Critical review of selected topics in the current literature. Emphasis on experimental data and basic scientific principles underlying modern theory and practice relative to food quality. May be repeated for credit with permission of instructor.

619 Field of Nutrition Seminar (also AnSc 619) Fall or spring. Noncredit.

M 4:30.

Lectures on current research in nutrition presented by visitors and faculty.

621 General Nutrition Spring. 4 credits.

Prerequisites: NS 331, Bio S 331, and Vet M 346. Students with equivalent course work may enroll with permission of instructor.

M W Th F 10:10. D. Roe.

The course is intended for graduate students with a major or minor in nutrition and undergraduate nutrition majors with the necessary background of course work. The aim is to present an in-depth treatment of nutritional science with human application. Subject matter will include historical perspectives, nutritional physiology, assessment of nutritional status, human nutritional requirements, and nutritional disease due to diet, disease, or drugs.

622 Advanced Nutrition Laboratory Spring.

1-5 credits. May be repeated for a maximum of 5 credits. Limited to 16. Prerequisites: organic chemistry, biochemistry, advanced nutrition, nutrition, or biochemistry laboratory. Modules A and B are prerequisites for Module C.

T 2:15-5:15, Sat 9-12. Division faculty. Study of the anthropometric, dietary, clinical and biochemical assessment of human nutritional status. *Module A* 1 credit. Anthropometric Assessment *Module B* 1 credit. Dietary Assessment *Module C* 1 credit. Clinical Assessment *Module D* 2 credits. Biochemical Assessment

623 Seminar, Human Metabolic Studies Spring. 1 credit. S-U grades optional. Prerequisite: graduate standing. Prerequisite or corequisite for those taking NS 624.

Initial class meeting T 12:20. R. Schwartz. An introduction to published reports or controlled studies with human subjects in nutrition research. Goals: (a) to cover approaches possible in research with human subjects, (b) to understand the constraints peculiar to research with human subjects, and (c) to test nutritional questions to determine the feasibility of obtaining an answer to them by research with human subjects.

624 Research Methods in Human Metabolic Studies Fall. 3 credits. Prerequisites: NS 331 or equivalent, laboratory experience in biochemistry or quantitative analysis, or permission of instructor.

Lec and lab, M W 1:25-4:25. R. Schwartz and division faculty. Principles of human metabolic research, experimental design of human studies, dietary considerations, and methods of collecting, analyzing, and evaluating biological material. Laboratory will include planning and management of a metabolic study as well as collection and the appropriate analyses of blood, urine, and feces.

625 Seminar in Food Habits Research Fall. 3 credits. Enrollment limited to 12 graduate students. W F 3:35. D. Sanjur.

The seminar focuses research attention on the interface between nutrition and social sciences. Emphasis given to the development of a research proposal using sociocultural conceptual frameworks and techniques as applied to nutritional data.

626 Special Topics in Food Spring. 2 credits.

Time to be arranged. G. Armbruster, E. E. Hester, B. A. Lewis. Current research related to food will be reviewed in the context of basic principles and their application to the quality of food.

627 Special Topics in Food Spring. 2 credits.

Time to be arranged. N. Mondy.

634 Vitamins and Coenzymes (also Bio S 634)

Spring. 2 credits. Offered in alternate years. Prerequisites: organic chemistry 253 or 357-358, and Bio S 331 or 330 or their equivalents in biochemistry. Next offered 1979-80.

D. B. McCormick.

The chemical, biochemical, and nutritional aspects of the vitamins and coenzymes.]

635 Metabolism and Enzyme Mechanisms (also Bio S 635)

Spring. 2 credits. Prerequisites: Chem 357-358, either Bio S 330 or 331. Physical chemistry suggested. If any of these prerequisites or equivalents are not met, permission of the instructor is required.

T Th 9:05. W. L. Dills and staff.

Lectures cover molecular mechanisms of metabolic regulation and mechanisms of enzyme-catalyzed reactions, including explicit enzyme function.

Discussions cover examples from the current literature.

646 Seminar in Physicochemical Aspects of Food

Spring. 3 credits. S-U grades optional. Prerequisite: a college course in organic chemistry or biochemistry.

T Th 9:05, additional discussion period to be arranged. E. E. Hester.

An introduction to physicochemical aspects of food for graduate students who have had limited or no work in this area. The seminar uses the lectures of NS 246 as a basis for supplementary readings and critical review of research on selected topics.

650 Clinical and Public Health Nutrition

Spring. 3 credits. Prerequisites: NS 431 or equivalent level course.

M W F 9:05. D. Roe.

For graduate students with a major or minor in nutrition and undergraduate nutrition majors in their senior year. Lectures will cover social, environmental, and disease variables that influence the nutrition of infants, children, and adults. Endemic nutritional problems, such as obesity, dental caries, and anemias, of public health importance in the United States will be discussed. Student presentations will be made in class.

651 Nutrition and the Chemical Environment

Fall. 3 credits.

M W F 11:15. D. Roe.

The relationship between nutrition and the effects of foreign chemicals. Students are offered an overall

view of compounds to which we are exposed, including natural food toxicants, food additives, water pollutants, pesticide residues, and radioactive wastes as well as medications and illegal drugs. A factual and scientific background is developed so students can interpret information and misinformation circulated in the news media.

652 Nutrition Counseling

Spring. 2 credits.

Open only to students in the Clinical Dietetics Program. Prerequisites: NS 441, 442, and permission of instructor.

T Th 9:05-11. J. Rivers, D. Roe, and M. Devine. Principles and procedures of nutrition counseling in clinical practice. Emphasis on subject matter and process skills necessary to develop, implement, and evaluate nutritional care plans for individuals and groups. Includes workshops, simulation techniques, and work with clients in selected settings.

659 The Nutrition and Physiology of Mineral Elements (also Vet M 759)

Fall. 2 credits. Prerequisites: basic physiology, intermediate biochemistry, general nutrition.

T Th 8. R. Wasserman, R. Schwartz, and D. Van Campen.

Lectures on nutritional aspects, and physiological, biochemical, and hormonal relationships of the prominent macro- and micro-elements, with emphasis on recent developments. Included will be information on methodologies of mineral research and the chemistry of ions and complexes as well as essentiality, requirements, transport, function, homeostasis, interrelationship, and toxicity of various mineral elements.

660 Special Topics in Nutrition

Fall and spring. 3 credits maximum each term. Registration by permission of the instructor.

Division faculty.

Designed for the student who wishes to become informed in any specific topic he or she selects that is related directly or indirectly to nutrition. The course may include individual tutorial study, experience in research laboratories, a lecture series on a special topic selected by a professor or a group of students; and/or selected lectures of a course already offered. Topics may be changed so that the course may be repeated for credit.

680 International Nutrition Problems, Policy, and Programs

Fall. 3 credits. Registration by permission.

T Th 11:15-12:30. M. Latham.

The course is designed for graduate students who wish to learn about the important nutritional problems of developing countries. The major forms of malnutrition related to poverty and their underlying causes will be discussed. Emphasis will be placed on programs and policies that can assist poor countries and communities to improve their nutritional and health status.

690 Seminar in Nutrition and Behavior

Spring. 3 credits. Registration by permission. S-U grades optional.

Time to be arranged. D. Levitsky.

Selected topics include the effect of diet on the developing brain and its effect on behavior, physiological basis of feeding and drinking behavior, and control of obesity. Students should have at least one course in psychology, physiology, and nutrition.

695 Seminar in International Nutrition and Development Policy

Spring. 2 credits. S-U grades optional. Prerequisite: NS 680 or equivalent.

Time to be arranged. M. Latham and division faculty.

The role of nutrition in national development. Emphasis will be on the interdisciplinary nature of the programs and policies needed to solve the food and nutrition problems of low-income countries and communities. The planning of programs and the evaluation of alternate strategies designed to improve nutrition will be discussed, using examples from particular countries.

699 Special Topics in International Nutrition

Fall. 2 credits. S-U grades optional.

703 Seminar in Nutritional Science

Fall or spring. 1 credit. S-U grades only.

T 12:20 or W 12:20. Division faculty.

899 Master's Thesis and Research

Fall or spring. Credit to be arranged. S-U grades optional. Registration with permission of the chairperson of the graduate committee and the instructor.

Hours to be arranged. Division graduate faculty.

999 Doctoral Thesis and Research

Fall or spring. Credit to be arranged. S-U grades optional. Registration with permission of the chairperson of the graduate committee and the instructor.

Hours to be arranged. Division graduate faculty.

Officer Education

Aerospace Studies Courses

Freshman Year

AS 161 United States Air Force Today Fall. 1 credit.

1 class each week. A. J. Ferencak.
A study of current United States military forces with emphasis on the analysis of the doctrine, mission, and organization of the United States Air Force. The Air Force's Strategic Air Command and the Navy's Fleet Ballistic Missile System are explored as elements of strategic offensive forces. Aircraft and missile defense is studied.

AS 162 United States Air Force Today Spring. 1 credit.

1 class each week. A. J. Ferencak.
A study of the Aerospace Support Forces of the United States, with emphasis on the mission, resources, and operations of tactical air forces throughout the world. Included is an overview of the Army and Navy operations and functions as they contribute to the total national defense.

Sophomore Year

AS 211 Development of Air Power Fall. 1 credit.

1 class each week. C. A. Houston.
Factors leading to the development of air power and the concepts and doctrine for the employment of air power are studied. A review of the history of manned flight. The effects of World War I on the employment of air power are studied and the struggle for the development of an independent air arm is analyzed. The course also examines the employment of air power in World War II, including such topics as strategic bombing, tactical air power, and the role of air superiority in warfare.

AS 212 Development of Air Power Spring. 1 credit.

1 class each week. C. A. Houston.
The employment of the Air Force since World War II in military and nonmilitary operations to support national objectives is studied. The effects of technology on defense policy and strategy are analyzed. Quasi-military employment of the air arm in such activities as the Berlin Airlift and national and international relief missions in Asia, Africa, and the Americas is discussed. The role of air power in the Korean conflict, the Cuban crisis, and the Vietnam War is examined from the viewpoint of technology and tactical doctrine.

Junior Year

AS 331 Management and Leadership Fall. 3 credits.

3 classes each week. J. S. Levisky.
Air Force leadership responsibilities at the junior officer level including the responsibility, authority, and function of the Air Force commander and staff are studied. Management research and theory covering recent approaches to leadership models is emphasized. The function of the military law system as contained in the Uniform Code of Military Justice is covered, emphasizing similarities and differences from civil law. Case study exercises are used. Oral and written reports are presented.

AS 332 Management and Leadership Spring. 3 credits.

3 classes each week. J. S. Levisky.
Air Force management at the junior officer level is studied to provide an understanding of the basic concepts of the management and the decision-making process. Management fundamentals,

including planning and organizing, coordinating, directing, and controlling are covered, with emphasis on the manager in the world of power and politics. Includes managerial strategy and tactics. Case studies relating to military situations are used, and oral and written reports are required.

Senior Year

AS 461 American Defense Policy Fall. 3 credits.

3 classes each week. W. R. Williamson.
The course will examine the functions and roles of the professional officer in a democratic society and how they relate to the socialization processes, prevailing public attitudes, and value orientations associated with professional military service. Throughout the course the students will make oral presentations on topics of contemporary military interest. The course will move to the study of the formulation of defense policy and will address political, economic, and social constraints. It will explore the requisites for maintaining adequate national security forces and assess the impact of technological and international developments upon strategic preparedness and the overall defense policymaking process.

AS 462 American Defense Policy Spring. 3 credits.

3 classes each week. W. R. Williamson.
An investigation of basic contemporary nuclear strategy; its evolution, control, and future. Alternatives to nuclear war will be examined, including arms control, limited wars, wars of revolution, and insurgency. The course will conclude by examining governmental processes and relationships that determine the contemporary military environment and provide a perspective for the future of defense policymaking in the United States.

Military Science Courses

Freshman Year (MS I)

MS 101 United States Organization for Defense Fall. 1 credit. Required.

AROTC staff.
An examination of the United States defense apparatus in terms of organization, mission, personnel, and interrelationships among military forces and between the military forces and various branches and departments of the government. The United States Army force structure is examined from the policymaking level in Washington to the role of the officer education programs on college and university campuses. The complexities and magnitude of operating the defense organization are dealt with to provide framework for subsequent instruction.

Sophomore Year (MS II)

MS 221 Mapping: Land Navigation Fall. 1 credit. Required.

AROTC staff.
The course provides the student with a practical knowledge of the various forms of topographic representation. The student develops, interprets, and utilizes maps in terrain association and land navigation. The student's knowledge of topography is complemented by an orientation on significant environmental influences from political, social, and climatic factors. Portions of the course emphasize practical experiences in land navigation and orienteering.

MS 201 American Military History Fall. 1 credit. Optional.

AROTC staff.
An introduction to the origin and growth of the United States Army as an institution maintained by the nation to protect its interests, secure its way of life,

and, when necessary, to implement foreign policy. The principles and theories of war are examined and their application illustrated by examples drawn from American military history. The foreign and military policies of the United States and the basic causes that have led to the various conflicts in which the United States has participated are also explored.

MS 231 Social and Organizational Psychology in the Military Environment Fall. 1 credit. Optional.

AROTC staff.
This course allows the student to develop a basic understanding and appreciation of the theories of social and organizational psychology and behavior as they apply to the military setting. Attention is given to leader types, the source and exercise of authority, and the impact of varying styles of leadership on motivation and organization effectiveness. The student is introduced to the concepts of integrity, ethics, and professionalism.

Junior Year (MS III)

MS 332 Theory and Dynamics of the Military Team Fall. 2 credits. Required.

AROTC staff.
After an initial introduction to techniques of presenting briefings, the student is provided with a broad understanding of the principles, fundamentals, and applications of team concept of military organizations. Particular emphasis is given to leadership responsibilities of the commander as the team coordinator. Additionally, the student is given an opportunity to develop an understanding of the roles and contributions of the various branches of the Army in support of the military team.

MS 322 Leadership in Small Unit Operations Spring. 2 credits. Required.

AROTC staff.
This course provides the student with an understanding of the nature of decision making and the tactical application of the military team. Through the use of conferences and extensive practical exercises, the student develops a familiarity with the factors influencing the leader's decisions, the processes of planning, coordinating, and directing the operations of military units to include troop-leading procedures, and development of operation plans and orders.

Senior Year (MS IV)

MS 424 Contemporary Military Environment I Fall. 2 credits. Required.

AROTC staff.
A detailed examination of the functions and activities of military organizations, their commanders, and their staff. Discussion focuses on students' past experiences and future expectations in examining such aspects of the military environment as the chain of command, decision making, command and staff relations actions, and the various elements of small unit administration.

MS 461 Contemporary Military Environment II Spring. 2 credits. Required.

AROTC staff.
A continuation of 424, the student is provided the opportunity to examine carefully the leadership environment of an Army officer. Conferences and seminars are used to examine the techniques of effective military leadership, the sociological and psychological environment of the present military, the nature of military law, and above all, the professional ethics, responsibilities, and obligations of an Army officer.

Naval Science Courses

Freshman Year

NS 101 Fundamentals of Naval Science Fall. Noncredit.

One hour class each week (lecture-recitation).
Navy staff.

A study of fundamental aspects of naval science, including its conceptual contributions to sea power, factors involved in the physical development of naval forces, resources which must be managed, and prospects for the future.

M & AE 101 Naval Ship Systems Spring. 3 credits.

3 classes each week (lecture-recitation).
R. L. Wehe.

The course is an introduction to primary ship systems and their interrelationship. Basic principles of propulsion, control, internal communications, structure, and other marine systems are considered.

Sophomore Year

NS 211 Armed Conflict and Society Fall. 3 credits.

3 classes each week. Presentation by Marine Corps and Navy instructors with guest lecturers, primarily from government and history departments.

A study of modern warfare which examines the relationship of military strategy to geography, economics, sociology, technology, and national political realities and values; the evolution of warfare, including principles of war, weapons and associated equipment, and the effects of nuclear weapons and guerrilla warfare on traditional concepts of national strategy.

NS 201 Seapower—Maritime Affairs Spring. 1 credit.

One seminar weekly. Navy staff.

The seminar discussions explore the meaning and modern applicability of seapower concepts, including such components as naval power, ocean science, ocean industry, ocean commerce, and international law.

Junior Year (Navy)

Ag Eng 305 Principles of Navigation Fall. 4 credits.

4 classes each week (lecture-recitation-project work).

The course covers coordinate systems, chart projections, navigational aids, instruments, compass observations, tides and currents, and soundings. It also includes celestial navigation, time, spherical trigonometry, motion of the stars and sun, star identification, position fixing, use of the nautical almanac, electronic navigation systems, and air navigation.

NS 321 Naval Operations Spring. Noncredit.

One hour class each week. Times to be arranged.
Navy staff.

The course covers the execution of naval operations and the examination of sensors, weapons, and supportive elements as they apply to naval operations. The student will study the theory of sound propagation in water their electromagnetic wave propagation in air, and their application to naval operations. Topics in ship handling will also be discussed.

Senior Year (Navy)

NS 451 Naval Weapons System Fall. 3 credits. 3 classes each week (lecture-recitation). Times to be arranged. Navy staff.

A technically oriented course covering the development and solution of the naval fire control problem for air, surface, and subsurface targets.

Emphasis is on such topics as interior and exterior ballistics, target motion, missile guidance systems, ship motion, and stabilization corrections. Following the development of the fire control problem, the course examines the theory, use, and design of radars, sonars, analog and digital computers, gyroscopes, synchro and servo mechanisms, and various components of naval weapons.

NS 431 Naval Organization and Management Spring. Noncredit.

1 hour class each week (seminar). Navy staff. Discussions cover scientific principles and functions of management relevant to the naval environment and the structure of naval organization. Theories and findings from the behavioral sciences relevant to leadership are explored with particular emphasis on self-development and individual responsibility.

Junior or Senior Year (Marines)

NS 311 Amphibious Warfare Spring. 3 credits.

3 classes each week (lecture-recitation). Times to be arranged. Marine Corps staff.

History of the development, theory, techniques, and conduct of amphibious operations during the twentieth century. Special emphasis is on amphibious operations conducted in the Central Pacific during World War II.

Physical Education

Although courses are listed under Men's Physical Education and Women's Physical Education both men and women may register for any course in either department (with the exception of the swimming course offered by Men's Physical Education). Enrollment is limited by the number of places in each class and the locker space available; other restrictions are included in the course descriptions.

Men's Physical Education

Registration

Registration for courses in Men's Physical Education is not part of course or University registration. Students register in the Teagle Hall gym on the dates listed on the calendar below, unless the course description states otherwise. Contact the Physical Education Office, Teagle Hall, to find out which hours registration will be held.

Instruction in physical education starts the third week of the academic semester and continues through the last week of classes.

Calendar

<i>Fall</i>	
Registration	September 1, 4-6
Classes begin	September 18
Classes end	December 8
<i>Spring</i>	
Registration	January 19, 22-24
Classes begin	February 5
Classes end	May 4

Team Sports

Badminton Fall and spring
M T W Th F 9:10, 10:15, 11:20, 12:25. Two classes each week.
Beginning and intermediate levels.

Basketball Fall and spring.
M T W Th F 9:10, 10:15, 11:20, 12:25;
M T W Th 1:30, 2:35. Two classes each week.
Organized on a team basis according to experience and ability.

Volleyball Fall and spring.
M T W Th F 9:10, 10:15, 11:20; M T W Th 1:30, 2:35. Two classes each week.
Beginning and intermediate levels. Fundamentals and team play are stressed.

Individual Sports

Archery Fall and spring. Register at Helen Newman Hall.
Two classes each week.
Beginning instruction in the care of equipment, seven basic steps for shooting, scoring, and practice shooting at 20, 30, and 40 yards.
Intermediate. Review of basic skills followed by instruction in intermediate skills.

Basic Mountaineering Fall and spring.
M or T 1:30-4:30.
This course provides instruction in fundamentals and practical experience in outdoor survival, basic mountaineering, and related subjects. Fee for equipment, travel, and incidentals: \$40.

Bowling Fall and spring.
M T W Th 10:15, 11:20, 12:25, 1:30, 2:35 or 3:40.
Two classes each week.
Beginning and intermediate levels. Fee for each class (students bowl two lines; shoe rental included): \$1.45.

Dance Programs Fall and spring. For registration or more information report to the Main Office, Helen Newman Hall.

Equitation Fall and spring. Class days and hours assigned by Mr. Lent at University Registration in Barton Hall.
Fee: \$70.

Fencing Fall and spring.
M T W Th 2:30 and 3:30 (beginners); T Th 7 p.m. (advanced). Two classes each week.
Beginners are provided with all necessary equipment. Fee \$15.

First Aid Fall and spring.
W 7-9 p.m. Meeting Room G-1 Barton Hall.
American Red Cross Standard First Aid course.

Judo and Karate

Judo Fall and spring.
M T W Th 10:15 and 1:30. Two classes each week.
Beginning course with professional instruction. GHI provided. Fee: \$30.

Karate Fall and spring.
M T W Th 11:20 and 2:35. Two classes each week.
Beginning course with professional instruction. GHI provided. Fee: \$30.

Students interested in judo or karate at the intermediate and advanced level should join the Judo Club or the Karate Club and register in evening classes. Information about the clubs is available at the Physical Education Office, Teagle Hall.

Outdoor Leadership Training—Introductory Back Packing Fall and spring.
Instruction includes basic back packing skills, emergency equipment repairs, safety consciousness and accident prevention, first aid, trip planning, route selection, orienteering, minimum impact camping, and other topics. Fee: \$15.

Riflery Fall and spring. Register at Helen Newman Hall.
Instruction and practice in the techniques of target riflery from various shooting positions. Fee: \$10.

Introduction to Scuba Diving Fall and spring.
M T Th F 9:10, 10:15, 11:20, and 1:30. Two classes each week.
Beginning course—general certification only. All equipment is provided, including tanks, regulator, snorkel, and vest. Fee: \$38.

Skating Fall and spring.
M T W Th F 9:10, 10:15, 11:20, and 12:25. Three classes each week.
For beginning or intermediate skaters. Students provide their own skates (hockey skates) or rent skates. Fee: \$5; skate rental is \$.75 for each class.

Skeet and Trap Fall and spring.
M or W 2:35.
Beginning course includes lectures and shooting at the Tompkins County Rod & Gun Club range. Guns and shells will be furnished. Fee: \$35.

Skiing Spring. For registration or more information report to the Physical Education Office in Teagle Hall.

Squash Fall and spring.
M T W Th F 9:10, 10:15, 11:25, 1:30, 2:35, 3:15.
Two classes each week.
Beginning course. Fee: \$7.

Swimming Fall and spring. Enrollment limited to men.
M T W Th 10:15, 1:30.
Instruction in beginning (survival) swimming for nonswimmers.

Tennis/Volleyball Fall and spring.
M T W Th F 9:10, 10:15, 11:20. Volleyball in the Teagle Gym and tennis on Upper Alumni Field Courts.
Beginning class emphasizes fundamentals in each sport. Racquet and ball are provided.

Water Safety Courses

Advanced Life Saving Fall and spring.
W 7:30-9:30 p.m.
Students should be in good physical condition. One class each week.

ARC Water Safety Instructors Course Spring.
Prerequisite: advance life saving certification.
M T W Th F 4:30-6:30.
Classes start in late March and are held until the course is completed (approximately 32 hours).

WSI Refresher Course Spring. Prerequisite: current WSI certification.
M T W Th F 4:30-6:30.
Students should come prepared to be tested for required swimming skills and physical endurance.

Weight Lifting Fall and spring.
M T W Th F 9:10, 10:15, 11:20, 1:30, 2:35, 3:15.
Two classes each week.
Beginning and intermediate classes include instruction in correct lifting techniques. Each student will be assigned a series of exercises designed for his or her individual needs.

Women's Physical Education

Registration

Registration for courses in Women's Physical Education is not part of course or University registration. Students register at Helen Newman Hall during the first week of classes, unless the course description states otherwise.

Instruction in physical education starts the third week of the academic semester. Courses offered "fall" or "spring" begin the third week of the semester and continue through the last week of academic instruction. Courses offered "fall I," "fall II," "spring I," or "spring II" are given in six-week units. The calendar below shows when they are offered.

Calendar

<i>Fall</i>	
Registration	September 4-8
Fall I classes begin	September 18
Fall II classes begin	October 30
Fall classes end	December 8
<i>Spring</i>	
Registration	January 22-26
Spring I classes begin	February 5
Spring II classes begin	March 26
Spring classes end	May 4

Team Sports

Basketball Fall II and spring I.
Two classes each week.
Beginning—Instruction and practice in the basic skills of passing, catching, dribbling, shooting, defense and offense, rules and strategy.
Intermediate—Emphasis on and practice of shooting skills, alternate offenses and defenses, advanced team strategy.

Field Hockey Fall I.

Two classes each week.

Instruction and practice of basic hockey skills: dribbling, passing, dodging, tackling, team play, and strategy.

Lacrosse Fall I and spring II.

Two classes each week.

Instruction and practice of basic skills (cradle, passing, catching, goal shooting, checking) and team play and strategy.

Soccer Fall I.

Two classes each week.

Introduction to the game of soccer. This includes basic individual skills (passing, trapping, volleying) and team play and strategy.

Softball Spring II.

Two classes each week.

Instruction in regulation softball play. Batting, pitching, and fielding skills are also emphasized.

Volleyball Fall I, fall II, spring I, and spring II.

Two classes each week.

Beginning—Presentation and practice of basic skills: serving (underhand, sidearm, overhead), volley, underhand pass, bumping, spiking, blocking, rules and scoring.

Intermediate—Emphasis on accuracy and consistency. Skills taught include spiking and blocking, overhead serves, various methods of team play and court coverage, the dink, Japanese roll, and other advanced techniques.

Volleyball Fall and spring. Register at the Physical Education Office, Teagle Hall.

M T W Th F 9:10, 10:15, 11:20; M T W Th 1:30, 2:35. Two classes each week.

Beginners and intermediate. Fundamentals and team play will be stressed.

Individual Sports**Archery** Fall I and spring II.

Two classes each week.

Beginning—Instruction in the care of equipment, seven basic steps for shooting, scoring, and practice shooting at 20, 30, and 40 yards.

Intermediate—Review of basic skills followed by instruction in intermediate shooting skills; clout shooting.

Badminton Fall II and spring I.

Two classes each week.

Beginning—Instruction and practice in rules, doubles play, strategy, and basic skills, including: clearing, serving, drop shots, smash. Class competition.

Intermediate—Review of basic skills followed by instruction in strategy for doubles; presentation of intermediate shots and skills; drive serve, around-the-head, cross court shots, advanced systems of play, class competition.

Badminton Fall and spring. Register at the Physical Education Office, Teagle Hall.

M T W Th F 9:10, 10:15, 11:20, 12:35. Two classes each week.

Beginning and intermediate levels.

Basic Mountaineering Fall and spring. Register at the Physical Education Office, Teagle Hall.

M or T 1:30–4:30.

This course provides instruction in fundamentals and practical experience in outdoor survival, basic mountaineering, and related subjects. Fee for equipment, travel, and incidentals: \$40.

Bowling Fall and spring. Men register at the Physical Education Office, Teagle Hall; women at Helen Newman.

Two classes each week.

Instruction in spot bowling techniques, use of the

hook ball delivery, scoring, and converting spares. Fee for each class (students bowl two lines; shoe rental included): \$1.45.

Conditioning Fall I, fall II, spring I, and spring II.

Two classes each week.

Vigorous exercise is performed to condition and stress the cardiovascular and respiratory systems. Entails running and exercising at various levels of intensity to increase endurance, strength, and flexibility.

Cycling Spring II.

One class each week.

Includes basic instruction in bike care. Students will tour the Ithaca area during classes, and must provide their own bicycle.

Dance

The courses listed below are offered both fall and spring.

Modern Dance: Dance Fundamentals**Elementary Modern****Intermediate Modern****Advanced Modern****Dance Composition****T'ai Chi****Ballet I****Ballet I+****Ballet II**

Two classes each week.

Classes in dance technique are intended to develop strength, flexibility, coordination, and the ability to perceive and reproduce phrases of dance movement with rhythmic accuracy and clarity of body design. The more advanced classes require mental and physical ability to perform more complex phrases in various styles.

Ballroom Dance Fall and spring.

Two classes each week.

Instruction in social or ballroom dancing. Dances taught include the waltz, Charleston, rumba, calypso, tango, and variations.

Folk Dance Fall and spring.

Two classes each week.

Introduction to basic folk dance steps and dances of many countries.

Equitation Fall and spring. Class days and hours assigned by Mr. Lent at University Registration in Barton Hall.

One class each week.

Fee: \$70.

Exercise and Figure Control Fall I, fall II, spring I, and spring II.

Two classes each week.

Exercise and discussion sessions designed to acquaint the student with the purpose of each exercise, the ways in which exercise may be used in weight control, the relationship of dieting and energy expenditure to weight control, design of an individual exercise program and participation in vigorous exercise and running.

Fencing Fall and spring.

Two classes each week.

Beginning—Introduction and practice of basic attacks and defenses in foil fencing. Conditioning and bouting in class competition.

Intermediate—Instruction and practice of advanced attacks and defenses in foil fencing. Bouting in class competition. Equipment is furnished. Fee: \$10.

Fencing Fall and spring. Register at the Physical Education Office, Teagle Hall.

M T W Th 2:30, 3:30 (beginning); T Th 7 p.m. (advanced). Two classes each week.

Beginners are provided with all necessary equipment. Fee: \$15.

Figure Skating Fall II and spring I.

Two classes each week.

Beginning—Instruction and practice in figure skating techniques: forward and backward crossovers, turns, spirals.

Intermediate—Review of basics followed by instruction and practice in intermediate techniques, including: lunge, jumps, spins. Students must provide their own skates. Fee: \$2.50.

First Aid Fall and spring. Men register at the

Physical Education Office, Teagle Hall; women at Helen Newman.

W 7–9 p.m. Meeting Room G-1 Barton Hall.

American Red Cross Standard First Aid Course.

Golf

Golf Fall and spring. Men register at the Physical Education Office, Teagle Hall; women at Helen Newman.

Two classes each week.

Instruction by P.G.A. professionals is geared to all levels of experience and ability. The objective is to give the beginner enough skill and experience to play, and to give the more advanced players direction to their thinking, practice, and play through a thorough understanding of fundamentals. Equipment is furnished. Fee: \$15.

Recreational Golf Fall and spring. Men register at the Physical Education Office, Teagle Hall; women at Helen Newman.

Students play at least 9 holes of golf (usually twice a week for six weeks); must have golfing experience and should have own clubs. Fee: \$30.

Gymnastics**Gymnastics I** Fall I and spring I.

Two classes each week.

Basic instruction for tumbling, dance for gymnastics, balance beam, and trampoline.

Gymnastics II Fall II and spring II.

Two classes each week.

Basic instruction for uneven parallel bars, vaulting, and trampoline.

Intermediate Gymnastics Fall and spring.

Prerequisites: Gymnastics I and II or equivalent, or permission of the instructor.

Two classes each week.

Jogging Fall and spring. Register at the Physical Education Office, Teagle Hall.

Two classes each week.

A program to meet the needs of each individual. Progress from jogging a few hundred yards to a capacity of 3 miles at the end of twelve weeks.

Judo Fall and spring. Register at the Physical Education Office, Teagle Hall.

M T W Th 10:15, 1:30. Two classes each week.

Beginning course with professional instruction. GHI provided. Fee: \$30.

Karate Fall and spring. Register at the Physical Education Office, Teagle Hall.

M T W Th 11:20, 2:35. Two classes each week.

Beginning course with professional instruction. GHI provided. Fee: \$30.

Those interested in judo and karate at the intermediate and advanced level may join the Judo Club or the Karate Club. Information about the clubs is available at the Physical Education Office, Teagle Hall.

Outdoor Leadership Training—Introductory Back Packing Fall and spring. Register at the Physical Education Office, Teagle Hall.

One class each week.

Instruction includes basic back packing skills, emergency equipment repairs, safety consciousness

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and prevention, first aid, trip planning, route selection, orienteering, minimum impact camping, and other topics. Fee: \$15.

Physical Fitness and Conditioning Fall and spring. Register at the Physical Education Office, Teagle Hall.

Two classes each week.
A scientifically managed exercise program for faculty, staff, students, and alumni. A medical examination by each individual's personal physician will be required before acceptance in the program.

Riflery Fall and spring.
Two classes each week.
Instruction and practice in the techniques of target riflery from various shooting positions. Fee: \$10.

Skating Fall and spring. Register at the Physical Education Office, Teagle Hall.
M T W Th F 9:10, 10:15, 11:20, 12:25. Three classes each week.
For beginning or intermediate skaters. Students provide their own skates (hockey skates) or rent skates. Fee: \$5; skate rental is \$.75 for each class.

Skeet and Trap Fall and spring. Register at the Physical Education Office, Teagle Hall.
M or W 2:35.
Beginning course includes lectures and shooting at the Tompkins County Rod and Gun Club. Guns and shells will be furnished.

Ski Conditioning Fall II.
Two classes each week.
A variety of indoor and outdoor exercises designed to increase flexibility, strength, and endurance in preparation for the ski season.

Skiing—Downhill Spring. For registration or more information report to the Main Office in Helen Newman Hall.

Skiing—Cross Country Spring I.
One class each week.
The class is designed for both beginners and advanced skiers. In the first few lessons the basic ski touring techniques will be taught, then the main emphasis will be on touring itself. Course includes lectures on waxing and on choosing proper skiing equipment. Fee: \$15.

Squash Fall and spring. Men register at the Physical Education Office, Teagle Hall; women at Helen Newman.
M T W Th F 9:10, 10:15, 11:20, 1:30, 2:35, 3:15.
Two classes each week.
Beginning course. Fee: \$7.

Swimming

Beginning Swimming Fall I, fall II, spring I, and spring II.
Two classes each week.
Instruction and practice in basic skills leading to passing the swimming proficiency test.

Intermediate Swimming Fall I, fall II, spring I, and spring II.
Two classes each week.
Practice and perfection of basic skills and five basic strokes.

Advanced Swimming Fall I, fall II, spring I, and spring II.
Two classes each week.
Practice and perfection of the eleven basic strokes.

Beginning Synchronized Swimming Fall.
One class each week.
Class will learn sculling, stunts including tub, marlin, log roll, front and back tuck somersaults, front and back pikes.

Diving Fall II.
Two classes each week.
Instruction in the fundamentals of competitive diving. Dives covered: front (pike and layout), back, front and back somersault.

Scuba—National Certification Fall and spring.
One class each week.
Basic scuba program includes classroom discussions, skill training in the pool, and open water training in Cayuga Lake. Internationally recognized basic certification. Fee: \$85.

Senior Life Saving Fall and spring.
Two classes each week.
American Red Cross Senior Life Saving instruction: course involves practice and execution of survival skills and life saving skills.

Water Safety Instructors Fall and spring.
Two classes each week.
Work toward American Red Cross WSI Certificate. Instruction in methods of teaching swimming strokes and lifesaving skills.

Tennis

Beginning Tennis Fall I and spring II.
Two classes each week.
Instruction and practice of the basic skills involved in playing tennis. Skills covered: grips and basic strokes, forehand, backhand, serve, footwork; team play for doubles and scoring.

Low Intermediate Tennis Fall I and spring II.
Two classes each week.
Review and further instruction in strokes, backhand and forehand, serve, volley, lob. Doubles strategy and play.

High Intermediate/Advanced Tennis Fall I and spring II.
Two classes each week.
Skills emphasized: backhand, volley, serve (flat, slice, twist), approach shot, lob, smash. Advanced strategy for singles and doubles play. Students provide their own racquets. Fee \$2.50

Tennis/Volleyball Fall and spring. Register at the Physical Education Office, Teagle Hall.
M T W Th F 9:10, 10:15, 11:20. Two classes each week. Volleyball in the Teagle Gym and tennis on Upper Alumni Field Courts.
Beginning tennis—instruction in fundamentals; racquet and ball provided.

Trampoline Fall and spring. Register at the Physical Education Office, Teagle Hall.
Two classes each week.
Beginning and intermediate skills taught will include swivel hips, front and back drops, flips, barani, combinations, and routines.

Weightlifting Fall and spring. Register at the Physical Education Office, Teagle Hall.
Two classes each week.
A series of exercises with weights will be designed to suit each student's individual needs.

New York State College of Veterinary Medicine

Anatomy

- 500 **Gross Anatomy** Fall.
- 501 **Gross Anatomy** Spring.
- 502 **Developmental and Microscopic Anatomy** Fall.
- 503 **Microscopic Anatomy** Spring.
- 504 **Neuroanatomy** Spring.
- 505 **Applied Anatomy** Fall.
- 506 **Applied Anatomy** Spring.
- 600 **Special Projects in Anatomy** Fall and spring.
- 601 **Advanced Anatomy** Fall and spring.
- 602 **Advanced Clinical Neurology** Spring.
- 700 **Vertebrate Morphology** Spring.

Avian and Aquatic Animal Medicine

- 255 **Poultry Hygiene and Disease** Fall.
- 555 **Avian Diseases** Spring.
- 671 **Diseases of Aquatic Animals** Spring.
- 771 **Graduate Seminar in Diseases of Aquatic Animals** Spring.
- 772 **Advanced Work in Aquatic Animal Diseases** Spring.

Clinical Courses

- 568 **Veterinary Medical Orientation** Fall.
- 569 **Veterinary Medical Orientation** Spring.
- 571 **Clinical Pathology** Fall.
- 572 **Senior Seminar** Fall and spring.
- 573 **Large Animal Clinic** Fall.
- 574 **Large Animal Surgical Clinic** Spring.
- 575 **Ambulatory Clinic** Fall.
- 576 **Ambulatory/Mastitis Clinic** Spring.
- 577 **Ancillary Clinics** Fall.
- 578 **Anesthesia** Spring.
- 579 **General Medicine** Spring.
- 580 **Comparative Radiology** Spring.
- 589 **Small Animal Medical Clinic** Fall.
- 590 **Small Animal Medical Clinic** Spring.
- 591 **Small Animal Surgical Clinic** Fall.
- 592 **Small Animal Surgical Clinic** Spring.
- 593 **Ophthalmology** Spring.
- 594 **Large Animal Medical Clinic** Spring.

- 595 **Rotating Clinic** Spring.
- 596 **Opportunities in Veterinary Medicine** Spring.
- 598 **Dermatology Clinic** Spring.

Clinical Sciences

Large Animal Medicine, Obstetrics, and Surgery

- 475 **Health and Diseases of Animals** Spring.
- 560 **Clinical Methods** Fall.
- 561 **Obstetrics and Reproductive Diseases** Spring.
- 562 **Obstetrics and Reproductive Diseases** Fall.
- 563 **Large Animal Medicine** Fall.
- 564 **Large Animal Medicine** Spring.
- 565 **Large Animal Surgery** Spring.
- 566 **Radiology** Spring.
- 567 **Clinical Nutrition** Spring.
- 581 **Basic Nutrition** Fall.
- 675 **Special Problems in Large Animal Medicine** Fall and spring.
- 676 **Special Problems in Large Animal Surgery** Fall and spring.

Small Animal Medicine and Surgery

- 677 **Special Problems in Large Animal Obstetrics** Fall and spring.
- 680 **Poisonous Plants** Fall.
- 681 **Horse Health Management** Spring.
- 682 **Large Animal Internal Medicine** Fall.
- 684 **Horse Lameness** Spring.
- 686 **Goats: Management and Diseases** Spring.
- 778 **Gastroenterology Conference** Fall and spring.
- 779 **Veterinary Gastroenterology** Spring.
- 780 **Veterinary Research Methods** Spring.
- 583 **Small Animal Medicine and Surgery** Fall.
- 584 **Small Animal Medicine and Surgery** Spring.
- 586 **Small Animal Surgical Exercises** Spring.
- 587 **General Surgery** Fall.
- 688 **Special Problems in Small Animal Medicine** Fall and spring.
- 689 **Special Problems in Small Animal Surgery** Fall and spring.
- 788 **Advanced Work** Fall and spring.

Diagnostic Laboratory

- 738 **Laboratory Methods of Diagnosis** Fall and spring.

Microbiology

- 315 **Basic Immunology Lectures** Fall.
- 316 **Basic Immunology Laboratory** Fall.
- 317 **Pathogenic Microbiology** Spring.
- 515 **Veterinary Immunology** Fall.
- 516 **Veterinary Bacteriology** Fall.
- 517 **Veterinary Virology** Spring.
- 518 **Veterinary Mycology and Protozoology** Fall.
- 519 **Epidemiology and Infectious Diseases** Spring.
- 520 **Community Health** Spring.
- 605 **Special Projects in Microbiology** Fall and spring.
- 606 **Small Animal Infectious Diseases** Spring.
- 707 **Advanced Work in Bacteriology, Virology, or Immunology** Fall and spring.
- 708 **Advanced Animal Virology Lectures** Spring.
- 709 **Advanced Animal Virology Laboratory** Spring.
- 710 **Microbiology and Immunology Seminar** Fall and spring.
- 711 **Laboratory Methods of Diagnosis** Fall and spring.

Pathology

- 330 **Introductory Parasitology and Symbiology** Spring.
- 440 **Parasitic Helminthology** Spring.
- 535 **General Pathology** Fall.
- 536 **Special Pathology** Spring.
- 537 **Veterinary Parasitology** Fall.
- 539 **Introduction to Laboratory Animal Medicine** Fall.
- 635 **Special Problems in Pathology** Fall and spring.
- 636 **Wildlife Pathology** Fall.
- 637 **Postmortem Pathology** Fall.
- 638 **Microscopy** Fall.
- 639 **Special Topics in Lab Animal Medicine** Fall.
- 735 **"State of the Arts" Seminar** Fall.
- 736 **Pathology of Nutritional Diseases** Spring.
- 737 **Advanced Work in Animal Parasitology** Spring.
- 738 **Laboratory Methods of Diagnosis** Fall.
- 739 **Advanced Work in Pathology** Fall.
- 740 **Reproductive Pathology** Spring.
- 745 **Diseases of Nonhuman Primates** Spring.

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746 **Comparative Pathology** Spring.

749 **Laboratory Animal Clinical Rotation** Fall and spring.

788 **Seminar in Surgical Pathology** Fall and spring.

789 **Seminar in Necropsy Pathology** Fall and spring.

790 **Special Topics in Pathology** Fall and spring.

Physical Biology/Section of Physiology

Invertebrate Zoology (Biological Sciences 310)

Histology: The Biology of the Tissues (Biological Sciences 313)

346 **Introductory Animal Physiology Lectures (also Biological Sciences 311)** Fall.

348 **Introductory Animal Physiology Lab (also Biological Sciences 319)** Fall.

Seminar in Anatomy and Physiology (Biological Sciences 410)

General Animal Physiology; A Quantitative Approach, Lectures (Biological Sciences 416)

General Animal Physiology, Laboratory (Biological Sciences 418)

Undergraduate Research in Animal Physiology and Anatomy (Biological Sciences 419)

550 **Applied Radiation and Veterinary Nuclear Medicine** Fall.

600 **Graduate Research in Animal Physiology and Anatomy (also Biological Sciences 719)** Fall and spring.

Lipids (Biological Sciences 619 and Nutritional Sciences 602)

650 **Special Projects in Physical Biology** Fall.

652 **Applied Electrophysiology** Spring.

653 **Clinical and Research Techniques in Veterinary Nuclear Medicine** Fall.

654 **Special Topics in Mineralized Tissue** Spring.

Mammalian Physiology, Lectures (Biological Sciences 654)

Mammalian Physiology, Laboratory (Biological Sciences 656)

Physiological Optics (Biological Sciences 695)

700 **Vertebrate Morphology (also Biological Sciences 414)** Spring.

750 **Radioisotopes in Biological Research (also Biological Sciences 616)** Spring.

751 **Biological Effects of Radiation** Fall.

752 **Biological Membranes and Nutrient Transfer (also Biological Sciences 618)** Spring.

755 **Physical Biology Graduate Seminar** Fall and spring.

758 **Molecular Mechanisms of Hormone Action (also Biological Sciences 658)** Spring.

759 **Nutrition and Physiology of Mineral Elements (also Biological Sciences 615 and Nutritional Sciences 659)** Fall.

Physiology, Biochemistry, and Pharmacology

525 **Vertebrate Biochemistry** Fall.

526 **Physiology for Veterinary Students** Spring.

527 **Physiology for Veterinary Students** Fall.

528 **Basic Pharmacology** Spring.

529 **Clinical Pharmacology** Fall.

620 **Special Projects in Physiology** Fall and spring.

621 **Toxicology** Spring.

622 **Special Projects in Pharmacology** Fall and spring.

626 **Veterinary Animal Behavior** Spring.

720 **Special Problems in Physiology** Fall and spring.

721 **Research** Fall and spring.

722 **Methods in Gastroenterological Research** Spring.

724 **Physiologic Disposition of Drugs and Poisons** Spring.

725 **Vertebrate Biochemistry Lectures** Fall.

726 **Physiology** Spring.

727 **Physiology** Fall.

728 **Basic Concepts in Pharmacokinetics** Fall.

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