

GENERAL CATALOG, UNIVERSITY OF CALIFORNIA, DAVIS, CALIFORNIA

UC/DAVIS 1973-74

GENERAL CATALOG

Davis

**Fall, Winter, and Spring Quarters
1973-74**

UNIVERSITY OF CALIFORNIA • DAVIS

UC / DAVIS

PUBLISHED AT DAVIS, CALIFORNIA

Volume 13 · June, 1973 · Number 3

**A series of administrative publications
of the University of California, Davis 95616.**

**Second-class postage paid at Davis,
California, and at additional offices.**

**Eleven issues a year—one in February, one in March, two in May,
two in June, one in July, two in August, one in September, and one in December.**

Information herein is subject to revision.

Price \$1.00

It is the responsibility of the individual student to familiarize himself with the announcements and regulations of the University printed in this catalog, the *Class Schedule*, and on Official Notices posted on bulletin boards.

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UNIVERSITY CALENDAR

1973-74

Davis Campus

	Fall 1973	Winter 1974	Spring 1974	(Fall 1974)
Pick up registration and course enrollment materials from Registrar's Office (all continuing students).	June 4- Aug. 23, Monday- Thursday	Nov. 12-14, Monday- Wednesday† (1973)	Feb. 11-13 Monday- Wednesday†	
Advisers available to all continuing students.	June 6-7 Wednesday- Thursday	Nov. 15-16 Thursday- Friday† (1973)	Feb. 14-15 Thursday- Friday†	
Turn in course enrollment materials (all continuing students).	Aug. 1-23, Wednesday- Thursday	Nov. 19-20 Monday- Tuesday† (1973)	Feb. 18-19 Monday- Tuesday†	
Turn in Registration Packets and Fee Payments (all continuing students).	Aug. 1- Sept. 4, Wednesday- Tuesday	Nov. 19- Dec. 7, Monday- Friday (1973)	Feb. 18- Mar. 6, Monday- Wednesday	
Late registration for continuing students.	Sept. 5- Oct. 5, Wednesday- Friday	Dec. 8- Jan. 18, Saturday- Friday	Mar. 7- Apr. 12, Thursday- Friday	
Quarter begins.	Sept. 17, Monday	Jan. 3, Thursday	Mar. 28, Thursday	Sept. 16, Monday
Orientation and testing.	Sept. 17-21, Monday- Friday	Jan. 3-4, Thursday- Friday	Mar. 28-29, Thursday- Friday	
Registration and payment of fees, in person.	Sept. 19, Wednesday	Jan. 3, Thursday	Mar. 28, Thursday	
Instruction begins.	Sept. 24, Monday	Jan. 7, Monday	Apr. 1, Monday	
Last day of late registration.	Oct. 5, Friday	Jan. 18, Friday	Apr. 12, Friday	
Final date to file petitions with the Registrar to add courses to study list.	Oct. 5, Friday	Jan. 18, Friday	Apr. 12, Friday	
Final date to file petition to drop courses. Thereafter permission may be granted by the dean of school or college only under exceptional circumstances.	Oct. 26, Friday	Feb. 8, Friday	May 3, Friday	
Final date to file petition to drop courses on a Passed/No Record basis with students' school or college. Exceptions rarely approved.	Oct. 26, Friday	Feb. 8, Friday	May 3, Friday	
Final date for graduate students to file petitions with the Dean of the Graduate Division to take courses on a Satisfactory/Unsatisfactory basis.	Oct. 26, Friday	Feb. 8, Friday	May 3, Friday	
Final date to file Independent Study Program project proposal form (available in the dean's office) either with the student's college dean or directly with Independent Study Committee.	June 4, Monday	Nov. 9, Friday (1973)	Feb. 7, Thursday	

† Dates are subject to change and should be checked with appropriate *Class Schedule*.

	Fall 1973	Winter 1974	Spring 1974	(Fall 1974)
Applications for admission to undergraduate standing, including applications for intercampus transfer, must be filed with complete credentials with the Office of Admissions on or before this date.	Nov. 30, Thursday (1972)	July 31, Tuesday (1973)	Oct. 31, Wednesday (1973)	Nov. 30, Friday (1973)
Applications for admission to graduate standing must be completed and filed with the Dean of the Graduate Division on or before this date.	June 1, Friday	Oct. 1, Monday (1973)	Jan. 1, Tuesday	June 1, Saturday
Applications for admission to the School of Medicine for 1974-75 must be filed with the School before this date.				Dec. 1, Saturday (1973)
Applications for admission to the School of Veterinary Medicine for 1974-75 must be filed with the Office of Admissions on or before this date.				Nov. 1, Thursday (1973)
Applications for admission to the School of Law for 1974-75 must be filed with the School on or before this date.				Mar. 1, Friday (1974)
Applications for readmission to undergraduate status must be filed with the Registrar on or before this date.	Aug. 6, Monday	Nov. 22, Thursday (1973)	Feb. 14, Thursday	Aug. 5, Monday
Applications for readmission to graduate status must be filed with the Registrar on or before this date.	Aug. 15, Wednesday (1973)	Dec. 3, Monday (1973)	Feb. 25, Monday	Aug. 16, Friday
Candidates who expect to complete work for A.B. and B.S. degrees must file an announcement of candidacy with the Registrar on or before this date.	Oct. 5, Friday	Jan. 18, Friday	Apr. 12, Friday	
Candidates who expect to complete work for masters' degrees must file applications for candidacy with the Dean of the Graduate Division on or before this date.	Sept. 28, Friday	Jan. 11, Friday	Apr. 12, Friday	June 28, Friday (for Sept. 1974)
Theses for masters' degrees must be filed with the committees in charge on or before this date.	Nov. 16, Friday	Feb. 22, Friday	May 17, Friday	Aug. 9, Friday (for Sept. 1974)
Theses for masters' degrees must be filed with the Dean of the Graduate Division on or before this date.	Dec. 14, Friday	Mar. 22, Friday	June 14, Friday	Sept. 6, Friday (for Sept. 1974)
Candidates who expect to complete work for the degrees of Doctor of Philosophy and Doctor of Engineering must file applications for candidacy with the Dean of the Graduate Division on or before this date.	Aug. 31, Friday	Nov. 30, Friday (1973)	Mar. 1, Friday	May 31, Friday (for Sept. 1974)
Theses for the degrees of Doctor of Philosophy and Doctor of Engineering must be filed with the committees in charge on or before this date.	Oct. 5, Friday	Jan. 4, Friday	Apr. 5, Friday	June 21, Friday (for Sept. 1974)

	Fall 1973	Winter 1974	Spring 1974	(Fall 1974)
Theses for the degrees of Doctor of Philosophy and Doctor of Engineering must be filed with the Dean of the Graduate Division on or before this date.	Nov. 30, Friday	Mar. 1, Friday	May 31, Friday	Aug. 16, Friday (for Sept. 1974)
Applications for fellowships and graduate scholarships for 1974-75 must be filed on or before this date.	Jan. 15, Tuesday (1974)			
Applications for 1974-75 undergraduate scholarships must be filed on or before this date.	Jan. 15, Tuesday (1974)			
Instruction ends.	Dec. 6, Thursday	Mar. 14, Thursday	June 6, Thursday	
Final examinations.	Dec. 8-14, Saturday- Friday	Mar. 16-22, Saturday- Friday	June 8-14, Saturday- Friday	
Quarter ends.	Dec. 14, Friday	Mar. 22, Friday	June 14, Friday	
Academic and administrative holidays.	Nov. 22-23, Thursday- Friday	Feb. 18, Monday	May 27, Monday	
	Dec. 24-25, Monday- Tuesday	Mar. 25, Monday	—	
	Dec. 31- Jan. 1, Monday- Tuesday	—	—	
Commencement Week	—	—	Mid-June	

THE UNIVERSITY OF CALIFORNIA, DAVIS

In 1868 Governor Henry H. Haight signed the Organic Act, which created the University of California. The following year the University opened its doors on the Oakland campus of the College of California, which had offered its buildings and land to the state in 1867 on condition that a "complete University" be created. In 1873 the University moved to Berkeley when the first buildings were completed.

Today the University has nine campuses to serve the State of California: Berkeley, Davis, Irvine, Los Angeles, Riverside, San Diego, San Francisco, Santa Barbara, and Santa Cruz. Each campus has its own distinct atmosphere and special features, but all share the same high standards and adhere to the same admission regulations.

Each campus is headed by a chancellor, and the principal Universitywide officer is the president. The government of the University is entrusted to a corporation called The Regents of the University of California. There are twenty-four Regents: sixteen are appointed by the Governor; the others, including the President of the University, serve *ex officio*. An Academic Senate governs the academic activities of the University; it is composed of the president, chancellors, vice-chancellors, vice presidents, deans, directors, registrars, librarians, and all professors and instructors responsible for courses.

The Davis Division of the Academic Senate determines for the Davis campus the conditions for certificates and degrees (subject to the approval of The Regents) and authorizes and supervises all courses of instruction in the academic colleges and professional schools.

THE HISTORY OF THE CAMPUS

A spirit of service and an atmosphere of closeness and friendliness accompany the commitment to academic excellence on the Davis campus. Originally known as the University Farm, the campus was acquired to serve the rural population of California, offering three years of instruction in the principles and practice of managing soils, crops, and animals. The need for such training had been anticipated by the late Judge Peter J. Shields, who helped write the legislative Act of 1905 establishing the Farm, and who is known as "the Father of the Davis Campus."

The need for greater educational opportunities in the state increased rapidly, and in 1922, in conjunction with the Berkeley College of Agriculture, the degree of Bachelor of Science in Agriculture was granted those who completed the Davis program. A few years later the Davis campus had its own College of Agriculture. In 1946 the School of Veterinary Medicine was established. Meanwhile, from its beginnings as an institution which had offered only a few basic, practical courses emphasizing agriculture, a full-fledged University campus was beginning to emerge.

The period of most rapid change and expansion began in 1951 when the College of Letters and Science was founded, and more degree programs became available. Although Davis had long offered courses in the humanities and social

sciences, the faculty in these disciplines now joined with the natural sciences faculty to offer fully developed University curricula. By 1961 graduate programs were so extensive and so numerous that a Graduate Division was established as a separate academic unit. The College of Engineering was formed in the following year, owing much to the foundation already provided by the curriculum in agricultural engineering which had been offered on the campus for many years. The School of Law held its first classes in the fall of 1966, and the School of Medicine admitted its first students in the fall of 1968.

THE PRESENT STATE OF THE CAMPUS

The University of California, Davis, has now been a general campus for twenty years. With an enrollment of more than 15,000 students, more than 4,000 of whom are graduate students; a faculty of some 1,900; and a staff of more than 5,000, we are encountering, in common with all other university campuses in the nation, problems which our own rapid growth, complicated by changes in society, have forced upon us, and which the founders of the "University Farm" could not have foreseen.

At Davis we are attempting to develop the means to address ourselves to these urgent problems from within and without the University. We are asking ourselves, as a campus, what the purpose of the University is and what role Davis is to play in the overall mission of the University. The faculty, students, and staff are reexamining the entire learning process and the environment of the student. We are working toward a formalized structure for decision-making on matters of common concern to the entire community—some sort of community council representing the constituent groups on campus: the Academic Senate, the Associated Students, the Graduate Student Assembly, the Academic Staff Organization, and the University Staff Assembly.

We feel that we have many advantages to bring to this attempt to solve our problems. Our location permits us to be somewhat insulated from the immediate thrust of society's urban problems. The spirit of friendliness and openness, maintained in the face of rapid growth, makes possible good communication between all segments of the campus. The fact that interdisciplinary groups have been present from the beginnings of this campus makes mutual respect and cooperation between departments, colleges, and schools the accepted rather than the extraordinary thing. The movement of the administration toward decentralization of decision making, involvement in the decision-making process of individuals affected by the decisions, and provision of administrative procedures for effecting responsible change should insure that our advantages are utilized.

We are moving ahead: strengthening our two young professional schools; expanding our established colleges to meet our share of the projected undergraduate enrollment; developing new interdisciplinary programs to respond to verifiable changes in student needs. Unafraid of change we yet require that change be made in a responsible fashion—cooperatively, deliberately, and with confidence that our strength and our willingness to listen to each other will carry us on.

STUDENT-FACULTY-STAFF COOPERATION

Faculty Advisers

The spirit of student-faculty cooperation on the campus is especially evidenced by the willingness of the faculty advisers to furnish academic counsel when needed. Every student has access to faculty counsel and is encouraged to contact his departmental or area adviser during orientation week and preregistration periods to seek advice on course selection and information about college or university requirements. The various academic deans are also available at all times to furnish assistance with any academic problem.

Administrative Advisory Committee System

The Administrative Advisory Committee system of the University of California, Davis, provides the Chancellor with a means of seeking and obtaining policy recommendations and advice on a wide range of topics from members of the student body, faculty, and staff.

By appointing interested members of the campus community to committees charged with advising various campus officials, the Chancellor can bring many viewpoints to bear on solutions to the varied problems of the campus population.

The Honor Spirit

A long-time tradition on the Davis campus, the Honor Spirit pervades all student activities. According to its code, the responsibility for good conduct rests with the individual student. He is considered to be a trustworthy adult who responds to the needs of the other members of the campus community. This spirit is largely responsible for the atmosphere of mutual respect and confidence that exists between the students, faculty, and staff, and among the students.

THE DAVIS COMMUNITY

Davis is a rapidly growing residential community of 30,000. Its population 20 years ago was 3,500 and the projection for 20 years from now in the Davis urban area is 55,000. It is located in the Sacramento Valley, 15 miles west of Sacramento, 72 miles northeast of San Francisco, and connected to each by a major freeway, Interstate 80. It is a junction of the Southern Pacific Railroad, has a Greyhound bus depot, and is 20 minutes from the Sacramento Airport. Its climate is temperate. There is rarely snow in winter and the average "mean" temperature in January is 45°. Summers are dry and warm with an average "mean" temperature in July of 74°.

Davis is ideally situated for access to outdoor recreation areas. In less than an hour, going west, one arrives at Lake Berryessa or, going east, at Folsom Lake, both of which are recreation areas featuring boating, picnicking, and swimming. An hour's drive brings one to Clear Lake and the famed Napa Valley to the west or the historic Mother Lode country to the east. Two hours away to the west are the coastal areas, Mendocino in the north and Santa Cruz in the south. Lake

Tahoe and the Sierra Nevada mountains, with excellent ski areas such as Squaw Valley, lie two hours to the east.

The community offers many facilities. Twenty-three churches serve the area. There are seven elementary schools, two junior highs, a senior high and a continuation school in the public school district. Students rank very high in comparative achievement tests. Excellent facilities are provided for the needs of special children and school services are wide-ranging. A favorable pupil-teacher ratio is maintained. There are also two private elementary schools.

A great variety of planned programs is offered, for all ages, in performing and fine arts, athletics, and special group recreation. Instructional programs are given on a year-round basis in aquatic and other sports, and facilities for swimming, tennis, and other sports are provided in the community's central and neighborhood parks and at the 18-hole municipal golf course.

Cultural opportunities are outstanding for a small community. In addition to the University Theatre, the Student Musical Theatre, and the University's full schedule of professional concerts, lectures, and exhibits, the Davis Art Center provides directed workshops and classes in fine arts, music, dance, and language and a permanent gallery featuring the work of local artists and offering rental services. There are two movie houses in town, one showing popular features and one specializing in art films, and a branch of the Yolo County Free Library housing 40,000 volumes. There are two local newspapers, and home delivery of the Sacramento and San Francisco papers is available.

Professional services in the Davis area are excellent. Many more physicians than would normally practice in a town of its size have been attracted to Davis by the UCD medical school. Hospital facilities are good with one private hospital within the town, a private and a county hospital with public health facilities ten miles away, and several large private hospitals and a Kaiser Foundation hospital in Sacramento, in addition to the Sacramento Medical Center of the University of California, Davis. There is a full range of other professional services available as well as restaurants, clothing stores, travel agencies, and many other facilities in the downtown business area and three shopping centers in the peripheral areas.

TRANSPORTATION

The central campus is closed to vehicular traffic. Parking permits are required for all campus lots. Permit fees in 1972-73 ranged from \$8 for motorcycles through \$20 for Residence Hall lots and \$30 for perimeter lots open to students to \$40 for central campus lots open only to faculty and staff. A small number of metered and daily permit spaces are available for visitors. Most members of the campus community ride bicycles. Bicycle and pedestrian lanes are clearly marked on campus and bicycle parking is available near all major buildings. The City of Davis has bicycle lanes (which are closed to vehicular traffic) on the major arteries. Bicycles must be registered with the city and riders are subject to traffic regulations and citations for rule infractions.

Although there is no public transportation in the city, the Associated Students (ASUCD) operate Unitrans, a service of five buslines to North, West, and

East Davis (the University campus is adjacent to the southern end of town). These buses run on a schedule convenient to class times and visits to labs or the libraries. Schedules and ride tickets are available at the beginning of every quarter.

RESEARCH FACILITIES ON THE CAMPUS

A number of centers, institutes, and laboratories supplement the extensive departmental research facilities on the campus: the Agricultural History Center, the Center for Administration of Criminal Justice, the Computer Center, the Food Protection and Toxicology Center, and the California Primate Research Center; the Institute of Ecology, the Institute of Governmental Affairs, the Institute of Marine Resources, and the International Agricultural Institute; the Bodega Marine Laboratory, the Crocker Nuclear Laboratory, the Laboratory for Research in Fine Arts and Museology, and the Radiobiology Laboratory; the University Arboretum, the Facility for Advanced Instrumentation, and the Kearney Research Foundation. The diversity of the areas of research illustrates the breadth of interests pursued on the Davis campus.

UNIVERSITY LIBRARY

The library on the Davis campus contains about one million volumes and annually receives 27,000 current periodicals and serials including government publications. Its holdings in the natural sciences and agriculture are outstanding; strong collections in the humanities, social sciences, fine arts, and engineering are available; and materials in law and medicine are rapidly being acquired. In addition to the main stack collection there are a number of special collections including a bibliographic center collection; 680,000 items on various forms of microcopy; some 33,000 maps; more than 400,000 pamphlets; a number of speech and music phonorecords; about 300,000 items in the F. Hal Higgins Library of Agricultural Technology; and a rare book collection of 16,000 volumes. In addition to the main library there are branch libraries for health sciences, physical sciences, and agricultural economics; a law library; and several specialized departmental collections.

The Reference Department of the main library provides orientation and assistance in using the collections which are operated on an open stack principle, permitting access to shelved volumes. The Educational Services program offers tours and lectures on the uses and resources of the library and a non-credit course, "Introduction to Library Research," is given each quarter. An information leaflet is available at the loan desk, the reference desk, and on counters near the card catalogue.

The Government Documents Department provides service for readers requiring use of government publications. The Library is an official depository for United States government publications and for all publications of the State of California. The Atomic Energy Commission reports and the National Aeronautics and Space Administration unpublished research reports are located in the Physical Sciences Library.

The Reserve Book Service makes available for short-term loan periods a collection of several thousand volumes that are heavily used because of assigned class reading.

The Periodicals Room houses 5,100 currently received, unbound titles of periodicals in a closed stack area. They are available for use only in the Library. A coin-operated copying machine in the Periodicals stack area can supply facsimiles of articles for \$.05 per exposure.

The Department of Special Collections provides readers with assistance in the use of rare books, the Hinman Collator, University Archives, and the F. Hal Higgins Library of Agricultural Technology. Other special facilities include a browsing collection for recreational reading, headphones for music listening, audio-visual equipment, a typing room, an outdoor reading area, and a copying service that provides facsimiles of printed materials at a nominal cost.

DIVISION OF EXTENDED LEARNING

The Extended University Council, a standing committee of the Davis Division of the Academic Senate, and the Dean of the Division of Extended Learning have responsibility for the administration of University instructional activities which are designed to make the resources of the University available to a broad segment of the population.

Part-Time Degree Program

In the fall of 1972 the University of California, Davis, embarked upon a three-year pilot program designed to extend opportunities to pursue selected regular degree programs to adults (especially those beyond the normal college age) whose employment or family responsibilities make full-time University attendance impossible.

Part-time undergraduate students with upper division standing may enroll for a maximum of eight units per quarter (9 units with the approval of the Dean), and must enroll for a minimum of three units per quarter. Part-time graduate students must take at least one course, and may take up to six units. Part-time students may apply an unlimited number of summer session units toward their degree requirements.

The Division of Extended Learning provides an educational advisory service to acquaint potential part-time students with the resources of the University, and continued advisory services will be available to part-time students after enrollment.

Fees. Part-time students pay approximately one half of the regular fees: \$108.50 per quarter for undergraduate students and \$118.50 for graduate students who are legal residents of the State of California. Nonresident students pay fees of \$42 per unit in addition to the above. Health services are available on a fee-for-services basis only. The \$7 student body membership fee is optional for the part-time student.

Bachelor's Degree Programs. Part-time students who are able to arrange their schedule in order to attend daytime classes may enroll in any Bachelor's degree

program currently offered on the Davis campus provided that space is available. Also, through special arrangements, a limited number of courses designed to contribute to the satisfaction of degree requirements in the following major fields are being offered in late afternoons and evenings during the 1973-74 academic year. These fields include: Agricultural Economics and Business Management, Biological Sciences, Dramatic Art, Economics, and English.

Opportunities also exist for students to develop individual majors if their academic interests cannot be accommodated within the framework of any one major program.

Admission. Students must be qualified to matriculate as upper division students and should have completed 84 quarter units (56 semester units) which are acceptable to the University for transfer credit. Transfer credit will be granted for courses completed in accredited colleges and universities which are consistent with the University of California curricula. The University grants transfer credit for approved transfer courses, completed with satisfactory grades, from the public community colleges of the state. Within normal admission regulations, a limited number of nontraditional students (those not fully admissible but able to demonstrate capacity for University work) may also be enrolled.

Master's Degree Programs. Students may be admitted only to specific master's degree programs which are approved by the Graduate Council for part-time students. The 39 programs which currently have this approval are grouped below according to their policies for scheduling classes to meet the needs of part-time students.

Part-time students will be considered for admission to the following master's degree programs which currently schedule a limited number of courses designed to contribute to the satisfaction of degree requirements in the late afternoons and evenings: Anthropology, Classics, Dramatic Art, Economics, Education, Geology, History, Mathematics (emphasis will be on the teaching of mathematics), Physical Education, and Spanish.

Several of the programs leading to a master's degree in Engineering are now offered during the day in Livermore via television link, and will be available via similar links in the Sacramento area beginning in the fall of 1973. Students may also come to the campus during the day for these courses if they can arrange their schedules accordingly. These Engineering programs are: Applied Science, Civil, Electrical, and Mechanical Engineering.

Part-time students will be considered for admission to the following master's degree programs provided they can accommodate themselves to present course schedules, taking a substantial portion of the work during the regular daytime class hours. At present these programs are: Agricultural Economics, Agricultural Science and Management, Agronomy, Anatomy, Animal Science, Atmospheric Science, Chemistry, Consumer Science, Ecology, Engineering (Agricultural), Engineering (Chemical), English, Entomology, Food Science, Geography, Horticulture, Microbiology, Physics, Physiology, Plant Pathology, Political Science, Range Management, Soil Science, Vegetable Crops, and Zoology.

Opportunities for study leading to degrees in other academic areas may soon be available. Students wishing to work toward masters' degrees other than those listed above are urged to contact the Division of Extended Learning.

Admission. In general, students must meet the normal admission requirements of the Graduate Division. They must have a Bachelor's degree from an accredited institution with standards for the degree substantially equivalent to those of the University of California. Grades received in upper-division courses related to the proposed graduate major should average at least 3.0 on a 4.0 scale. Letters of recommendation, Graduate Record Examination verbal and quantitative scores, and work experiences may also be considered. Certain departments may have additional admission requirements.

Application Procedures. Students who wish to apply for admission or to obtain further information about the Program for Part-time Degree Students should contact: Division of Extended Learning, University of California, 371 Mrak Hall, Davis 95616; or telephone (916) 752-2820.

Summer Sessions

In 1973 there will be two regular six-week Summer Sessions running from June 18 to July 27 and July 30 to September 7. The Summer Sessions will offer a number of lower division, upper division, and graduate courses of interest to students who may wish to maintain or accelerate progress toward their degree objectives. (Students attending both sessions may accomplish a quarter's work. See residence requirements, page 38. A substantial offering of upper division and graduate courses of interest to teachers and teacher candidates will also be offered, including courses for teacher candidates who have been admitted to internship programs and for other qualified graduate students who may wish to complete requirements for teaching credentials or degrees. In addition, variable unit courses in the 98-99, 198-199, and 298-299 series—group study, advanced special study, and research—will be available for qualified students in many departments. In addition, a number of special intensive short-term courses for teachers may be offered. Several courses may be offered at off-campus locations.

Summer Sessions will also be conducted on the Berkeley, Irvine, Los Angeles, Riverside, Santa Barbara, Santa Cruz, and San Diego campuses. Information about these Summer Sessions is available in the Summer Sessions bulletin, which may be obtained from the Office of Summer Sessions on the respective campuses.

Announcements concerning Summer Sessions in 1974 will be issued by the Registrar and the Office of Summer Sessions.

University Extension

University Extension fills a unique role in the University system. Its primary function is to link the University—its scholars, research, and resources—with the people and communities of the State through programs of continuing education.

University Extension programs on the Davis campus provide:

- opportunities to continue the pursuit of intellectual and cultural interests
- education for professional and career advancement
- education in public responsibility
- educational services for government and voluntary agencies.

Although many are designed for those who have attended college, most programs are open to any adult who can benefit from university-level study. Credit earned in classes offered through both the Concurrent Course Program and the Equivalent Course Program can be applied directly towards a degree, when and if participants become enrolled as regular students in the University.

Programs vary in length and format, from one-day conferences and short lecture series to courses of two or more quarters and certificate programs requiring up to several years. Instructors are drawn from the University faculty, nearby university and college faculties, and from the ranks of professionals in various fields of instruction. Guest speakers of national and international reputation participate in courses built around lecture series.

Credit and non-credit programs are offered in communities throughout the twenty-nine Northern California counties that UCD Extension serves. Information regarding current courses and programs may be obtained by writing University of California Extension, University of California, Davis 95616, or by telephoning (916) 752-0880.

Arts and Lectures Program

The Committee for Arts and Lectures is responsible to the Division of Extended Learning for the development of a program of cultural events to enrich and supplement the educational program for the Campus community and surrounding areas.

The Committee is composed of students, faculty, and staff members; program suggestions are welcome and should be addressed to the Committee office, 150 Memorial Union. In 1972-73 the program included a weekly film series; two professional dance companies in residence; mimes; a popular series of free "Wednesday on the Quad" noon entertainments; an Italian theatre company; numerous lectures, workshops, and poetry readings; and a concert series ranging over the musical literature from the Renaissance to the present day. Student tickets are available at reduced prices to events for which there is a charge.

The Conference Program

The Conference Office provides general planning assistance to groups sponsoring meetings, workshops, conferences and similar activities and makes the necessary arrangements for the use of campus facilities and services that are available to such groups.

The services of the Conference Office are designed to help reduce the amount of time that must be spent arranging conference details and to provide a central point of conference service for groups using the facilities of the Davis campus. This office is located in the Mini-Center and those interested in using conference facilities should telephone (916) 752-2813.

Admission and Registration

The University's undergraduate admission requirements, which are the same on all campuses, are based on two principles: first that the best predictor of success in the University is high scholarship in previous work, and second

that the study of certain subjects in high school gives a student good preparation for University work and reasonable freedom in choosing an area for specialized study.

ADMISSION TO FRESHMAN STANDING

Each campus of the University has enrollment quotas which limit the number of new freshman students which may be admitted for each term.

The University defines a "freshman applicant" as a student who has graduated from high school but who has not enrolled since then in a regular session in any collegiate-level institution. To be eligible for admission to the University as a freshman, applicants must meet the Subject Requirements, the Scholarship Requirements, and the Examination Requirements which are described below. Special requirements for nonresident applicants will be found on page 20.

Subject Requirements

Courses offered in satisfaction of the following requirements must appear on a list certified by the applicant's high school principal as meeting the subject requirements and be approved by the Director of Admissions of the University of California. The term "unit," as used below, means a one-year course in high school.

a. History, 1 unit

One unit of United States history, or $\frac{1}{2}$ unit of United States history and $\frac{1}{2}$ unit of civics or American government.

b. English, 3 units

A total of six semesters of English composition, literature, or oral expression.

c. Mathematics, 2 units

A total of two units of subjects such as elementary algebra, geometry, trigonometry, calculus, elementary functions, matrix algebra, probability, statistics, or courses combining these topics. Arithmetic and such nonacademic subjects as shop mathematics and business mathematics may not be included in the total.

d. Laboratory science, 1 unit

A tenth-, eleventh- or twelfth-grade year course in one laboratory science. Both semesters must be in the same subject field.

e. Foreign language, 2 units

Two units of one foreign language with a written literature. Both units *must* be in the same language.

f. Advanced course, 1 (or 2) units

Units offered in satisfaction of this requirement may be chosen from the following:

Mathematics, a total of 1 unit of second-year algebra, solid geometry, trigonometry, or other certified advanced courses.

Foreign Language, either 1 additional unit in the same foreign language offered under *e* above or 2 units of another foreign language.

Science, 1 unit of a laboratory science completed subsequent to the laboratory science used for *d* above. Both semesters must be in the same subject field.

g. Electives

Additional elective units to complete the minimum of 15 standard high school entrance units are also required.

Scholarship Requirements

At least a B average is required in courses taken after the ninth year and offered in satisfaction of the subject requirements. Grades received in elective courses or in courses taken in the ninth year or earlier are not used in computing this average. Subject requirements are satisfied by courses in which a grade of C or higher has been earned. Grades are considered on a semester basis except from schools that give only year grades. Grades, including those earned in accelerated and advanced courses, are accepted as they appear on the transcript.

In determining the B average, a grade of A in one course will be used to balance a C in another, but an A may not be used to compensate for D, I, or F grades. Courses taken in the ninth year or earlier in which a grade of D or lower is received may be repeated to establish subject credit.

Courses taken after the ninth year in which a grade of D or F is received may be repeated to establish subject credit and to improve scholarship. Courses may be repeated in an amount not to exceed a total of 1 unit of the *a-f* pattern. Grades earned in such repetitions will not be counted higher than a C in determining scholarship average.

Examination Requirements

As a requirement for admission, all freshman applicants (and advanced standing applicants who have earned less than twelve units of college credit subsequent to high school graduation) must submit scores from the following examinations.

1. College Entrance Examination Board Scholastic Aptitude Test
2. Three CEEB Achievement Tests, which must include:
 - a. English composition,
 - b. social science or foreign language,
 - c. mathematics or science.

Applicants whose scholarship average in the required high school subjects is 3.00 to 3.09 inclusive must achieve a minimum total score of 2500 on the ex-

aminations. Applicants whose scholarship average is 3.1 or above are not held for a minimum test score but must submit the required test pattern. The test results of all applicants will be used for the purposes of counseling, guidance, placement, and, when possible, in satisfaction of the Subject A requirement.

Examination Arrangements

Applicants for the fall quarter are urged to take the required examinations as early as possible. Those taking the examinations any later than January will delay the processing of their applications.

Arrangements to take the tests should be made with the Educational Testing Service, P.O. Box 1025, Berkeley, California 94701, or P.O. Box 592, Princeton, New Jersey 08540. The fees are to be paid to the Educational Testing Service. Scores will be regarded as official only if they are received by the Office of Admissions directly from the Educational Testing Service. Admissions applications cannot be processed until scores from the CEEB tests have been received by the Admissions Office.

Admission by Examination Alone

A high school graduate who has not satisfied the entrance requirements as a result of his high school record and who has not attempted college work subsequent to high school (except during summer session immediately following high school graduation) may qualify for admission if he achieves the prescribed minimum scores in the required examinations taken after the first half of the eleventh grade. See "Examination Requirements" above.

For admission by examination alone the total score on the Scholastic Aptitude Test must be at least 1100; the scores on the three Achievement Tests must total 1650, and the score on any one Achievement Test must not be less than 500.

SPECIAL REQUIREMENTS FOR NONRESIDENT APPLICANTS

Graduation From High School

The acceptability of records from high schools outside California will be determined by the Office of Admissions.

Subject Requirements

The subject pattern required is the same as that required for a California resident (see page 18).

Scholarship Requirements

The scholarship requirements for a nonresident applicant are the same as those for a resident except that the scholarship average must be 3.4 or higher in the required high school subjects taken in the tenth, eleventh, and twelfth years.

Examination Requirements

A nonresident applicant must take the same College Entrance Examination Board tests as those required of a resident applicant (see page 19). The test scores submitted will be used for the purposes of counseling, guidance, placement, and, when possible, in satisfaction of the Subject A requirement.

Admission by Examination Alone

A nonresident applicant who is ineligible for admission to freshman standing and who has not attempted college work subsequent to high school (except during the summer session immediately following high school graduation) may qualify for admission on the basis of examination alone. The tests required of a nonresident applicant are the same as those required of a resident but the scores on the three Achievement tests must total at least 1725.

HIGH SCHOOL PREPARATORY SUBJECTS

In addition to the high school subjects required for admission to the University, certain preparatory subjects are recommended for many University curricula to give the student an adequate background for his chosen field of study. Lack of a recommended high school course may delay graduation from the University. Details of these recommendations will be found in the bulletin *Prerequisites and Recommended Subjects*, which is ordinarily in the hands of high school and community college counselors.

A student needing additional preparation is advised to attend one of the many excellent California community colleges. There he can take courses applicable toward the requirements of the college or school of the University in which he wishes to enroll.

ADMISSION TO ADVANCED UNDERGRADUATE STANDING

Each campus of the University has enrollment quotas which limit the number of new advanced-standing students which may be admitted each term.

Applicants who have registered since high school graduation in any collegiate institution—including community colleges, summer school, or extension courses—must apply for admission to advanced standing. An applicant may *not* disregard his previous college record and apply as a freshman. However, an advanced standing applicant who has earned less than twelve units of college credit subsequent to high school graduation must satisfy the examination requirement for freshman applicants as described on page 19. The examination requirement may be disregarded in determining eligibility for freshman standing if the applicant has earned more than 12 units of college credit subsequent to high school graduation.

Regulations applying to admission to advanced standing are as follows:

1. Those *eligible* for admission from high school, who have attended another collegiate institution, must present from that institution a statement of good standing and a grade-point average of 2.0 (2.8 for nonresidents).*

* The grade-point average is determined by dividing the total number of acceptable units attempted into the number of grade points earned on those units. Courses completed with a grade lower than C- may be repeated up to a maximum of 16 quarter units without penalty.

The scholarship standard is expressed by a system of grade points (A = 4.0, B = 3.0, C = 2.0, D = 1.0, and I and F, no points) and grade-point averages earned in courses accepted by the University for advanced standing credit.

2. Those *ineligible* for admission from high school because of subject omissions may establish eligibility by completing, at an accredited college, the required courses with at least C grades, and by maintaining an average of 2.0 (2.8 for nonresidents).*

3. Those *ineligible* for admission from high school because of grade-point deficiency may establish eligibility by completing, at an accredited college, a minimum of 56 acceptable semester units (or 84 quarter units), with an average of 2.0 or better (2.8 for nonresidents).*

4. Those *ineligible* for admission from high school because of low scholarship or a combination of low scholarship and a lack of required subjects may be admitted after earning a grade-point average of 2.0 or better (2.8 for nonresidents) in at least 84 quarter units (56 semester units) of college credit in courses accepted by the University for transfer.**

5. Subject deficiencies of not more than 2 units may be waived for those who present the 56 or more semester units (or 84 quarter units) and the 2.0 grade-point average mentioned above (2.8 for nonresidents).

The University grants credit for courses consistent with its curriculum that have been completed in accredited colleges and universities. The University accepts approved transfer courses completed with satisfactory grades in the community colleges of the state. Frequently, students who intend to complete their upper division studies at the University will find it to their advantage to complete the first two years of the college work in a California community college. However, not more than 105 quarter units in a community college (70 semester units) are acceptable toward a University degree, although subject credit may still be earned. Entering transfer students earning credit by this means will not be penalized for changes that occur in University graduation requirements while they are attending community colleges.

The acceptability of extension courses taken at an institution other than the University of California is determined by the Office of Admissions. The faculty of the particular school or college in which the student plans to enroll, however, decides upon the applicability of such course work in satisfaction of degree requirements. Under the Advanced Placement Program of the College Entrance Examination Board, entering freshmen may receive advanced standing credit for Advanced Placement Examinations completed with scores of 3, 4, or 5 on both essay and objective sections of the tests. The Advanced Placement Examinations are taken, usually during the senior year, in conjunction with courses taken in high school. College credit will be allowed for satisfactory scores in examinations given as a part of the College Level Examination Program (CLEP-CEEB) providing the tests do not duplicate subjects completed in an accredited collegiate institution. For completion with a score of 500 or better in General

* The grade-point average is determined by dividing the total number of acceptable units attempted into the number of grade points earned on those units. Courses completed with a grade lower than C- may be repeated up to a maximum of 16 quarter units without penalty.

The scholarship standard is expressed by a system of grade points (A = 4.0, B = 3.0, C = 2.0, D = 1.0, and I and F, no points) and grade-point averages earned in courses accepted by the University for advanced standing credit.

** The advanced standing requirements for admission listed here are experimental and will be in effect for applicants applying to terms from the fall quarter 1973 through spring quarter 1977.

Examinations in Social Science, Natural Science, and Humanities, 10 quarter units for each examination can be allowed. For scores of 50 or better in Subject examinations which are appropriate to the University's curriculum, credit of 5 or 10 quarter units may be allowed depending on scope of the material covered. Examination arrangements are made through the College Entrance Examination Board, Box 592, Princeton, New Jersey 08540.

ADMISSION OF APPLICANTS FROM OTHER COUNTRIES

Applicants from other countries will be admitted in accordance with the general regulations governing admissions. An application, official certificates, and detailed transcripts of record should be submitted to the Office of Admissions early in the appropriate filing period (see page 26). Early filing will allow time for exchange of necessary correspondence and, if the applicant is admitted, will help him in obtaining the necessary passport visa.

An applicant from another country whose native language is not English may be admitted only after demonstrating that his command of English will permit him to profit by instruction in the University. An applicant's knowledge of English is tested by an examination given by the University. Admission of an applicant who fails to pass this examination will be deferred until he has acquired the necessary proficiency in the use of English.

Foreign students whose schooling has not been in English are urged to take the Test of English as a Foreign Language (TOEFL). Arrangements to take the test may be made in writing directly to TOEFL, Educational Testing Service, P. O. Box 592, Princeton, New Jersey 08540, U.S.A. Results of the test should be forwarded to the Office of Admissions, University of California, Davis, California 95616.

A student from a non-English speaking country is given college credit in his own language and literature only for courses completed in his country at institutions of college level, or for upper division or graduate courses taken in the University of California or in another English-speaking institution of approved standing.

Undergraduate Financial Aid. There will be no grants or loans awarded by the University of California, Davis, to undergraduate international students during their first year of study. There is no guarantee of financial help from the University following the first year.

SPECIAL ADMISSION CATEGORIES

In the case of a student who is technically ineligible for admission to the University, the Admissions Officer has authority and responsibility to consider other evidence of ability to pursue University work.

Conditions for admission to *special* or *limited status* are determined by the Admissions Officer and are subject to the approval of the dean of the college or school in which the applicant plans to study. Admission is for a specified time only, and a prescribed scholarship average must be maintained. No degree can be granted to students in special or limited status. Applicants must submit transcripts of record from all schools attended beyond the eighth grade.

Special Status

Students admitted to special status are those twenty-one years of age or older who have not fulfilled the University admission requirements but whose special attainments may qualify them for certain courses in the University toward a definite and limited objective.

No applicant will be admitted directly from high school, and only cases of unusual merit will be considered. A personal interview is usually required before final action can be taken.

A special status student will be admitted to courses for which, in the judgment of the instructor, he has satisfactory preparation. Students in this category will seldom be able to undertake the work of engineering and professional colleges or schools.

An applicant will not be admitted to special status for the purpose of making up requirements for admission to the University as a regular student.

Limited Status

Students in limited status are those with a bachelor's degree who are not candidates for an advanced degree, or those without a bachelor's degree who have completed a substantial amount of college work with a satisfactory scholarship average and whose special attainments may qualify them for certain courses in the University toward a definite and limited objective.

An applicant will not be admitted to limited status for the purpose of raising a low scholarship average.

(Enrollment pressures have necessitated closing this status to applicants desiring admission to the College of Letters and Science. Under extraordinary circumstances, by the permission of the Dean of the College, students may be admitted in limited status to the Colleges of Agricultural and Environmental Sciences and Engineering.)

Applicants for a Second Bachelor's Degree

The second bachelor's degree is granted only to students who have completely changed their objective. Those admitted to pursue this degree must indicate very strong probability of academic success.

Admission is subject to the approval of the Admissions Officer and of the dean of the school or college in which the applicant plans to enroll.

(Enrollment pressures have necessitated closing this status to applicants desiring admission to the College of Letters and Science.)

EDUCATIONAL OPPORTUNITY PROGRAM

The Educational Opportunity Program (EOP) provides entrance to the University, financial assistance based on need, and academic support services to students from racial minority and/or low income groups who may or may not meet the regular University admission requirements. EOP recruits Asians, Blacks, Chicanos, Native Americans, and Others. The "Others" group includes white applicants and those persons who do not want to be identified in one of the pre-

ceding ethnic categories. Those applying in the Others category must demonstrate a history of low income (based on parental income) during the primary and secondary school years.

EOP accepts and considers all complete applications from minority and/or low income students. The program is limited, however, by admission spaces and funds. Interested applicants are encouraged to apply to the other Educational Opportunity Programs throughout the state, as well as to the program on the Davis campus.

An application for admission to EOP at the Davis campus may be obtained by writing to the Educational Opportunity Program, Admissions, 175 Mrak Hall, University of California, Davis, California 95616.

REQUIREMENTS FOR ADMISSION TO GRADUATE STANDING

See page 184 or the *Announcement of the Graduate Division*.

APPLICATION PROCEDURES

Applicants are expected to study the admission requirements (starting on page 18) to determine as closely as possible their eligibility before following the steps outlined below. Undergraduate application should be directed to only one campus of the University.

Admission to the University is not an assurance of financial aid nor does it guarantee assignment to University housing. Separate applications are required of applicants desiring financial aid or University housing.

For Freshman Standing

1. Applying for Admission

Application packets for undergraduate admission are available from high school and community college counselors or from any University campus Admissions Office. Applications (and application fees) are to the University and not to a particular campus even though the applicant sends them to the campus of his first choice. Consequently, the fee is not refundable if a particular campus cannot accommodate the applicant. The opening dates listed below are the dates on which application materials are available; however, they may be requested in advance. All campuses observe these dates for the beginning of application filing. Each campus will accept for consideration all applications filed during the first month of the filing period. After the first month the deadline will vary from campus to campus. Each campus has enrollment quotas that limit the number of new freshman and new advanced standing students that may be admitted. Once these quotas have been filled, additional applications cannot be accepted and will be redirected to another University campus where enrollments are still open. For this reason, applicants should give careful thought to the order in which alternate campus preferences are listed on the application form. Equally important, the completed application should be filed as early in the filing period as possible.

<i>Quarter</i>	<i>Opening Date of Quarter</i>	<i>Application Filing Period</i>
Winter 1974	January 3	July 1-31, 1973
Spring 1974	March 28	October 1-31, 1973
Fall 1974	September 16	November 1-30, 1973

2. Application Fee

The completed application form, accompanied by a \$20 nonrefundable application fee, should be returned to the Office of Admissions as promptly as possible. (The application fee should be in the form of a check or money order made out to The Regents of the University of California.) An application received without the fee will be returned to the applicant.

3. Duplicate Applications

An applicant should not file an application for admission to more than one campus of the University for the same quarter. Since the admission requirements are the same on all campuses, admission to the University entitles a student to attend the campus selected if there is space available. If an applicant files with more than one campus, the processing of all his applications will be suspended until the Universitywide Director of Admissions is notified of the one campus on which the applicant wishes to be considered. Fees submitted with duplicate applications will not be refunded.

4. Transcript of Record

The applicant is responsible for arranging to have transcripts sent and for insuring their early arrival at the Office of Admissions, University of California, Davis.

Students still in high school should request their school to send directly to the Office of Admissions an official transcript of all work completed through the junior year and a list of courses in progress during the final two semesters. A complete and final official transcript, including a statement of high school graduation, must be submitted for each applicant after graduation. Evaluations of work undertaken at any additional schools attended after an application for admission has been filed, including work undertaken at any college attended before high school graduation, are considered to be a part of the applicant's record and are to be reported to the Office of Admissions. Transcripts and other documents submitted become the property of the University and cannot be returned or forwarded in any form to another college or university.

5. Redirection

Through its redirection program, the University has been able to assure that each qualified applicant is offered admission to one of the University campuses. If at the end of the first month of the application filing period a campus has more qualified applicants than it can accommodate within its enrollment quotas, redirection to alternate campuses becomes necessary. Fifty percent of the available space on a campus that is required to limit its enrollment is

reserved for those most highly qualified on the basis of scholastic achievement. Selection is then made from among remaining qualified applicants on the basis of an individual review of each application. This selection process will give consideration to such criteria as academic interests, available campus programs, hardship factors which prohibit or restrict a student from attending another campus, selective recruitment efforts, special achievements and awards, and similar considerations.

6. Notification of Eligibility

There are three stages of notification in the admissions cycle. Included with the application packet are two reply cards which are used in the first two stages of communication, and they should be returned, self-addressed and stamped, with the completed application. When the application is received in the Admissions Office, one card is returned to the applicant acknowledging receipt of the application and the other card is sent after any necessary redirection has been completed. This second card will advise the applicant of the campus where his application will be processed. Upon receipt of this card he is assured of admission to that campus if the standard admission requirements are met. In most instances the second card will be returned to applicants within three months after filing.

The length of time before final notification of admission is received by the applicant is subject to variation, depending on the unique circumstances of each applicant. In general, most applicants for the fall quarter will receive final notification by late spring. In the case of advanced standing applicants whose eligibility depends on their final semester of work, notification cannot be made until receipt of final transcripts. Delays in any notification will occur if required records have not been received by the Office of Admissions.

7. "Statement of Intention to Register" Form

Admitted applicants will receive a "Statement of Intention to Register" form with their notification of eligibility. The form should be completed and returned along with a \$50 nonrefundable fee. This fee will be credited to the University registration fee if the student registers for the quarter in which he is accepted.

8. Change of Campus

If, after an applicant has filed for admission to the Davis campus his plans change and he prefers to be considered for admission to another campus, he must write to the Director of Admissions, University Hall, University of California, Berkeley, California 94720, indicating his reason for the change. His records will be transferred to the campus for which he wishes to be considered provided facilities are available there. Such requests must be received before the end of the filing period.

9. Reapplication

An applicant who was deemed ineligible for admission, or one who was admitted but did not register in the quarter for which he was accepted, and who later desires to attend the University, must submit a new application for

admission with the \$20 fee. The new application will be acted upon in light of the current availability of facilities and current admission requirements.

For Advanced Undergraduate Standing

Applicants for admission to advanced undergraduate standing should follow all steps outlined above for applicants for freshman standing and, in addition, arrange with each college or university attended since graduation from high school to send directly to the Office of Admissions, University of California, Davis 95616, an official transcript of work completed or in progress. The one exception to the regulation on duplicate applications applies to an applicant who files an application for admission to one of the professional schools in the health sciences, including the School of Veterinary Medicine at Davis, who may also apply for admission to the general campus of the University in advanced undergraduate standing.

For Intercampus Transfer

An undergraduate student who is registered on any campus of the University, or who was previously registered in a regular session of the University and has not since been registered in another institution, may apply for transfer to another campus of the University by filing the proper forms *on the campus where he last registered*. The intercampus transfer application forms and application for transcript of record forms may be obtained from the Office of the Registrar and must be filed with that office. There is a fee of \$20 at the time of filing. Dates for filing are the same as those listed for new applicants.

For Graduate Standing

An application form and information may be obtained by writing directly to the Office of the Graduate Division, Room 252, Mrak Hall, University of California, Davis 95616.

For Professional School Admission

School of Law

The requirements for admission to the School of Law are described on page 164. More detailed information and the appropriate application form may be obtained by writing the School of Law, University of California, Davis 95616.

School of Medicine

The requirements for admission to the School of Medicine are described on page 170. More detailed information may be obtained by writing to the School of Medicine, University of California, Davis 95616.

School of Veterinary Medicine

The requirements for admission to the School of Veterinary Medicine are described on page 172. More detailed information and the appropriate application may be obtained by writing the School of Veterinary Medicine, University of California, Davis 95616.

GENERAL REGISTRATION PROCEDURE

All students must complete registration requirements. These requirements include:

1. Obtaining registration materials from the Registrar at the designated time and place. (Detailed information may be found in the *Class Schedule* available in the UCD Bookstore and Room 129 Mrak Hall shortly before the opening of each quarter.)

Late registration privileges will be granted through the tenth day of instruction. A \$10 fee will be assessed to defray the extra clerical costs of late registration.

2. Preparing a study program of courses, and obtaining the adviser's approval and signature when required.

3. Enrolling in the Subject A course if the requirement has not already been satisfied (see page 37).

4. Satisfying the maximum and minimum unit load for which a student may enroll each term. These vary with each college or school. However, the University considers 12 quarter units a minimum full-time load for undergraduate students. All students participating in student and intercollegiate activities must carry this minimum number of units.

5. Paying the prescribed fees (see page 40).

For all nonimmigrant international students, the Associated Students Supplementary Health Insurance program is required (see page 52).

6. Carrying out the following additional procedures if you are a new or reentering student:

a. submitting a Statement of Residence (see page 31);

b. having a physical examination given by the University Medical Examiners (see page 51).

New graduate students who have been registered previously at Davis as undergraduates are considered to be new students.

7. Becoming familiar with the requirements of one's particular college or school.

8. Presenting completed registration forms and packets to the Registrar by the prescribed times (see the *Class Schedule*).

ADDING OR DROPPING COURSES

In order to add or drop courses after initial enrollment in classes, a student is required to file the appropriate petition. The department offering the course, the dean of his college (when required) and, in the case of a graduate student, his adviser must approve the student's petition. The completed petition is then filed at the office of the department offering the course and is subsequently presented to the Registrar's Office.

CHANGES OF MAJOR, COLLEGE, OR SCHOOL

With the approval of the appropriate dean or deans, a student in good standing can transfer from one area of study to another. Petition forms for this purpose may be obtained from the Registrar.

CHANGE OF NAME

Petition forms for this purpose may be obtained from the Registrar. Changes for reasons other than marriage must be accompanied by evidence of the legality of the change.

WITHDRAWALS

Withdrawals may be granted by the University for *emergency* reasons or for *good cause*. Unauthorized withdrawals may jeopardize the student's registration privileges and result in failing grades. Forms for this purpose must be obtained from the Registrar's Office.

It is also important that students who have been receiving veterans' benefits or who have been deferred by Selective Service because of registration in the University report their change of status immediately, in person or by mail, to the Office of Selective Service and Veterans Affairs.

Planned Educational Leave Program

Planned Educational Leave is defined as a planned interruption or pause in a student's regular education during which he temporarily ceases his formal studies at Davis while pursuing other activities that may assist in clarifying his educational goals, provide job opportunities and practical experiences away from the campus, allow time for the solution of personal problems, and enhance the prospect of successful completion of his academic program. The intent of the Program is to make it possible for a student to suspend his academic work, leave the campus, and later resume his studies with a minimum of procedural difficulty.

Any registered student at the Davis campus, undergraduate or graduate, is eligible to enroll in the Planned Educational Leave Program. Freshmen who have been admitted but have not yet registered are also eligible, the intent being to provide an opportunity for beginning students to pause between high school and college. Professional schools have special guidelines for the participation of their students in this Program.

Each applicant for enrollment in the Program is required to file an application form, including a brief explanation of his reasons for leaving the Davis campus, and must state in writing when he intends to resume his academic work. The appropriate dean must approve the application. The minimum Planned Educational Leave is one full quarter; the normal maximum is one full academic year. A student may request an extension of his Leave. For purposes of this Program, leave of one full quarter is defined as a leave commencing no later than the second week of instruction in a quarter.

It is expected that students enrolled in the Program will devote their leave period primarily to non-classroom activities. Students on Planned Educational Leave are not eligible to enroll in concurrent courses on the Davis campus and shall not earn academic credit at Davis during the period of the Leave.

At the end of his Planned Educational Leave, a student is guaranteed readmission if he resumes his regular academic work at the agreed upon date. Stu-

dents who do not return at the prearranged time and do not extend their leave, will be considered to have withdrawn.

A fee of \$20 is charged, payable when a student enrolls in the Program. There are no additional charges, other than normal quarterly registration fees, upon his return. In total amount, this fee is identical to that paid by a student who withdraws and is required to pay a readmission fee when he returns. (The readmission fee is collected in advance.) A student is not eligible to receive normal University services during the period of his planned leave. Certain limited services, however, such as Placement Services, Counseling Services, faculty advising, and Draft Counseling are available. Male students are urged to consult the Office for Selective Service and Veterans Affairs before they depart. Grants and other financial aids will be discontinued for the period of the leave, but every effort will be made, where legally possible, to allow a student to renegotiate loan payment schedules and to insure the availability of financial aids upon his return.

For applications and specific information about the Planned Educational Leave Program, students should consult the Student Development Office. In addition, students may consult the appropriate Dean's Office, the Registrar, The First Resort, or their faculty advisers.

READMISSION AFTER AN ABSENCE

All former students who wish to re-enter the University of California, Davis, must file an application for readmission with the Registrar and submit the non-transferable, nonrefundable fee of \$20. (Former students are those who have interrupted the completion of consecutive *quarters* of enrollment on the Davis campus.) Official transcripts of all work attempted in the interim must be submitted. Final dates for filing for readmission are listed on page 7.

RULES GOVERNING RESIDENCE

Students who have not been legal residents of California for more than one year immediately prior to the residence determination date for each quarter in which they propose to attend the University are charged, along with other fees, a tuition fee of \$500 for the quarter. The residence determination date is the earliest opening day of the term on any of the University of California campuses.

Legal residence is established by an adult who is physically present in the state while, at the same time, intending to make California his permanent home. The prior legal residence must be relinquished, and steps must be taken at least one year prior to the quarter to evidence the intent to make California the permanent home. Some of the relevant indicia of an intention of California residence are: voting in elections in California and not in any other state; satisfying resident California state income tax obligations on total income; establishing an abode where one's permanent belongings are kept; maintaining active resident memberships in California professional or social organizations; maintaining California vehicle plates and operator's license; maintaining active savings and checking accounts in California banks; maintaining permanent military address or home of record in California if one is in the military service, etc. Conduct inconsistent

with the claim of California residence would include, but not necessarily be limited to, the following: maintaining voter registration and voting in person or by absentee ballot in another state, if the basis of the franchise is legal residence; obtaining a divorce in another state; attending an out-of-state institution as a resident of the state in which the institution is located; obtaining a loan requiring legal residence in another state.

The student who is within the state for educational purposes only does not gain the status of resident regardless of the length of his stay in California. In general, the unmarried minor (a person under 18 years of age) derives legal residence from his father (or from his mother if the father is deceased), or, in the case of permanent separation of the parents, from the parent with whom the minor maintains his place of abode. A man or a woman may establish his or her residence.

A student who is a minor and remains in this state after his parent, who was a resident of California but has established residence elsewhere, shall be entitled to retain residence classification until one year after the student turns eighteen, thus enabling the student to establish residency, so long as continuous attendance is maintained at the University.

Nonresident students who are minors or 18 years of age and can evidence that they have been totally self-supporting through employment and actually present in California for the entire year immediately prior to the opening day of the quarter and have evidenced the intent to make the state their permanent home may be eligible for resident status.

Exemption from payment of the nonresident tuition fee is available to the natural or adopted child, stepchild or spouse who is a dependent of a member of the armed forces of the United States stationed in California on active duty; such residence classification may be maintained until the student has resided in the state the minimum time necessary to become a resident, so long as continuous attendance is maintained at the University. If the member of the armed forces is transferred on military orders to a place outside of the United States immediately after having been stationed on active duty in California, the student who is the natural or adopted child, stepchild or spouse dependent on the member of the military is entitled to residence classification under conditions set forth above. A student who is a member of the armed forces of the United States stationed in California on active duty, except a member of the armed forces assigned for educational purposes to a state-supported institution of higher education, shall be entitled to residence classification until he has resided in the state the minimum time necessary to become a resident.

A student who is an adult alien is entitled to residence classification if the student has been lawfully admitted to the United States for permanent residence in accordance with all applicable provisions of the laws of the United States; provided, however, that the student has had residence in California for more than one year after such admission prior to the residence determination date. A student who is a minor alien shall be entitled to residence classification if the student and the parent from whom residence is derived have been lawfully admitted to the United States for permanent residence in accordance with all

applicable laws of the United States, provided that the parent has had residence in California for more than one year after acquiring such permanent residence prior to the residence determination date of the term for which the student proposes to attend the University.

Children of deceased public law enforcement or fire suppression employees who were California residents, and who were killed in the course of law enforcement or fire suppression duties, may be entitled to residence classification.

A student in continuous full-time attendance at the University who had resident classification on March 7, 1973, shall not lose such classification as a result of the adoption of the uniform student residency law on which this catalog statement is based, until the attainment of the degree for which he or she is currently enrolled.

New and returning students are required to complete a Statement of Legal Residence, a form that is issued at the time of registration. Their status is determined by the Attorney in Residence Matters' Deputy who is located in the Registrar's Office.

The student is cautioned that this summation regarding residency determination is by no means a complete explanation of the law. The student should also note that changes may have been made in the rate of nonresident tuition and in the residence requirements between the time this catalog statement is published and the relevant residence determination date. As this catalog statement is written, regulations are in the process of adoption and will serve to implement the uniform residency determination law enacted in Statutes 1972, Chapter 1100 (AB 666) as adopted by The Regents. A copy of The Regents' regulations is available for inspection upon request to the Attorney in Residence Matters' Deputy in the Registrar's Office.

Those classified incorrectly as residents are subject to reclassification as nonresidents and payment of all nonresident fees. If incorrect classification results from false or concealed facts, the student is subject to University discipline and is required to pay all back fees he would have been charged as a nonresident. Resident students who become nonresidents must immediately notify the Attorney in Residence Matters' Deputy.

Inquiries from prospective students regarding residence requirements for tuition purposes should be directed to the attorney in Residence Matters, 590 University Hall, 2200 University Avenue, Berkeley, California 94720. No other University personnel are authorized to supply information relative to residence requirements for tuition purposes. Any student, following a final decision on residence classification by the Attorney in Residence Matters' Deputy on the campus attended by the student, may make written appeal to the Attorney in Residence Matters at the above address within 120 calendar days of notification of the final decision by said Residence Deputy.

Scholastic Requirements

EVALUATIONS

Every instructor is required to assign a letter grade for each student registered in his course. The QUALITY of a student's work will be reported in one of the following grades:

Passing work: A, excellent; B, good; C, fair; D, barely passing.

Failing work: F, work so poor that it must be repeated to receive recognition.

Undetermined: I, work is satisfactory but incomplete for good cause.

Passed (P) or No Record grading option. Subject to regulation by the faculties of the various colleges and schools, a student in good standing is authorized to petition to undertake one course each term on a Passed or No Record basis and is allowed to accumulate this option when it is not used. Units thus earned will be counted in satisfaction of degree requirements, but such courses will be disregarded in determining the student's grade-point average. In the event that a student does not pass a course under this option, no entry is made on his transcript. Students wishing to exercise this option should familiarize themselves with the requirements of their particular college or school.

Passed (P) or Not Passed (NP) grading only. In specific courses which have been approved by the respective departments and by the appropriate Committees on Courses of Instruction, individual instructors may assign *only* Passed or Not Passed grading. A student electing such a course may do so in addition to using his Passed or No Record options.

Satisfactory (S) or Unsatisfactory (U). Graduate students, under certain circumstances, may be assigned grades of S or U, but in calculating the grade-point average, units gained in this way will not be counted.

In Progress (IP) grading. Evaluation of the student's performance may be deferred in certain sequential courses (those that carry the designation *deferred grading only, pending completion of the sequence* in course descriptions). In order to gain credit toward graduation, a student must successfully complete the entire sequence in successive quarters. Such courses may not be taken by students on probation, nor may the student take such a course using the Passed/No Record or Satisfactory/Unsatisfactory grading option.

Quality points (grade points) will be assigned each grade as follows:

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

All grades except I are final when filed by an instructor in his end-of-term course report. No final grade except I may be revised by reexamination. The student may replace an I grade with a passing grade and receive unit credit, and grade points if the instructor assigns a letter grade, provided he completes the course work in a way authorized by the instructor. Courses for which an I grade has been assigned may not be repeated except on an audit basis. A student whose

record shows more than 16 units of I grades will be subject to probation or disqualification. While I grades do not count in the grade-point average for or against the student's record during his enrollment, they could weigh negatively at the time of his graduation. In determining whether a bachelor's degree candidate has achieved the 2.0 grade-point average, an I grade is counted as though it were an F. Hence, it is recommended that students do not delay the clearance of incomplete grades as graduation may well be jeopardized.

A student may repeat only those courses taken on a UC campus in which he has received a grade of D, F, Not Passed, or No Record. In computing the grade-point average of an undergraduate who repeats courses in the University in which he received a D or F, only the most recently earned grades and grade points shall be used for the first 16 units repeated. Thereafter, the student will receive the grade assigned and the corresponding grade points earned for each time he takes the class. However, when a course is repeated, the units completed will be credited towards a degree only once.

The QUANTITY of work attempted by the student is measured in quarter units (see page 188) which are assigned by the faculty for each individual course. To convert these units to semester units multiply by $2/3$; from semester to quarter units by $3/2$.

The student's course work is recorded in terms of units, grades, and grade points. The ratio of grade points over units attempted determines the grade-point average. The student is expected to maintain a C (2.0 grade-point average) or better on all work undertaken in the University. If he falls below a C average, he will be scholastically deficient.

CLASS LEVEL

A student may determine his class level from the chart below:

<i>Class Level</i>	<i>Unit Breakdown</i>
Freshman	0 -40
Sophomore	40½ -83½
Junior	84 -134½
Senior	135 -

The minimum number of units needed for a bachelor's degree in the University is 180. Specific unit requirements for the various colleges and schools are outlined in each section under "Requirements and Curricula" beginning on page 62.

SCHOLASTIC DEFICIENCIES

The following provisions apply to all undergraduate students in the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science.

Probation. A student shall be placed on probation if at the end of any term his grade-point average for that term, or his cumulative grade-point average, is less than C (2.0) computed on the total of all courses undertaken at the University of California.

To be removed from probationary status, a student must achieve an overall

grade-point average of at least C (2.0) on all work attempted in the University of California.

Disqualification. A student shall be subject to disqualification from the University if:

1. his grade-point average falls below 1.5 for any term, or
2. after two consecutive terms on probation he has not achieved an overall grade-point average of at least C (2.0) on all work attempted in the University of California, or
3. he has accumulated more than 16 units of I (Incomplete).

The student subject to disqualification is subject to such action as the faculty of his college or school may determine. The faculty may:

1. disqualify such a student from the University, or
2. suspend his disqualification, continuing him on probation.

The faculty of his school or college is also the body which may authorize the return on probation of a disqualified student.

To transfer from one campus of the University to another, or from one college or school to another on the same campus, a student who has been disqualified or is on probation must obtain the approval of the dean whose jurisdiction he is seeking. After making the transfer, the student is subject to supervision by the faculty of the new college, school or campus.

Graduate and professional students with scholarship deficiencies are subject to action at the discretion of their respective deans.

TRANSCRIPTS OF RECORD

Upon written request to the Office of the Registrar, a student will be provided with an official transcript of work he has completed in a regular session at the Davis campus of the University of California. Transcripts of all work done through University Extension or Concurrent Enrollment should be requested directly from the University Extension Office, 4445 Chemistry Building. Transcripts of work completed at another UC campus or another institution must be requested directly from the campus or institution concerned.

The fee for transcripts is \$2 for the first copy and \$1 for each additional copy requested at the same time. Graduate and undergraduate transcripts are individual records and must be requested separately.

Application for a transcript of record should be made at least one week in advance of the time needed.

MID-TERM GRADE STANDING

Students wishing to know their cumulative grade at the mid-quarter may inquire from their instructor. Those who have deficient grades (D, F, or Not Passed) should confer with their adviser. Counselors in the Office of Student Development may also be of assistance.

FINAL EXAMINATIONS

The *Class Schedule* lists the times that final examinations are to be held. These are set up according to the day-and-hour periods in which the classes are given

during the quarter. This information is available at the beginning of the term so that students can avoid final examination conflicts.

Final examinations are mandatory in all undergraduate courses except independent study courses, courses which consist of laboratory work only, and courses for which the final examination has been waived by the Academic Senate. On courses which have the final examination waived, the course description will include the statement, "no final examination."

Wherever practicable, final examinations are written and must be completed within a previously announced time limit. Examinations in non-laboratory courses may not exceed two hours.

Final grade notices will be sent to the student if, before the end of the term, he has deposited with the Registrar a self-addressed, stamped envelope.

CREDIT BY EXAMINATION

Under certain prescribed conditions currently enrolled students in good standing may receive credit by taking an examination without formally enrolling in a course. A petition and a copy of the prescribed conditions may be obtained from the Registrar's Office. The petition is subject to the approval of the instructor giving the examination and the department involved. The completed petition, accompanied by a fee of \$5, is then presented to the dean of the student's college or school or, in the case of a graduate student, to the dean of the Graduate Division for final approval. The credit received for the examination may not duplicate any credit the student has already applied toward his degree. The final results will be reported to the Registrar and the appropriate grade (with the exception of the I grade) and grade points will be assigned.

DEGREE REQUIREMENTS

Three groups of requirements must be satisfied before the student can become eligible for candidacy for the bachelor's degree. They are: 1) college or school requirements; 2) individual departmental requirements, which are all specific and vary as to particulars; and 3) the University requirements, which are general and apply to all schools and colleges. For information on college, school, or departmental requirements see the appropriate section of this catalog.

The University requirements are as follows:

Subject A: English Composition

Every entering student should satisfy the Subject A requirement. This requirement is designed to assure a level of competence in written English essential to satisfactory progress as a University student. The requirement can be met:

1. By achieving a grade of 5, 4, or 3 in the College Entrance Examination Board (CEEB) Advanced Placement Examination in English, *or*

2. By achieving a score of 550 or higher in the CEEB Achievement Test in English Composition, *or*

3. By entering the University with credentials showing the completion of an acceptable 3 semester- or 4 quarter-unit college-level course in English composition with a grade of C or better, *or*

4. By writing a superior essay on the Subject A Diagnostic Essay Examination. This examination can only be taken once.

Satisfaction of the Subject A requirement is determined by the Office of Admissions. Students not meeting the requirement in one of the ways described above must enroll in the non-credit course in Subject A during their first quarter of residence in the University. A fee of \$45 is charged for the course.

International students whose native language is not English can meet the Subject A requirement by passing a special examination in English composition and, if necessary, completing English 26 with a minimum grade of C.

American History and Institutions

Every student must demonstrate a knowledge of American History and Institutions. Every graduating student should have at least a minimum knowledge of the background of this country's development and an understanding of the political, economic, and social interrelationships of its way of life.

He may meet this requirement in any of the following ways:

1. One high school unit in American history, or $\frac{1}{2}$ high school unit in American history and $\frac{1}{2}$ high school unit in civics or American government, with a grade of C or better in each course.

2. By completing any one of the following courses: History 17A, 17B, 21A, 21B, 27A, 27B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 176A, 176B, 178A, 178B, 179A, 179B, 183A, 183B (upper division courses may be taken only with the consent of the instructor); Political Science 1, 5, 5D, 100, 101, 102, 103, 104, 105, 106, 109A, 109B, 113, 127, 128, 160, 163; Economics 111; Sociology 30A, 30B, 30C. Students taking these courses are subject to the rules that apply for prerequisites and majors.

3. By presenting evidence that the requirement has been satisfied at another collegiate institution through courses in the area of American History and Institutions whose credits are acceptable for transfer to the Davis campus of the University of California.

4. By successful completion of the Advanced Placement Examination in American History.

International students studying at the University on F class (student) or J class (exchange visitor) visas should call at the American History and Institutions office to secure exemption from the requirement. They should bring their passports, visas, and registration cards with them.

Further information may be obtained from the Supervisor of the American History and Institutions Requirement, 227 Voorhies Hall.

Residence Requirement

The minimum residence requirement for a bachelor's degree at the University of California is one academic year. Each summer session in which a student completes a course of at least 2 quarter units may be counted as half a quarter's residence. Thirty-five of the final 45 quarter units completed by each candidate must be earned in residence in the college or school of the University of California in which the degree is to be taken; no more than 18 of these 35 quarter units may be completed in summer session courses on the campus of residence.

Exceptions to this rule are candidates for the Juris Doctor degree, and those who have been in the military service. With the approval of the dean of his college or school, a candidate for the bachelor's degree who was in active service in the armed forces of the United States in the year preceding the award of the degree may be recommended for the degree after only one quarter of University residence in which he completes at least 16 units or passes a comprehensive examination in his major or field of concentration.

Scholarship Requirement

To receive a bachelor's degree, a student must obtain twice as many grade points as units for all courses attempted by him in the University. An exception to this rule is authorized for honors students undertaking certain courses (see conditions for Credit by Examination, page 37).

Unit Requirement

Every candidate will present a minimum of 180 quarter units as partial satisfaction of the requirements for the bachelor's degree.

Filing for Degree Candidacy

Each candidate for an undergraduate degree must file an Announcement of Candidacy with the Registrar at the beginning of the quarter in which he plans to receive the degree. The dates for filing are published in the calendar on page 7 of this catalog and in the *Class Schedule*.

HONORS AND PRIZES

Deans' Honors List

The names of all students in the College of Letters and Science who have completed a minimum of 12 units of work on the Davis campus exclusive of units taken on Passed or Not Passed (or No Record) basis and who have achieved a minimum grade-point average of 3.3 during the preceding term, and all other undergraduate students who have completed a minimum of 12 units of work and who have achieved a 3.2 cumulative grade-point average or better in all work undertaken in the University and in their college will be listed by the various deans and posted on the bulletin boards outside the offices of the respective colleges.

Graduation Honors

Graduating students may qualify for honors, high honors, or highest honors. An appropriate notation is made on diplomas and on permanent records in the Registrar's Office.

Prizes

Prizes for student achievement and scholarship on the Davis campus consist of inscribed plaques and cash awards. The University Medal is the highest honor awarded to a graduating senior in recognition of superior scholarship and achievement. In addition, a College Medal is given to the outstanding graduating senior of each of the colleges and professional schools.

Student Expenses, Financial Aid, and Housing

FINANCIAL AID PROGRAM

The primary purpose of the Financial Aid Program at Davis is to provide financial assistance and advice to students who would be unable to pursue their education at the University without such help.

In addition to budgetary advice and counsel, financial assistance consists of scholarships, grants, loans, and employment—offered singly or in various combinations—to meet the difference between the student's resources and the cost of attending the University.

The University expects parents to make a maximum effort to assist their sons and daughters with college expenses. The student's desire to be independent of his parents or his rejection of their support is not held to be a valid reason for granting financial aid. The University also expects that all students will provide a part of the total cost of attending the University from resources outside the University. The financial assistance given by the University should be viewed only as supplementary to the resources of the applicant and his family. These premises are assumed in determining the type and amount of assistance necessary to meet the student's financial deficit.

The following information will introduce you to the various types of financial assistance available on the Davis campus as well as to the procedures for making application for assistance. We invite you to make further inquiries about our Financial Aid Program and about the various ways in which a college education might be financed.

EXPENSES

Legal residents of California are not required to pay tuition at the University. (Students classified as nonresidents must pay a tuition of \$500 per quarter.) Nevertheless, there are certain other expenses that have to be considered. Although each student must determine his own budget in keeping with his needs and resources, the following approximated costs per quarter are presented as a guide.

Registration:	<i>Undergraduates</i>	<i>Graduates</i>
University Registration fee	\$ 100.00	\$ 100.00
Memorial Union fee	3.50	3.50
Student body membership fee	7.00	...
Education fee	100.00	120.00
Total for California residents	\$ 210.50	\$ 223.50
Tuition for nonresidents	500.00	500.00
Total for nonresidents	\$ 710.50	\$ 723.50
Compulsory health insurance for international students	35.00	35.00
Total for International Students	\$ 745.50	\$ 758.50
Additional approximated costs:		
Room and board	\$ 350-500.00	
Books and supplies (costs may exceed \$75.00 in special cases, such as for students in medicine or veterinary medicine)	35- 75.00	

Miscellaneous (includes travel, health insurance, laundry and clothing, recreation, medical and dental care, and toiletries)	150-250.00
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The costs listed above are average costs. Fees are subject to revision.

Students should have enough funds with them at the beginning of the fall quarter to cover registration fees, books, and the first month's room and board, as scholarship, grant, work-study, and loan checks will not be available until after registration.

Students may be subject to the following fees for optional services: parking, \$30 or \$20 for cars, depending on the type of permit desired, and \$8 for motorcycles; \$32 for health insurance; \$3 for changes in individual class schedules after the announced deadlines; \$10 for late registration; \$2 for each transcript requested plus \$1 for each additional copy requested at the same time; \$20 for applications for readmission or intercampus transfer. The \$50 undergraduate Acceptance of Admission Fee is nonrefundable and is applied toward the University Registration Fee at the first registration.

APPLICATION PROCEDURE

Application forms may be obtained from the Office of Financial Aid, North Hall, University of California, Davis, California 95616. To facilitate the granting of monies to students, two application forms have been developed to handle the undergraduate scholarships, loans, grants, and work-study jobs administered by the Davis campus. The regular form is for all entering students and those continuing students applying for scholarships. A short form is available for continuing students *not* applying for scholarships.

The application, which consists of the student's personal and budgetary information and the Parents' Confidential Statement, is reviewed by the financial aid committee to determine eligibility for, and dollar amount of, a scholarship, loan, grant, employment under the Work-Study Program, or a combination of these.

A Parents' Confidential Statement must accompany the student's personal and budget information page in order for the application to be complete and to permit an evaluation of need. The Parents' Confidential Statement form may be obtained from the high school or college and must be sent to the College Scholarship Service, P.O. Box 1501, Berkeley, California 94701 for evaluation by December 15, one month before the University's financial aid application deadline.

Application Deadline. Applications are available in November of each year, and the deadline for applying for all financial aid for the following academic year is *January 15*. Both the completed application and the Parents' Confidential Statement must be received by the Financial Aid Office before this date.

Applications received after this date will not be considered for scholarships and will be considered for other types of aid only if funds are available.

Notification of awards will be made to students by

May 1—for scholarships

July 1—for other types of financial aid (loans, jobs, grants).

TYPES OF AID AVAILABLE THROUGH THE FINANCIAL AID OFFICE*

Undergraduate Scholarships

Regents Scholarships. These awards, granted by the President of the University and the Chancellor of the Davis campus, are among the highest honors that may be conferred upon an undergraduate student. Recipients are selected on the basis of academic excellence and exceptional promise. Students are eligible for Regents Scholarships upon graduation from high school or upon completion of the sophomore year at the University, at one of California's public community colleges, or at another accredited collegiate institution. All scholarship applicants who meet the qualifications are considered for these awards.

The amount of each scholarship is based on the student's financial need. Awards may be honorary in nature or may be accompanied by a stipend to cover the difference between family resources and the yearly standard cost of education at the University. *If you wish to be considered for a Regents Scholarship with honorarium only, you should so indicate, and you need not file a Parents' Confidential Statement.*

The term of appointment is four years for students entering from high school and two years for students appointed on completion of the sophomore year. Regents scholars are expected to maintain at least a B average in course work undertaken at the University.

President's Scholarships. These one-year awards are made annually to entering and continuing students, including community college transfers. They are granted by the President of the University and the Chancellor of the Davis campus. Again, all scholarship applicants are considered for these awards.

President's scholarships are awarded on the basis of scholastic attainment, financial need, and promise. The awards carry a maximum stipend of \$500. In cases where the established financial need exceeds this amount, the awards will be supplemented by additional scholarship funds, grants, loans, and/or part-time work under the College Work-Study Program.

University, Alumni, Endowed, and Agency Scholarships. These scholarships are made possible through funds provided by individual donors, private corporations and agencies, the alumni associations, and The Regents of the University. These awards vary considerably in amount but normally average between \$400 and \$500 per year.

Most scholarships are open to all undergraduate students on a competitive basis. Although some are restricted by the donors to recipients who meet given criteria, students need not apply for any specific scholarship, but should indicate on the application form all the listed criteria which they can meet.

These scholarships, with the exception of some agency grants, are awarded by the Chancellor of the Davis campus on the advice of the faculty. They are granted on the basis of academic achievement, financial need, and promise.

Normally, scholarships are awarded for one year; financial assistance for suc-

* All of the financial aid programs described here are subject to changes necessitated by changes in federal and state laws subsequent to the publication of this catalog.

ceeding years will depend upon the academic performance in the University and continued financial need. An average of B in the University is generally required for a recipient to be considered for awards after the first year. Where the established financial need exceeds the amount of the awards, the awards will be supplemented by additional scholarship funds, grants, loans and/or part-time work under the College Work-Study Program.

Graduate Aid

There are various scholarships and fellowships available to graduate students through the Graduate Division. For information concerning application, see page 186. Graduate students are also eligible for most types of aid handled through the Financial Aid Office. Graduate students should follow the same procedure for applying for these funds as undergraduates (see application procedures in preceding section).

Basic Opportunity Grants

Provisions for the Basic Opportunity Grants (BOG) have been made possible by the Higher Education Act of 1972. As of this printing, details of the program have not been finalized. The intent of the BOG legislation is to provide grants (non-repayable aid) for undergraduate students who have a demonstrated financial need. The amount of a grant may not exceed 50 percent of the actual cost of attendance at an institution nor may it exceed \$1,400 per student per year minus the student's expected family contribution.

Supplementary Educational Opportunity Grants

The Supplementary Educational Opportunity Grant (SEOG) program has replaced the Educational Opportunity Grant Program. As of this printing, funding for this program for the 1973-74 academic year has not been finalized. Eligibility for the SEOG is limited to undergraduate students of exceptional financial need, as measured on a scale of parental contribution which has been established by the Federal Government. Upon receipt of the completed Financial Aid Application and the Parents' Confidential Statement, the Financial Aid Office determines the parents' contribution by using College Scholarship Need Analysis procedures. The amounts of the grants range from \$200 to \$1,500, with the provision that no student may receive more than \$4,000 in SEOG funds during his undergraduate years. The amount of the grant may not exceed one half of the total financial aid award, as the grant must be matched on an equal basis with some other form of financial aid (i.e., a scholarship, grant, loan or job from the University, or a scholarship or grant from outside sources).

Educational Fee Grant

Commencing with fall quarter 1973, regularly enrolled students who are residents of California, may apply to receive grants up to a maximum of \$100 per quarter for the first three consecutive quarters of attendance as an undergraduate at the University of California. Awarding of Educational Fee Grants is based on demonstrated financial need as determined by the student's application for aid.

Improved Access Grant

Students transferring to the University of California from a post-secondary educational institution other than the University of California who will have class standing of sophomore or higher with a cumulative grade-point average of not less than 2.0 in acceptable transfer courses at the point of admission, may apply for grants up to \$700 per academic year. Awarding of Improved Access Grants is based on demonstrated financial need as determined by the student's application for aid. Continuing eligibility for grants is subject to the availability of funds.

UC Grants

All full-time graduate or undergraduate students with an established need may apply for assistance under the University of California (UC) Grants Program. These grants are ordinarily given only to students with exceptional financial need and are usually given in conjunction with other aid.

EOP Grants

The Educational Opportunity Program (EOP) grants are provided from University sources to assist students who are officially identified as participants in the Educational Opportunity Program.

College Work-Study Program

The College Work-Study Program enables the University to offer employment to financially needy students during the school year and vacation periods. The program is designed to assist those students who are from low- or middle-income families, who need funds to continue their education, and who are enrolled or accepted for enrollment for a full-time course of study at the University. The on-campus and off-campus jobs are limited to an average of 15 hours per week for any one quarter. During scheduled holidays or vacations of at least one week in length, the student may work a 40-hour week without having these hours count as part of the 15-hour weekly average. Work-study jobs are primarily awarded to assist students in meeting their college expenses and secondarily to provide practical job experience in an area closely related to the student's academic endeavors. The number of working hours awarded to any one student will be dependent on his financial need. In other cases of demonstrated financial need, Work-Study jobs may be awarded during the summer on a full-time basis.

These jobs should not be confused with the regular employment offered by the Student Employment Center, as the jobs under the Work-Study Program are limited to those students demonstrating a definite financial need.

Loans

National Direct Student Loan (NDSL). Regularly enrolled students, or applicants for admission to the University, who are United States citizens or permanent residents of the United States, are eligible for NDSL loans to meet their financial need.

The maximum loan that any *undergraduate* student may obtain for one academic year (three quarters) is \$1,000. A fraction thereof may be awarded for one or two quarters. The total amount which may be borrowed by undergraduate students under this program—including loans granted by other collegiate institutions—is \$5,000. For *graduate* students, the maximum for one academic year (three quarters), is \$2,500 or a fraction thereof for one or two quarters. The total that may be borrowed by graduate students under this program is \$10,000 (including loans granted as undergraduates and by other institutions of higher education). However, when demand exceeds the funds available, loans will be granted on a competitive basis and amounts restricted.

Repayment of NDSL loans begins nine months after graduation or when the student ceases to carry at least one half the normal full-time academic workload at an institution of higher education approved by the U. S. Commission of Education and may be extended over a ten-year period at 3 percent interest on the unpaid balance. Members of the armed forces, members of the Peace Corps, and members of VISTA may defer payment and extend the repayment period.

If the recipient of a loan undertakes service either as a full-time teacher in a public or other nonprofit private elementary or secondary school federally designated as a school with a high enrollment of students from low-income families, or as a full-time teacher of handicapped children (including mentally retarded, hard-of-hearing, deaf, speech impaired, visually handicapped, seriously emotionally disturbed, or other health-impaired children who by reason thereof require special education) in a public or other nonprofit elementary or secondary school system, the amount of his loan may be reduced for each year of teaching. If the recipient of the loan undertakes service as a full-time staff member in a Head Start preschool program the amount of his loan may be reduced for each year of teaching. If the recipient of the loan serves as a member of the Armed Forces of the United States, the amount of his loan may be reduced for each year of service. Details of the conditions and amounts of the loan reductions may be obtained from Student Aid Accounting (916) 752-3646.

Regents' Loan Funds. These funds are principally used to supplement stipends of scholarship and fellowship recipients but may also be granted to other qualified students. Regents' Loans, normally repayable in five years, bear an interest rate of 3 percent on the unpaid balance, beginning upon graduation or withdrawal from the University of California. Students who undertake graduate studies at the University of California may defer payment until they complete or terminate such studies. Regents' loans are limited to \$1,500 a year or \$6,000 per student.

Educational Fee Deferral Loan. Regularly enrolled students who are residents of California may apply to defer payment of their Educational Fees until after they graduate or leave school. Deferral of Educational Fees is based on demonstrated financial need as determined by the Student's application for aid. Commencing with fall quarter 1973, eligible students will receive Educational Fee Grants up to a maximum of \$100 per quarter, in lieu of the Educational Fee Deferral Loans, for the first three consecutive quarters of attendance as an under-

graduate at the University of California (see section on Educational Fee Grant).

To defer Educational Fees the student signs a promissory note requiring repayment of the fees commencing nine months after the student graduates or withdraws from the University. Interest on the unpaid balance accrues at the rate of 3 percent per year commencing nine months after termination of enrollment. Interest and installments may be postponed for a period not exceeding four years while the student is on active duty with the armed forces or with the Peace Corps or VISTA.

University Short-Term Loans. To be eligible for a short-term loan, a student ordinarily must have attended the University for at least one quarter. These funds, made possible by gifts to the University, are granted in small amounts, up to \$200, to help students with educational expenses. Although repayment schedules are determined individually for each loan, these loans are usually repaid within the academic year or with earnings from employment the following summer.

Emergency Loans. These loans, not to exceed \$50, are available for emergency educational expenses. Repayment is normally made within 30 days. Interest at the rate of 1 percent per month is charged on the unpaid balance after the loan has been outstanding more than 30 days.

Federally Insured Student Loans. These are available through local banks, credit unions, and savings and loan associations for citizens and nationals of the United States or those in the country for other than a temporary purpose.

The maximum loan amount for any student is \$2,500 per academic year, with an aggregate maximum of \$10,000. The loan may be made only for meeting costs of the student's education while he is attending school at least half-time.

Interest on the unpaid balance accrues at 7 percent per year, although for students receiving federal interest benefits there is a grace period on interest and installments during periods of continued enrollment and for the first nine months after the termination of enrollment. As of this printing, details of the interest benefit program have not been finalized.

Applications may be obtained from the Financial Aid Office, eligible lenders, or the U.S. Office of Education in San Francisco. The student completes the application and supportive materials and then submits them to the Financial Aid Office. When the application is returned, the student presents it to an eligible lender. It is the lender's option to grant or deny the loan. If the lender is willing to make the loan, the application is forwarded to the U.S. Office of Education in San Francisco where it is reviewed for compliance with governing regulations. If the student meets all requirements the lender is issued an insurance commitment. Upon receipt of the commitment the lender sends the check to the University for disbursement to the student.

Health Professions Student Assistance Program

The Health Professions Student Loan Program and the Health Professions Scholarship Program are designed to assist students needing financial aid to pursue a course of study leading to the degree of Doctor of Medicine or Doctor of Veterinary Medicine. Eligible students should contact the Schools of Medicine or Veterinary Medicine for applications.

Awards are made on the basis of financial need. The maximum loan in a 9-month academic year is \$3,500 and the maximum scholarship in a 12-month period is \$3,500. However, because of limited funding, a maximum-level loan is rarely awarded. Interest at the rate of 3 percent per year accrues one year after the borrower ceases to pursue a full-time course of study, at which time the aggregate of loans is repayable over a 10-year period. There are various conditions of deferment and cancellation of the loan which may be discussed at the time of application.

Student Employment Center

Many students who attend the University expect to earn part of their expenses. However, the undergraduate curricula are organized on the assumption that a student will give most of his time and attention to college studies. If possible, the student should avoid outside employment until he has become adjusted to his new environment, has established sound study habits, and is maintaining a good scholastic standing. By the end of the first quarter the student should know the demands of University life and his own capabilities well enough to plan a program combining studies and work.

The Student Employment Center helps students find part-time and summer employment. It also assists students' spouses in obtaining part-time and full-time employment. The office receives job listings from employers and refers qualified students to these openings. A board listing of jobs is maintained at the Financial Aid Office and interested students are invited to come to the first floor, North Hall, for information and job referrals.

STUDENT AID FUNDS NOT HANDLED BY THE FINANCIAL AID OFFICE

Graduate Scholarships and Fellowships

Information about scholarships or fellowships, etc., for graduate students may be obtained from the Graduate Admission/Fellowship Office, Room 252 Mrak Hall. Applications for fellowships and graduate scholarships must be filed with the Dean of the Graduate Division, University of California, Davis 95616, not later than January 15 prior to the academic year for which the award is sought.

Army ROTC Scholarship Program

One-, two-, three-, and four-year ROTC scholarships, which provide \$100 a month plus payment of all tuition, fees, books, and school supplies, are available to selected students. Four-year scholarship applications must be filed by January 1 of the year prior to enrolling in the University. One-, two-, and three-year scholarships are limited to students enrolled in ROTC. Additional information and application blanks may be obtained from the Department of Military Science.

California State Scholarships

Scholarship awards administered by the California State Scholarship and Loan Commission cover, in part, mandatory fees and are for a maximum of four years. To qualify for renewal as a California State Scholar in the University, a student must have continuing financial need and maintain at least a C average.

California State Scholars who elect to attend a public community college before enrolling in the University may have their scholarships held and activated upon their entering the University. Information and application forms have been sent to all schools and colleges in the state, and may be obtained from local school counselors or by writing to the California State Scholarship and Loan Commission, 714 P Street, Suite 1640, Sacramento, California 95814.

Veterans Benefits

Financial benefits are available to veterans and to certain veterans' dependents under Federal and State laws. If a student is eligible for these benefits, he must file a Certificate of Eligibility with the Office for Selective Service and Veterans Affairs at the time of registration, and must appear in person at this Office each quarter with his current registration card.

If eligibility for these benefits has not previously been established, application should be made well in advance of enrollment. Information and forms for requesting benefits may be obtained from the above office which is located in Room 217, East Hall (above the *Coffee House*).

Veterans and veterans' dependents who do not receive advanced payment should be prepared to maintain themselves financially for a period of from 60 to 75 days pending receipt of their subsistence checks.

LIVING ACCOMMODATIONS

Residence Halls

The University provides housing for approximately 3,000 students in a variety of residence halls on campus. Some 28 residences are clustered around three dining commons and each of these areas has its own individual architecture and ambience. In addition there is space for approximately 1,000 single students in off-campus University Affiliated Residence Halls. Each of these halls is staffed with professional personnel who work in conjunction with the residents, striving to create and maintain an environment conducive to the achievement of educational goals.

In 1972-73 the on-campus room and board rate, which included 20 meals per week was \$1,275 for the academic year. Rates are subject to change. All students planning to live in residence halls sign a contract for one academic year (with the option to cancel at the end of the winter quarter). Payment is usually made in installments according to a payment schedule. Rooms in the residence halls contain all of the necessary furniture and also include study lamps, linen, and blankets. Telephones and weekly laundering of linen are included in the room and board rate. Further information on how to apply for housing is sent as part of the University admissions procedure. Specific questions should be directed to Housing Services, 111 South Hall, University of California, Davis 95616. Since accommodations are in great demand, early application is advised. (An applicant does not have to wait until he is officially admitted to the University to apply for a residence hall assignment.) An advance payment will be required when a signed contract is returned. If a student *sends written notice to Housing Services* before August 1 that he wishes to cancel his contract, a total refund will be made; after this date, only a partial refund will be possible.

Housing for Married Students

There are 476 apartments for married students on the Davis campus. Some of these apartments have one bedroom, but most are two-bedroom units. Both furnished and unfurnished accommodations are available. Apartment rates for 1972-73 were: one bedroom, unfurnished, \$95; two bedrooms, unfurnished, \$108; two bedrooms, furnished, \$124. Rates include water, gas, trash collection, and electricity. Applications for these units can be obtained by writing Married Students Housing, 120 South Hall, University of California, Davis 95616.

Off-Campus Housing

The members of the Housing Office staff believe that living in the community is an integral part of the university experience and a student's total educational growth. Our staff works closely with the members of the ASUCD Fair Housing Committee, and the Davis Apartment Owners and Managers Association, and is committed to a program of expanding our services to meet the ever-increasing housing needs of the University community.

One of the services of the Housing Office staff is to assist students, faculty, and other University personnel by maintaining lists of private rooms, apartments, duplexes, trailers, and houses available for rent in the Davis area. Since these listings change quite rapidly as the different units are rented, prepared lists are *not furnished* by mail. It is suggested that those who wish to find off-campus housing plan to make arrangements early by consulting the list of vacancies in the Housing Office. Also on file are lists of "Roommates Wanted." Students may advertise here for roommates or may use the file to contact others who have already obtained living accommodations.

Rental arrangements should be made in person with the manager or owner and a clear understanding reached on the conditions of occupancy. If a lease is required, we recommend the "Model Lease," a document written jointly by the ASUCD Fair Housing Committee, the Davis Apartment Owners and Managers Association, and the Housing Office.

The Fair Housing Committee publishes a viewpoint on housing which is a helpful guide to living in the community. Additional material is available at the Housing Office in South Hall.

Students who live off-campus without kitchen facilities may purchase meal plans which allow them to eat in any one of the residence hall dining rooms.

Fraternities

Ten national fraternities are represented on the Davis campus, providing living quarters and meals for their more than 350 undergraduate members and pledges. These national fraternities are—Alpha Gamma Rho, Chi Phi, Delta Sigma Phi, Kappa Sigma, Phi Delta Theta, Sigma Alpha Epsilon, Sigma Nu, Sigma Phi Epsilon, Theta Chi, and Theta Xi. The fraternities, under their system of self-government, provide social, recreational, and academic programs for their members as well as some experience with business activities. This unique "total" living experience gives fraternity members the opportunity to secure a progressive education both in and out of the classroom.

The size of fraternity live-in groups ranges from 20 to 50. The monthly cost of fraternity living at Davis varies from \$110 in some houses to \$130 in others.

Membership in fraternities is by invitation. Men who are interested in fraternities should write or call on the Independent Living Group Adviser in the Housing Office.

Sororities

There are no sororities on the Davis campus.

Student Services and Activities

STUDENT HEALTH PROGRAM Medical Evaluation

To safeguard the health of the student and the University community, every new full-time student, as a part of registration, must

be examined by the University Medical Examiners. Tests for tuberculosis are a part of the physical examination of all new students.

Applicants with contagious diseases will be excluded. Any student having a physical condition that might disturb the classwork of other students should not apply for admission as he will be disqualified at registration.

Each prospective student is advised to have a physical examination by his own physician to determine his fitness for college work before coming to the University. Any defects capable of remedial treatment, such as diseased tonsils or imperfect eyesight, should be corrected to prevent possible loss of time from studies.

Students returning after an absence must have a health evaluation at the Student Health Service.

Student Health Service

The Student Health Service, by preventing and treating acute illnesses, conserves the time of students for their classwork and studies. This service is made possible, for the most part, by the registration fee. It is not a health insurance. Each regularly enrolled student may have such medical care as the Health Service is staffed and equipped to provide from the first day of the quarter through the last day of the quarter. Hospitalization, up to ten days per quarter, is provided as needed.

Continuing students not enrolled during a quarter or when on summer vacation but remaining in residence in the Davis area, may maintain their eligibility for the medical services of the Student Health Service by paying an appropriate fee to the Cashier. Enrollment in this program may be initiated only during the registration period for each quarter or summer session.

When, in the opinion of the Director of the Student Health Service, serious illness or injury requires prolonged care and will obviously prevent continuation of class work during the current quarter, the patient will be returned to his community or home for definitive treatment.

The Student Health Service does not take responsibility for dealing with chronic physical defects or illnesses present at the time of entrance to the University. The Student Health Service does not assume responsibility for dental treatment. It does not take responsibility for treatment of remediable defects where medical or surgical treatment is elective and not of an emergency nature, and where the student's best interest will be served by treatment during vacation.

The Student Health Service is designed as a medical facility to provide medical care while the student is away from home and in attendance at the University; it does not supplant the medical care of the family physician. Full cooperation is encouraged between the student, the Student Health Service, and the family physician.

Supplementary Health Insurance

A supplementary health insurance plan is available at the time of registration. This insurance supplements the student health program and is used for medical care needed between quarters and when away from the campus. It likewise provides for surgical-professional fees and other benefits as outlined in the Supplementary Health Insurance brochure. Procurement of this insurance is strongly urged.

International Students. The purchase of health insurance is a condition of registration for all nonimmigrant international students. At the time of registration, all nonimmigrant international students must enroll in the Associated Students Supplementary Health Plan. Students who present documentary evidence of equivalent insurance coverage to the Director of the Cowell Student Health Service may have the requirement to purchase the Associated Students Supplementary Health Plan waived.

Those sponsored students who do not pay the registration fees are not eligible for Student Health Service or the Associated Students Supplementary Health Plan without making special arrangements.

CAREER PLANNING AND PLACEMENT SERVICES

Placement advisers assist students in their career planning, in locating initial positions following graduation, and in subsequent placements as alumni. Students dropping out of the University for a term or longer who are interested in employment or military service should see a placement adviser. The services of the Placement Center are available without cost to students and alumni.

Occupational Information—Career Planning

Students at all levels of study are encouraged to begin their career planning early and to discuss with placement advisers the various occupational opportunities available. A library of vocational information is maintained by the Placement Service and the Counseling Center (see below). Students may use this library at their convenience. Students interested in a work-learn experience which may aid in their career planning should contact the Work-Learn Center, South Hall.

Preprofessional Advising

The Preprofessional Advising Office, located on the second floor of South Hall, (916) 752-2672, is an academic and career counseling service for students interested in the health science professions. While the office is largely student-staffed, it has a close association with the School of Medicine, the School of Veterinary Medicine, and the Office of Allied Health Sciences on this campus. Both individual and group counseling sessions are used to acquaint students with career possibilities in the health sciences, requirements for admission to professional schools, work-learn experiences, and academic program planning. The office maintains an extensive health sciences career information library available for student use.

Career Placement Service

Students and alumni seeking careers in business, industry, agriculture, and government are invited to use the services of the Placement Center. Placement advisers discuss matters of job choice and methods of obtaining jobs with registrants. In addition, they arrange employment interviews, receive job listings from employers, and refer qualified registrants to these employers. Graduating students regardless of impending military service, graduate school, or other plans are encouraged to register with the Placement Center early in their final year of study. Alumni may use the placement services for initial or subsequent placement at any time.

Educational Placement Service

Placement service is available to students and alumni who are interested in teaching. Information on the background, training, and professional experience of its candidates enables this office to match qualifications with specifications of available positions. Placement advisers counsel candidates, communicate with employers, receive vacancy data, and arrange interviews. The University reserves the right to refer only those persons who are considered to be fully qualified.

COUNSELING CENTER

The Counseling Center is staffed with psychologists who provide educational/vocational and personal/social counseling to all regularly enrolled students. Through individual interviews and group discussions, they:

Help students with personal and interpersonal concerns.

Assist students in their choice of academic majors and future occupational and life goals.

Provide a wide range of psychological testing when appropriate.

Work with students who are involved in the process of self-exploration.

Organize and lead encounter, self-awareness, and life goals groups.

EDUCATIONAL OPPORTUNITY PROGRAM COUNSELING

The Educational Opportunity Program (EOP) counseling services are furnished to minority and/or low income students. Each EOP student is assigned to an EOP counselor who maintains contact with the student throughout his University career. The EOP staff provides counseling services and supportive educational programs designed to assist the student in his total University experience.

EOP counselors are concerned and involved with the academic, psychological, financial, social, and overall campus adjustment of the students they serve. Through individual interviews and group discussions, counselors help students with their choice of academic majors, course scheduling, and occupational goals. They provide referrals for a wide range of advisory consultations and make available information about various professional opportunities for which students may wish to prepare. Counselors are involved with the academic needs of EOP students and may become involved in the evaluation of financial needs as well.

Tutorial Services. Tutoring is a free service available to EOP students and is considered an integral service of EOP. It is directed toward enabling the student to keep pace with the demands of his educational curriculum.

PEER-ADVISING CENTER

The First Resort, located in 161 East Hall (behind the *Coffee House*), is an advising center staffed by students. These student advisers assist other students on academic questions, career interests, and personal concerns.

The First Resort works closely with other counseling services on campus and keeps up to date with the requirements of the various UCD colleges. It is prepared to advise new and continuing students on matters relating to academic requirements, course selection, choosing a major, and program planning.

ACADEMIC ADVISING INTERN PROGRAM

The Academic Advising Intern Program (AAIP) is staffed by students in departmental, teaching division, and college offices who offer peer advising services. These students are knowledgeable about the policies, requirements, and faculty within their unit and are committed to sharing this information with their fellow students. Interns are also available to aid students in "undeclared" and "exploratory" majors.

In addition to advising on academic matters AAIP interns are committed to increasing and enriching contact between students and faculty. Their function is not to be a barrier to or a substitute for faculty advising and other advising and counseling services, but to augment and help complete the campus counseling and advising program.

Information regarding AAIP can be obtained from the AAIP Coordinators' Office, 218 South Hall (telephone 752-2000), or by contacting departmental, college, or teaching division offices.

WORK-LEARN PROGRAMS

The Davis campus provides opportunities for students to enrich their academic studies through work-learn experiences. Work-Learn, an educational program linking academic learning with practical work experience, is closely tied to academic programs, advising, counseling, and career guidance. It expands learning beyond the campus, enables a student to explore potential professional and career opportunities, and seeks to provide practical experience in careers.

Work-learn experiences cover a spectrum of activities. To name only a few possibilities, the student may serve as a curriculum aide in a school district; youth workshop counselor; instructor in health courses; research analyst in a criminal justice department; teacher, counselor, or recreation specialist working with emotionally disturbed children; counselor for probation cases; research assistant with a conservation organization; legislative intern with legislators or legislative committees; administrative intern in a department of a local, state, or federal government; design engineer with consultants and large industries; or specialist in agricultural and resource industries and agencies.

Academic credit may be awarded in an appropriate departmental or college course for work-learn experiences which are planned and approved in advance, emphasize learning rather than routine activities, and include field supervision by a qualified nonfaculty person (where appropriate) and/or the faculty member responsible for giving the credit. In some cases, students receive both credit and monetary compensation for work-learn experience. Participation may be either full-time or part-time, depending on student needs and interests and the time available.

Work-learn opportunities are available to all interested students through several organized programs at Davis: *Bixby Work-Learn* for experiences in agricultural, biological and environmental sciences; *Cooperative Education* in the College of Engineering for experiences in engineering and the physical sciences; *PROBE* for experiences in humanities, social and behavioral sciences; *Public Affairs Internships* in the Department of Political Science; and *Environmental Management* in the Division of Environmental Studies.

Additional work-learn opportunities are available through the Departments of Psychology, Rhetoric, Family Practice, Applied Behavioral Sciences, Environmental Horticulture, and Economics.

Interested students should contact the campus Work-Learn Center. Students seeking information on specific career opportunities should contact the Placement Center. Both centers are located in South Hall.

SELECTIVE SERVICE AND VETERANS AFFAIRS

The Office for Selective Service and Veterans Affairs, located in Room 217, East Hall (above the *Coffee House*), assists students who have inquiries and problems regarding their Selective Service status. It is up to each individual, however, to request educational or other deferments from his local draft board, which has exclusive authority over all deferments. The Office for Selective Service and Veterans Affairs will, upon a student's request, certify information about the student's educational progress to his local board. The student must appear in person at this Office each quarter with his current registration card. (*Note: Since Fall Quarter 1971, a student entering college for the first time has not been eligible for deferment as a student.*)

Each draft-eligible male student, undergraduate or graduate, will find it to his advantage to continually keep himself aware of Selective Service laws and procedures. Even during periods when inductions are not being made, draft-eligible students still have responsibilities for registration, classification, personal appearances, appeals, and physical examinations. Individual counseling in all areas relating to the draft is available at any time through the "Draft Help" section of this Office, which is also located in Room 217, East Hall. Students with questions and concerns are urged to contact this Office.

A student reaching his eighteenth birthday may register for Selective Service at the Office for Selective Service and Veterans Affairs. This registration opportunity is offered as a service to the student. This Office is not part of the Selective Service System.

INTERNATIONAL STUDENT SERVICES

Students from other countries may obtain from the staff of the International Student Services Office assistance, information, and advice on all matters pertaining to their attendance at the University and to their residence in the United States.

Prospective students are advised to study very seriously their ability to pay the costs of attending this institution. International students will find that their living costs are higher than those listed in this catalog. It has been our experience that in addition to all fees for each quarter (see page 40), international students should count on a minimum of \$270 per month for 12 months for living expenses, books and supplies, and incidental expenses. Even this sum may not be enough for dental care, unusually expensive books and laboratory equipment, surgical instruments, etc. Extra expense is incurred the first few months for students living in apartments for towels, bedding, and cooking utensils, etc.

In addition to three academic quarters, there are two summer sessions and many international students enroll in at least one. Please add summer session fees (approximately \$175 per session) to your possible expense.

There is no University financial aid available to international students in their first year of study, and no aid can be guaranteed in following years. A prospective international graduate student who has been corresponding with an academic department about a Research or Teaching Assistantship should receive a clearly defined offer in writing before departing for Davis.

Students interested in taking the Test of English as a Foreign Language (TOEFL) can obtain copies of the *TOEFL Bulletin of Information and Registration Forms* from local Educational and Language Centers if living in Hong Kong, India, Nepal, and Taiwan. Students who cannot obtain these locally should write for the *TOEFL Bulletin of Information for Candidates, International Edition and Registration Forms* well in advance of University deadlines from: Test of English as a Foreign Language, Box 899, Princeton, New Jersey 08540, U.S.A.

SERVICES TO THE HANDICAPPED

The Office for Services to the Handicapped is located in Room 217, East Hall, telephone (916) 752-2020 or 752-2021. (This is also the Office for Selective Service and Veterans Affairs.) The Office seeks to assist physically handicapped students with a wide variety of needs. It serves as a personal liaison between the handicapped student and various campus and community services, and provides assistance with arrangements for such matters as attendant care, building modifications, special parking, reader services for blind students, and administrative matters for students sponsored by the State Department of Vocational Rehabilitation.

Services are provided through an easily accessible drop-in facility at TB-8 Annex (between Voorhies Hall and University House). As of this writing, this facility is operated on a part-time basis, and students should call the main office (752-2020) to ascertain times when the drop-in facility will be available.

Interested handicapped students are encouraged to contact the office for additional information and assistance.

EDUCATION ABROAD

The University of California's Education Abroad Program offers students an opportunity to study overseas and receive academic credit from the University. The primary purpose of the program is to provide an academic experience in a different educational system. Through this academic experience the student is able to become involved in the language and culture of the host country.

Eligibility requirements for undergraduate students include: junior or senior standing by the time of participation in the program; the equivalent of two years of University-level language preparation with a B average; and the ability to adapt successfully to a different culture. Students planning to study abroad during the senior year are advised to investigate academic residency requirements. In addition to the teaching credential program described below, graduate students are eligible for consideration at some centers if they have completed at least one year of graduate work at the University of California, have the support of their department and the Graduate Division, meet the language requirements, and receive the endorsement of the Education Abroad Selection Committee on the Davis campus.

In 1973-74, nine-month programs for undergraduates will be continued in the United Kingdom, Japan, Sweden, Norway, Hong Kong, France, Lebanon, Germany, Italy, Israel, Ireland, Spain, Kenya, and Ghana, and a ten-month program in Mexico City. Special teaching credential programs are given in Mexico City and Paris for graduate students who intend to teach Spanish or French. At many centers, an intensive language and orientation program precedes the undergraduate academic schedule. The centers are administered overseas by University of California faculty members who assist students in meeting their educational objectives and help with living arrangements and personal problems.

Estimated minimum costs for the nine-month program range from \$3,352 (for Hong Kong) to \$4,932 (for Lund). Estimated cost for the graduate teaching credential program is \$1,952 for Mexico City and \$2,113 for Paris.

The Education Abroad Program is administered centrally from the Santa Barbara campus. Detailed information on the program and application forms are available at UCD from the Education Abroad section of the International Student Services Office, Room 323, South Hall. Information pertaining to other opportunities for study, travel, and employment abroad is available at the same office.

STUDENT CONDUCT AND DISCIPLINE

Students enrolled in or individuals seeking enrollment in the University assume an obligation to conduct themselves in a manner compatible with the University's function as an educational institution. Misconduct for which such persons are subject to discipline falls into the following categories (subject to revision for 1973-74):

1. Dishonesty, such as cheating, plagiarism, or knowingly furnishing false information to the University;

2. Forgery, alteration, or misuse of University documents, records, or identification;

3. Obstruction or disruption of teaching, research, administration, disciplinary procedures, or other University activities, including its public service functions, or of other authorized activities on University premises, or, during times of campus emergencies, within one mile thereof;

4. Physical abuse or conduct which threatens the health or safety of any person on University-owned or -controlled property or at University-sponsored or -supervised functions, or, during times of campus emergencies, within one mile of a University campus or facility;

5. Theft or destruction of or damage to property of the University or of a member of the University community or campus visitor or, during times of campus emergencies, destruction of, or damage to property on campus or within one mile thereof;

6. Unauthorized entry to or use of University facilities;

7. Violation of University policies or of campus regulations, including campus regulations concerning the registration of student organizations, the use of University facilities, or the time, place, and manner of public expression;

8. Manufacture or attempted manufacture of or use, possession, or distribution of narcotic or dangerous drugs, including but not limited to marijuana and lysergic acid diethylamide (LSD), except as expressly permitted by law;

9. Violation of the rules governing residence in University-owned or -controlled property;

10. Disorderly conduct or lewd, indecent, or obscene conduct or expression on University-owned or -controlled property or at University-sponsored or -supervised functions;

11. Participation in mass disorder, disturbance of the peace, or unlawful assembly, on a University campus or facility, or, during times of campus emergencies, within one mile thereof;

12. Failure to comply with directions of a University official or other public officials acting in the performance of their duties while on a University campus or other University facility, or, during times of campus emergencies, within one mile thereof, or resisting, delaying, or obstructing such University or other public officials in the performance of or the attempt to perform their duties; or

13. Conduct which adversely affects the student's suitability as a member of the academic community.

Students are subject to disciplinary action for misconduct on other campuses of the University.

These categories are based on the University's "Standard of Conduct" which is currently under revision.

Administration

The President of the University, through the Chancellor, has ultimate authority for the administration of student discipline. Assistance in this area is provided by members of the teaching staff, the administrative officers concerned with student welfare, the Student Conduct Committee, and the Student Judicial Board.

Types of Discipline

The major types of disciplinary actions are:

Warning: Notice to the student that continuation or repetition of specified conduct may be cause for other disciplinary action;

Censure: Written reprimand for violation of specified regulation;

Probation: Exclusion from participation in privileges or extracurricular University activities as set forth in the notice of probation for a specified period of time. If a student while on probation violates any of the terms set forth in the notice of probation or violates the Standard of Conduct, as determined after the opportunity for a hearing, he shall be subject to further discipline in the form of suspension, dismissal, or expulsion;

Interim Suspension: Exclusion from classes and other privileges or activities as set forth in the notice of interim suspension, pending final determination of an alleged violation;

Suspension: Exclusion from classes, and exclusion from other privileges or activities or from the campus as set forth in the notice of suspension, for a definite period of time with reinstatement thereafter dependent upon a showing of observance during the period of suspension of the terms set forth in the notice of suspension. If a student while on suspension violates any of the terms set forth in the notice of suspension or violates the Standard of Conduct while on a campus of the University or in relation to a University-sponsored activity, as determined after the opportunity for a hearing, he shall be subject to further discipline in the form of dismissal or expulsion;

Dismissal: Termination of student status for an indefinite period and, if as specified in the notice of dismissal, exclusion from the campus for a period not to exceed one year. The student may be readmitted to the University only with the specific approval of the Chancellor of the campus to which he applies. If a dismissed student violates the Standard of Conduct while on a campus of the University or in relation to a University-sponsored activity, or if he violates any of the terms set forth in the notice of dismissal as determined after the opportunity for a hearing, he shall be subject to further discipline in the form of expulsion;

Expulsion: Permanent termination of student status without possibility of readmission to any campus of the University;

Other: Other types of discipline as set forth in campus regulations.

Student Relations Council

The Student Relations Council of the Associated Students deals with student welfare, student-faculty relations, and ASUCD Constitution interpretation. The Council fosters the honor spirit, a code which places the responsibility for classroom and campus conduct with the individual student.

THE ASSOCIATED STUDENTS

The entire full-time undergraduate student body holds membership in the Associated Students, University of California, Davis (ASUCD). Graduate students and part-time students may become members by paying the fee. The ASUCD, through its elected governing body (the ASUCD Senate), and appointed activities chairmen, is responsible for many student services and student activities.

The ASUCD serves to represent students in both the administrative and the decision-making processes on the Davis campus. ASUCD also cooperates with the other University of California campuses to operate a full-time Student Lobby in Sacramento to represent student interests to State government.

ASUCD administers valuable student services such as a low-cost supplemental health insurance program; Unitrans, the only mass transit system in Davis; a convenient copying service; a free legal counseling service; a bike repair shop; a travel service; and the Coffee House.

The ASUCD publishes the *California Aggie*, a daily campus newspaper; *Student Viewpoint*; and has Committees on Fair Housing (which publishes the annual *Housing Viewpoint*), Consumer Rights, and Academic Affairs.

A major effort of the ASUCD is Picnic Day, the campus open house welcoming the public each spring. Other special ASUCD events or activities include Experimental College, Judging Day (competition in agricultural skills and knowledge for high school students), Cal Aggie Camp Program (an annual summer encampment for underprivileged children in the area, financed by student fund-raising events), many community services projects, Homecoming, Radio KDVS stereo FM and AM, the Cal Aggie Marching Band, Student Forums, Blood Bank, Spring Sing, and the all-important Orientation Week for incoming students. The ASUCD Entertainment Board presents a continuing entertainment program and concert series for the campus community with reduced ticket prices for ASUCD members.

STUDENT ACTIVITIES

Over 250 independent student organizations are served by the Student Activities Office which is located in the Memorial Union. Included in this category are political, social, cultural, sports, departmental, graduate, religious, community action, ethnic, service, international, special interest, and living groups. A significant portion of the events and activities on campus are sponsored by student organizations and are generally open to all students. Students are encouraged to visit the Student Activities Office if they wish to get involved in an existing organization, find out what's going on at UCD, or form their own organization.

Davis students join those of all other University campuses in All-University festivals featuring the arts and intramurals.

RECREATIONAL FACILITIES AND PROGRAMS

Student recreational activities at Davis are centered in the Memorial Union, the Recreational Swimming Pool Complex, the Putah Creek Recreational Area,

the Silo Barn Student Center, the Coffee House and snack bars, the Gym and Intramural Playing Fields, and the campus theatres. The Memorial Union, located at the North end of the quad, is a center containing conference rooms; offices for the Student Activities staff and the ASUCD staff, activities chairmen, and officers; lounges equipped with comfortable furniture, magazines, and newspapers; the Coop Vending Area and Dining Commons (largest meal and snack centers on campus); the UCD Bookstore; KDVS, the campus radio station; the *California Aggie*, the campus newspaper; the Memorial Union Art Gallery; the Craft Center with photo facilities, jewelry and small metal sculpture rooms, weaving equipment, and facilities for sewing, silk screening, block printing, leather work, and woodworking; the Campbell Library for recreational reading; the Cameron Music Listening room; the music rehearsal room with piano, music stands and chairs reserved for rehearsals by individuals, groups, or small bands and choruses; the Outdoor Adventures Program which functions as a recreational switchboard, a resource center and a rental outlet to facilitate the bringing together of people with a common interest in the vast wilderness and outdoor activities; the Games Area with bowling lanes, billiard tables and facilities for cards and chess, and a TV Lounge; Freeborn Hall, the largest campus auditorium for concerts, dances, banquets, and conferences; the MU Box Office; the Information Desk where the campus Master Calendar of events is compiled; the Reservation Desk where the reservations for campus facilities are made; The Nest and Hutch, small stores featuring candy, tobacco and gifts; and the outdoor plazas. In order to more comfortably accommodate its many users, the Craft Center is scheduled to move out of the MU and into larger quarters.

The Recreational Swimming Pool complex includes a large, cloverleaf-shaped swimming pool with a water capacity in excess of half a million gallons, separate wading pool, bath house, snack bar, terrace, shuffleboard courts, and a lodge. The lodge has a main floor lounge with a fireplace, a well-equipped kitchen, and meeting rooms on the second floor.

The Putah Creek Recreation Area features bicycle paths and hiking trails with footbridges at convenient intervals, a well-developed arboretum, a bridle path, picnic areas, and a small lake with boating facilities. Recreational as well as instructional sailing and canoeing are offered fall and spring quarters. The Putah Creek Rec Lodge, set on a grassy area suitable for small-team sports, has outdoor barbeque pits and tables as well as an indoor fireplace, kitchen, and lounge suitable for dancing. Located along Putah Creek, just east of the Putah Creek Rec Lodge, are the UCD Horse Barn and Recreational Horse Arena. Throughout the year, recreational horseback riding instruction and trail riding are offered. Complementing the recreational boating and horseback riding instruction is the recreational skiing instruction offered winter quarter. The instruction includes numerous ski trips to the Sierras.

The Silo Barn Student Center has a main floor meeting room, table tennis and game facilities, student office space on the second floor, and a snack bar area.

The Associated Students run a Coffee House in East Hall where delicatessen-type food, coffee, tea, cider, and soft drinks are sold. There is live entertainment on weekend evenings and recorded music during the week in an informal at-

mosphere. Other snack bars on campus are "The Roost" in Segundo Hall at the dorms; "The Silo" in the Silo Barn Student Center, serving the Vet Med, Medical School, engineering, and chemistry building portion of the campus; the Wyatt Pavilion snack bar on Putah Creek; and the Rec Pool Snack Bar. These are run by the campus food service and serve limited menus designed for the needs of each area. Vending machines are located conveniently around the campus.

The Intramural Recreation Program is a major feature of the Davis Campus. Hundreds of students, male and female, participate in individual and team sports scheduled during all three quarters. They use the several gymnasiums; the Physical Education Pool; badminton, handball, volleyball, and tennis courts; playing fields; the MU Games Area; the track at Toomey Field; and off-campus facilities such as the Davis Municipal Golf Course. The well-attended competitions provide not only active sports participation but spectator sports for all living units of the campus—dorms, fraternities, and off-campus housing.

The campus theatres house a rich fare of dramatic art and concerts throughout the year. The University Theatre productions are given in the 500-seat, proscenium stage, Main Theatre of the Dramatic Art Building or in Wyatt Pavilion Theatre, a former horse-judging pavilion converted into an octagon-shaped Elizabethan theatre with thrust stage. Faculty and student productions utilize Theatre Labs A and B for dramatic readings and intimate theatre productions where arena performance is suitable, as well as the two larger theatres; the Student Musical Theatre uses the Silo; and other student groups use the Graffiti Theatre in Hughes Hall and other informal theatres on campus. Most off-campus groups perform in Freeborn Hall when visiting as a part of the Committee for Arts and Lectures or ASUCD Entertainment Board sponsored series.

Requirements and Curricula

The program and majors described in the following pages have been developed by the colleges and schools to aid students in achieving their educational goals. Self-designed and self-initiated programs of study can be arranged for students who, after a serious attempt, find no existing program which meets their needs. Academic advisers and deans will assist such students to draw up acceptable programs.

College of AGRICULTURAL AND ENVIRONMENTAL

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College of Agricultural and Environmental Sciences

The major programs in the College vary in their requirements but reflect the common desire:

- to ignite curiosity
 - to increase understanding of the significance, methods, and interrelations of the various ways of studying the universe
 - to cultivate the skills and self-discipline essential for successful inquiry and action
- to develop understanding of the student's own and other cultures
 - to permit the student to develop an educational program which utilizes to greatest advantage his individual abilities and interests
 - to provide the knowledge and sense of competence necessary for successful pursuit of a career.



Challenge and opportunity as a result of social and technological changes characterize these times. Today's challenges—protection of the environment from man's diverse activities, improving of nutrition in major segments of the population, total development and utilization of human as well as renewable natural resources—are challenges of special significance.

Teaching and research in the College of Agricultural and Environmental Sciences now extend far beyond the traditionally important mission of food and fiber production. Activities reach from the soil to the home; from the farms to the cities. The needs and interests of families, rural as well as urban, are served. The best uses of land and forest areas and control of water for home, agriculture, and industry, as well as for fish and wildlife and recreational purposes are studied. These areas, serving the needs associated with the production, processing, and distribution of more than 200 crops, offer special challenges as well as outstanding career opportunities.

The educational objective is the application of the biological, physical, and social sciences to resource management, farming and ranching, business, education, conservation, recreation, and the family and community.

Social problems as well as technological advances are major considerations. The goal is to develop concern within people, not only with technology, but with the human problems that such technology might create. The teaching and research programs of the College of Agricultural and Environmental Sciences were designed to meet these challenges and to contribute significantly to progress in these changing times.

THE ADMINISTRATIVE STRUCTURE OF THE COLLEGE

The College operates under an administrative structure which was designed by students, faculty, and administrators as a mechanism for insuring the continuing flexibility, responsiveness, and rigor of the College's programs in the face of perpetually changing educational needs. Embodied in the program is a new freedom of action for students in choosing courses and forming curricula. From the institution's point of view this freedom has brought with it the need

to assist students in the development of the maturity required for such judgmental responsibility. The challenge of securing these objectives has been given to five Teaching Divisions, each representing a wide variety of course and curricular opportunities, and each administered by a chairman having but one concern: quality education. The Divisions and their chairmen are concerned not only with the provision of good teaching in important areas of knowledge but also with student receptivity to subjects being taught. Thus, good advising has assumed an importance equivalent to good teaching. The College is organized to help a student determine what he wants and needs to learn and then assist him in learning it. Furthermore, the focus of the College's programs is to educate students for activities for which there is a societal demand. Thus, the program provides students with an opportunity to explore the utility of their training in study-internship situations. Teaching Division offices provide career guidance and the Bixby Work-Learn Program provides work experience opportunities for the student in areas as varied as ranching, city planning, laboratory research, child development, marketing, resource management, veterinary medicine, teaching, etc. The College is geared toward preparing people to meet successfully the challenge of leading productive lives, both from the personal and the societal points of view.

STUDENT RESPONSIBILITIES AS MEMBERS OF THE COLLEGE COMMUNITY

In recent years student point of view has had a significant impact on both educational programs and College governance. Students participated in the design of the College's programs, and are actively participating in the implementation of the College plan. A wide spectrum of the College, Teaching Division, and Departmental committees which determine educational and administrative policy include student members. Any student desirous of taking part in the committee system of college governance may do so. All that is required is an indication of interest to the College Office, 228 Mrak Hall. The maintenance of standards of excellence in teaching is dependent on constructive help from every student concerning both courses and programs. Students in the College of Agricultural and Environmental Sciences, as full participants in the educational process, are expected to provide both the chairmen of the Teaching Divisions and the Deans with candid appraisals of the College programs. Formal procedures for the distribution and collection of questionnaires concerned with immediate student reactions to specific courses are currently in use. Furthermore, students are encouraged to communicate with the College Office at any time, in person or by letter, concerning the impact of the College programs on their education. Suggestions which could lead to the improvement of the courses and teaching programs are also encouraged. Such information is invaluable to the College community as plans are laid for meeting the educational needs of future classes of students.

UNDERGRADUATE PROGRAMS

Program Planning

University life is a complicated, sometimes bewildering, process. For example, the student who has the academic side of his existence under control may be in need of a small "assist" in dealing with some other area such as registration procedures, or vice versa. The College offers a variety of mechanisms by which students can obtain advice or help in solving such problems.

Faculty Advisers

Each student in the College is assigned a faculty adviser to help him with the planning of a program in the area of his educational interests. A student who has not decided on a specific course of study and who would normally spend a year or two in the exploratory program is assigned an adviser especially familiar with the breadth of course offerings available in this and the other colleges. A student having well defined educational objectives is assigned an adviser having the training and experience required to facilitate program planning in one of the many special areas of study.

The function of the adviser is to sensitize the student to the educational opportunities which the Davis campus represents, to discuss the implications of the choice of one option or another, and generally, to use his experience to help students meet their educational goals. The great potential which the adviser-student relationship can have for the student has long been recognized in the College. As a result, a student is strongly urged to consult with his adviser each quarter prior to registration for classes. The underlying philosophy of program planning, then, is that advising is a joint adviser-advisee responsibility.

As a student's educational objectives evolve he may choose a new adviser whose area of expertise corresponds more directly with his own educational objectives. Because of his knowledge, experience, and interest in a particular field, the faculty adviser can be of particular value to the student.

Orientation Classes

Each quarter the College offers an orientation class for its new students (see page 404). The course was established in order to facilitate the assimilation of students into the academic community and to help students identify the many educational opportunities available to them on the Davis campus. Although not required of all students, this course is recommended as a useful means of discovering what the Davis campus and College of Agricultural and Environmental Sciences are all about.

Expanded Course Descriptions

Most of the majors available in the College of Agricultural and Environmental Sciences provide for considerable student initiative in the selection of courses. It is therefore crucial that students be informed of the objectives and contents of the various courses they might want to consider taking. The courses section

of this catalog is designed to assist in that process. Students sometimes find that, because of space limitations, the catalog does not include all the data they would like to have about a course. The faculty of the College has responded to this student need by writing up more detailed descriptions of each of its course offerings. These "Expanded Course Descriptions" are available for student use on campus at the University Library reference and periodicals desks, college offices, advisers' offices, Teaching Division and Departmental offices, *The First Resort*, and in dormitory head residents' offices.

The "Expanded Course Descriptions" are prepared by the instructor a month prior to the initiation of the process of registration for classes. Copies are available just before the advising period for each quarter. These descriptions are current and contain information in such areas as: course goals, texts used, preparation required of the student, bases for grading, notes on course format, detailing of special assignments (papers, field trips, etc.), and a topical outline of the material to be covered. The "Expanded Course Descriptions" are an excellent guide to students as they search for the courses which will make up their Davis campus educational experience.

Peer Advisers

The faculty adviser is often quite removed from some of the day-to-day problems faced by a student, and may be unable to provide guidance on such matters. For this reason a team of student-advisers has made itself available at the Peer Advising Center—*The First Resort* (see page 54), at the College Office, and at Teaching Division Offices. The student-advisers keep themselves up-to-date on the "how's," "where's," and "why's" of University operating procedures. The advisers are prepared to help other students with a variety of scholastic questions about courses, requirements, and enrollment procedures. They are both a source of information and a means of referral to appropriate action offices.

Associate Deans of Resident Instruction

The College has associate deans who work with students toward the realization of their educational objectives. Students are encouraged to consult with a dean on all matters related to the success of their academic programs. Although the deans excel in educational problem-solving, they welcome the opportunity to become acquainted with individual students and engage in informal conversations. It is through such mechanisms that the deans keep themselves apprised of the state of the educational process for which they are responsible.

Work-Learn Opportunities

Students in the College wishing to enrich their academic program through a work-learn experience should contact the Bixby Work-Learn Office. Work-learn experiences may assist in career selection, expand experience, and integrate classroom and field work. In many cases academic credit can be granted for work-learn experiences.

As students often prepare for careers about which they know very little, they may fail to grasp the usefulness and importance of their courses, or they may not

realize which courses will lead to an acceptable career possibility. Work-learn experience may assist in removing doubts about chosen careers, and improve motivation, learning, and achievement.

The Bixby Work-Learn Program (maintained by the College through an endowment and originally directed toward experience in production agriculture) now provides opportunities in many of the fields for which the College prepares students, including biology and environmental sciences. This voluntary program provides supervised work-learn experiences, full time or part time, in summer or in any quarter of the academic year. Interested students should stop in or write to the Bixby Work-Learn Office (TB-10) or the Campus Work-Learn Center.

To facilitate credit for work-learn experiences, the College has initiated an internship course, Work-Learn 192 (see page 477). By planning in advance with a sponsoring faculty member a student can take up to 15 units per quarter of work-learn experiences that follow appropriate academic processes and include methods of evaluation.

Field-work experience is also possible through courses in Applied Behavioral Sciences (see page 213) and environmental management internships in environmental studies (see page 307).

The Student's Role

Although many services are provided to assist the student in program planning, it is he who, in the last analysis, determines the program he will pursue. The most crucial decision the prospective student makes in this process is the selection of his career and/or educational objectives. These may or may not require enrollment in a university. As part of making these decisions students should investigate their educational opportunities in the College by visiting the campus prior to applying for admission and talking with the deans, faculty and students. If the University is to be a means of reaching a career decision, its potential in that regard should be ascertained.

Once the student has decided to enroll in the College and has chosen an educational objective, be it specific or exploratory, the advising services enumerated above can be of assistance to him. Our advisers know the resources of the College and can help the student in using them to accomplish his specific goals. Advisers can be called upon long before a student plans to appear on campus. High school students desiring information about proper college preparatory programs and college students contemplating transfer are encouraged to seek guidance from our deans and faculty advisers as early as one or two years before coming to the Davis campus. It is best that this be done in person, but information can be provided by letter or phone.

It has been the experience of advisers that much of the inflexibility attributed to college programs exists only in the mind of the student. Recommendations meant to serve as guides are sometimes understood to be hard and fast rules. The citation of "courses normally taken by students" often leads students to believe the courses so cited are required.

The concept of prerequisite knowledge which underlies the listing of prerequisite courses in the course descriptions is particularly misunderstood. Edu-

cation is a building process. It is difficult or impossible to learn advanced principles without first understanding elementary ones. As a matter of convenience most students acquire prerequisite knowledge through prerequisite courses, but that is not the only route available. Students who have acquired the prerequisite knowledge need not take a course in order to so certify. Courses may be challenged by examination. Instructors will often indicate to a student, on the basis of an informal discussion, that he is prepared for advanced study without the need for examinations or courses. Students should also note that many upper division courses have no special requirements and are within a student's intellectual capacity as early as the freshman year.

Flexibility in planning has also been constrained by the belief that students in one college can not take courses in other colleges. This is not true. Within the boundaries of enrollment limitations and the student's ability to acquire useful knowledge as a result of taking a particular course, a student may elect to enroll in almost any course listed in this catalog.

General Requirements

It is the *student's responsibility* to see that he fulfills all requirements for graduation. In brief these are:

University Requirements: Subject A requirement; American History and Institutions requirement; residence requirement; unit requirement, a total of 180 quarter units of work with a C average or better; and the requirement of filing an Announcement of Candidacy at the beginning of the quarter in which the student plans to graduate (see pages 37–39 for complete details).

College Requirements: the student must fulfill the Bachelor of Science requirements in a major as prescribed by the faculty; not more than 6 units of the required total of 180 units may be Physical Education 1, and 54 units must be upper division work.

Major Requirements: See various majors beginning on page 73 of this section.

Natural Sciences, Social Sciences, and Humanities Requirements: The purpose of these requirements is to provide breadth to a student's program. Since the broadening effect of any particular course is dependent on the student's major and his general interests, it is not possible to be specific as to what is desirable and what is not. For example, natural science courses add more breadth to an agricultural economics and business management major than they would to a biochemistry major. The faculty adviser has guidelines for each major showing what the student should consider. In the last analysis it is the student, with the counsel of his adviser, who selects the breadth courses.

Study List

Majors offered in the College of Agricultural and Environmental Sciences are the mechanisms by which the faculty offers guidance to students interested in study in any one of a number of different areas of knowledge. The majors can be likened to road maps; each represents a variety of routes to a series of different but related educational goals. The great flexibility inherent in the majors makes them adaptable to a wide spectrum of student interests.

The study list is a personalized educational itinerary consisting of the courses in which a student has chosen to enroll during a particular quarter. It should be part of a grand plan for exploration or the attainment of specific long-term goals. It should allow for (a) the acquisition of prerequisite knowledge needed for courses to be taken in subsequent quarters, (b) the fulfillment of college and major requirements, and (c) a proper balance between the demands of the course program and the student's ability to master the subject matter under study.

In order to remain in good standing the full-time student is expected to take 12 units per quarter; he may take as many as 18 units. Normal progress toward the degree implies an average course load of 15 units. It is sometimes necessary and/or educationally desirable for a student to take less than 12 or more than 18 units per quarter; this can be done with the Dean's approval. Students should not hesitate to seek approval for educationally sound deviations from the normal course load. A lower division physical education course may be added to the maximum number of units without the Dean's approval. In estimating the demands of a particular program, students should plan an out-of-class effort of three hours per week for each unit of credit.

Passed or No Record Option

A regular student *in good standing* registered in the College of Agricultural and Environmental Sciences may elect to take courses on a Passed or No Record basis. The P grade will be assigned for a grade of C- or better. Units thus earned are counted in satisfaction of degree requirements, but are disregarded in determining the student's grade-point average. In the event that a student does not pass a course under this option, no entry is made on his transcript. For graduation, at least 2/3 of the units taken in residence must be in courses taken for a letter grade; this leaves a maximum of 1/3 of the units in residence which may be taken with the Passed/No Record grading option. Courses which are *required* to be taken on a Passed or Not Passed basis *only*, as designated in course descriptions, are considered part of the units which must be taken for a letter grade; such grades are recorded on the transcript. Courses in which grades of D or F are earned may not be repeated Passed/No Record.

Credit by Advanced Placement Tests

Students who have taken advanced courses in high school may earn up to 10 units advanced standing credit for each College Entrance Examination Board Advanced Placement Test successfully passed with a score of 5, 4, or 3.

The credit allowed will fulfill requirements within the College equivalent to the courses listed in the table on page 161. Students should consider the list carefully in selecting course work in the same areas to avoid taking equivalent courses and thus duplicating credit.

Transfer Students

In order to facilitate program planning for students contemplating transfer to the University and the College of Agricultural and Environmental Sciences, the expositions of major requirements beginning on page 73 have preparatory work set out in a special category. These preparatory courses may be taken at

the University of California or elsewhere. Generally the nature of the area of knowledge covered by a specific requirement can be determined through a reading of the course descriptions beginning on page 192 of this catalog. Students need not present identical courses but only ones having similar content. Students attending a community college should consult their counselors to determine which community college courses are appropriate and acceptable for satisfaction of College of Agricultural and Environmental Sciences requirements.

When questions arise as to the best approach to preparing for transfer to the Davis campus, students are encouraged to write directly to the Teaching Division chairman responsible for their intended major for specific information and/or to plan a visit to the campus to discuss their programs with a faculty adviser.

Honors

Undergraduate Honors

The Dean's Honors List, published at the end of each quarter, includes the names of all students in the College of Agricultural and Environmental Sciences who have completed at least 12 units on the Davis campus and have a cumulative grade-point average of at least 3.2 for all work undertaken in the University.

Honors at Graduation

The graduating student who is completing his major with distinction may be recommended for honors or highest honors. The names of students to whom honors and highest honors have been awarded are announced at commencement, and the distinction is noted on their transcripts and diplomas. The minimum grade-point averages required to qualify for these honors are shown in the following table:

<i>Units Completed at the University</i>	<i>Grade-Point Average</i>	
	<i>Honors</i>	<i>Highest Honors</i>
135 or more	3.20	3.60
90-134	3.40	3.70
45- 89	3.50	3.80
Less than 45	not eligible	

College Medal

Each year the outstanding graduating senior in the College is awarded a silver medal bearing the University Seal and known as the "Agricultural and Environmental Sciences Medal." Scholastic excellence is the primary basis for choosing the recipient, but other considerations also receive attention.

Scholarships

To encourage capable young men and women to pursue a career in the agricultural and environmental sciences, many companies and private individuals have established scholarships restricted to students majoring in the College. Students with high scholastic standings who need additional financial support are, therefore, encouraged to apply (see page 41).

Teaching Credentials

Inquiries concerning preparation for teaching credentials in subject matter taught in the College should be addressed to the Department of Applied Behavioral Sciences, University of California, Davis 95616.

Choosing a Program

There are several alternatives available to undergraduate students:

1. a regularly established major program;
2. an individually designed major program;
3. a preprofessional program (preforestry);
4. the exploratory program leading to the selection of one of the first two alternatives above.

MAJORS AND SPECIAL PROGRAMS

A list of the majors and special programs available to students enrolled in the College is presented below. Complete outlines of these majors and programs are presented on pages 73-104.

Majors and programs are grouped by Teaching Divisions in order to facilitate student inquiry about them. Questions regarding the majors should be presented at the appropriate Division office for resolution.

Students who fulfill the requirements for more than one major in the college may have such accomplishments noted on their transcripts. Request for certification of double, triple, etc., majors between colleges should be made to the College Office.

Division of Agricultural Sciences, D. S. Brown, Chairman

Division Office, 129 Hoagland Hall, 752-0265

Agrarian Studies	Crop Protection
Agricultural Science and Management	Entomology
Animal Science	International Agricultural Development
Avian Sciences	Plant Science

Division of Biological Sciences,* S. R. Snow,** Chairman

Division Office, 150 Mrak Hall, 752-0391

Bacteriology	Genetics
Biochemistry	Physiology
Biological Sciences	Zoology
Botany	

Division of Food and Consumer Sciences, W. L. Dunkley, Chairman

Division Office, 165 Everson Hall, 752-0610

Community Nutrition	Food Science
Consumer Food Science	Food Service Management
Dietetics	Home Economics
Fermentation Science	Nutrition Science
Food Biochemistry	Textiles

* An Intercollegiate Division.

** Associate Dean of the Division of Biological Sciences.

Division of Resource Sciences, L. D. Whittig, Chairman

Division Office, 129 Hoagland Hall, 752-0265

Atmospheric Science	Renewable Natural Resources
Environmental Planning and Management	Soil and Water Science
Range and Wildlands Science	Wildlife and Fisheries Biology

Division of Applied Economic and Behavioral Sciences, G. R. Hawkes,

Acting Chairman

Division Office, 165 Everson Hall, 752-0769

Agricultural Economics and Business Management	Child Development Design
Agricultural Education	Development, Resource, and Consumer Economics
Applied Behavioral Sciences	

Individual Major: College Office, 228 Mrak Hall, 752-0107

Non-Degree Programs: College Office, 228 Mrak Hall, 752-0107

Exploratory Preforestry

Exploratory Program—an aid to finding a major

Many students are undecided about the major they really want to pursue and are unaware of the alternatives available to them. The *Exploratory Program* permits students, with the assistance of selected advisers, to take courses which pinpoint more accurately individual interests and aptitudes. This is not a degree program, but is an *aid to the student in finding a major best suited to him and his needs*. He should not expect to stay in the program more than two years as further delay in selecting a major may delay graduation. For registration purposes, students should indicate *Exploratory* on admission materials and study list cards.

Individually Designed Major Programs

An individual major may be designed by a student having a specific academic interest not represented by an established major. Such a major involves interrelated courses of 45 upper division units from two or more areas of study. After preliminary consultation with one of the deans of the College about this special program, the student plans his major with an adviser or a group of advisers. He then submits the proposed program to a special committee for review at least four quarters before he plans to graduate. This proposal must include: (1) a description of the special educational aims of the student and (2) a list of the planned courses. For further details concerning the Individual Major, contact the College Office, 228 Mrak Hall.

Examples of some of the individual major programs are: Business Management and Human Relations, Creative Therapeutic Recreation, Family Development, Geobotany, Health Sciences, Human Ecology, Hydrometeorology, Physical Therapeutic Science, Plant Pathology, Psychobiology, Recreation Planning, Social Criteria for Environmental Design, The Child in Society, Vocational Therapy, Youth Guidance and Counseling, and Zoo Management.

Because many students are interested in health sciences a special group of advisers has been prepared to help these students choose an established major

or create a major which meets their specific educational needs. Students who indicate an interest in a Health Science or Allied Health Sciences profession will be given the benefit of the assignment of one of these specially qualified advisers.

THE MAJORS

AGRARIAN STUDIES is a multi-disciplinary program designed for students who seek the "broad-view" and are challenged by the scientific, philosophical, and cultural concepts important to an understanding of agriculture and its relationship to man. Through a purposeful integration of science and the humanities the major provides a sound general education important for effective leadership in agriculture and in many agriculturally or environmentally related aspects of business, government, international service, or teaching. Depth of understanding in the student's field of agricultural interest is achieved by the selection of specialized courses and in work-experience that can be gained in programs offered by Bixby Work-Learn or the Campus Work-Learn Center.

With appropriate selections of a field of emphasis and electives, students may also prepare for admission to graduate study or the professional schools.

Bachelor of Science Major Requirements

UNITS

<i>Social Sciences and the Humanities</i> [*]	52
Program of courses selected in consultation with an adviser and designed to develop an understanding of agriculture in the context of man and his cultural evolution. To include, but not limited to, courses in agricultural history, language** and the communicative arts, philosophy of science, anthropology and/or geography, political and/or economic principles.	
<i>Natural Sciences</i> [*]	52
Courses selected in consultation with an adviser specifically to give the student an understanding of the scientific disciplines and biological systems important to modern, evolving agriculture. As appropriate for each student the program will include courses in chemistry, biochemistry, mathematics (statistics and/or calculus), biological sciences (general biology and/or botany, genetics, microbiology or zoology), ecology, and the earth sciences.	
<i>Agricultural Specialization</i> [*]	36
Agrarian studies (Agrarian Studies 2, 188)	
	6
Courses chosen to provide a depth of understanding in one of the following or closely allied fields: agricultural economics, animal sciences, food sciences, plant sciences, resource sciences	
	18
Closely related courses in either the natural sciences (e.g., nutrition, physiology, soils, etc.) or the social sciences (e.g. anthropology, geography, political science, etc.) chosen specifically to enhance the student's understanding of agriculture in a scientific or a cultural context	
	12
<i>Unrestricted Electives</i>	40
Total Units for the Degree	
	180

^{*} Examples of typical programs in Agrarian Studies with suggested courses in these areas may be obtained from the major adviser through the College Office.

^{**} Proficiency in a foreign language is contributory to a general education and specifically useful to an understanding of various aspects of agriculture. Students specializing in the agricultural sciences are encouraged to choose French, German, Japanese, or Russian; those interested in agricultural heritage could well choose Greek or Latin; students preparing for international aspects of agriculture or "agribusiness" would have obvious choices based on geographical interests.

AGRICULTURAL ECONOMICS AND BUSINESS MANAGEMENT focuses on the student's understanding of the total economic and social environment through study of the agricultural, biological, physical, and social sciences. The major offers an option of two areas of specialization:

The *Agricultural Economics* option is preprofessional, essentially preparation for continued study at the graduate level. The emphasis is on the theoretical aspects which lie behind decisions concerning production, marketing, use of resources, prices, and policy. Supplemental courses are offered in statistics, effects of governmental policy, rural appraisal, and related topics.

The *Agricultural Business Management* option, while considering the theoretical, deals more with the practical managerial problems. Emphasis is on the decision-making function of management, use of scientific management controls and organization, personnel policies, and procurement and marketing methods.

Both options prepare graduates for professional management positions in financial and research institutions not necessarily limited to agriculture.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	43
English (choose from English 1, 2, 3, 4A, 4B, or 5)	4
English (from above list) or Rhetoric (Rhetoric 1 or 2).....	4
American History and Institutions†	8
Economics 11A-11B and (Economics 1A-1B or 2A-2B-2C).....	17
Mathematics including Mathematics 13 and 16A	10
<i>Depth Subject Matter</i>	44-45
Theory (Agricultural Economics 100A, 100B)	6
Statistics: choose two from Agricultural Economics 106A, 106B, and 155	6
Senior research (Agricultural Economics 190A, 190B)	4
<i>Agricultural Economics Option</i> (Preprofessional)	29
Mathematics 16B	
Agricultural Economics 100C	
Economics 101	
Additional upper division agricultural economics and economics	
or	
<i>Agricultural Business Management Option</i>	28
Agricultural Economics 18	
Additional upper division agricultural economics and economics	
Restricted electives: choose 18 units from Agricultural Economics 100C, 112, 113, 114, 117, 130, 140, 150; Economics 134, 150, 160, 161.	
<i>Breadth Subject Matter</i>	32
Agriculture (excluding agricultural economics)	
Natural science (including mathematics beyond preparatory subject matter)	
Social science (excluding economics), history, and philosophy	
Required: 8 units in one area and 12 units in each of the other two.	

* For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*

† Students meeting the American History and Institutions requirement may substitute social science and humanities as interpreted under the Social Sciences and Humanities requirement.

Unrestricted Electives60-61

Total Units for the Degree 180

The AGRICULTURAL EDUCATION major serves those interested in teaching agricultural sciences in high schools or junior colleges as well as those preparing for a service-type career in agriculture. It prepares graduates whose function will be to supervise youth and adult groups and to direct programs requiring preparation in both agricultural and human resources. State and federal requirements for instructors participating in federally funded vocational programs are also met. The need for scientists, technicians, and creative educators to assist in domestic and international agricultural programs has created a continuing demand for qualified instructors and supervisory personnel. This major also provides general preparation which is appropriate for work in banking, sales and service, rural recreation, and related agricultural industries. Students interested in obtaining breadth in both agricultural and environmental sciences will appreciate the scope and flexibility which this program provides.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	42
Biological sciences (including genetics)	21
Chemistry (including organic)	15
Physics (choose from Physics 2A, 2B, or 2C)	6
<i>Depth Subject Matter</i>	64
Agricultural economics	9
Agricultural Education 160, 320A	4
Agricultural engineering	11
Animal sciences	16
Environmental sciences (includes offerings in environmental horticulture, environmental studies, environmental toxicology, renewable natural resources, and wildlife and fisheries biology)	8
Plant and soil sciences	16
<i>Breadth Subject Matter</i>	33
English (choose from English 1, 2, 3, 4A, 4B, or 5)	12
Economics 1A or 1B	5
Social sciences and humanities electives†	16
<i>Restricted Electives</i> to supplement or expand any of the above areas.....	14
Choose from the following: Entomology 110; Environmental Planning and Management 20; Nutrition 103; Plant Pathology 120; Soil and Water Science 1; Water Science 110A, 110B.	
<i>Unrestricted Electives</i>	27
Total Units for the Degree	180

Teacher Credential. Students may make appointments with credential counselors and obtain a statement of the complete requirements for the credential at the Applied Behavioral Sciences departmental office. Required courses for pro-

* For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

essional preparation include: Education 110, 120; Agricultural Education 160, 320B, 320C, 320E; and 9 postgraduate quarter units of subject matter courses.

The **AGRICULTURAL SCIENCE AND MANAGEMENT** major is designed to provide the training required by business or industry to function in the management of the larger, more diverse agricultural operations. Students may specialize in one of three areas: *animal science*, *food science and technology*, or *plant science*. Course work in biological, physical, social, and agricultural sciences with supporting courses in economics, business, and management permits individual flexibility. In addition to the Bachelor of Science, normally completed in four years, a fifth year Master of Science program is offered.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	48
Biological Sciences (including Biological Sciences 1 and Botany 2) ..	16
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Mathematics: including calculus and statistics	10
Physics (Physics 2A and 2B or 2C)	6
<i>Depth Subject Matter</i>	53
Agricultural sciences (including at least one course in animal science, food science, plant science, soil and/or water science)	20
Agricultural economics (including Agricultural Economics 100A and two courses chosen from 112, 113, 114, 117, and 140).....	15
Specialization (animal science, food science and technology, and plant science)	18
<i>Breadth Subject Matter</i>	36
English and/or rhetoric (choose from English 1, 2, 3, 4A, 5 and/or Rhetoric 1, 3).....	8
Economics (Economics 1A, 1B)	10
Social science and humanities electives	18
<i>Restricted Electives</i> to supplement or expand any of the above areas	19
<i>Unrestricted Electives</i>	24
Total Units for the Degree	180

ANIMAL SCIENCE is the study of man's domestic animal resources through the integration of genetics, biochemistry, physiology, nutrition, economics, and other social sciences for improvement and expansion of these resources for food and recreation. A student may emphasize scientific, production, or management aspects and may focus on animals for milk, meat, fiber, work, or recreation. This major leads to a variety of career opportunities in management and production including positions in feed and food processing, financial institutions, chemical industries, private and public extension services, education, and government service. *Preveterinary medicine* requirements may also be met through this major by the student electing qualitative and quantitative chemistry, embryology, and sufficient social science courses.

* For convenience in program planning the usual courses taken to satisfy the requirement are shown in parentheses. Equal or more comprehensive courses are acceptable.

Bachelor of Science Major Requirements*	UNITS
<i>Preparatory Subject Matter</i>	42
General biological sciences (including Biological Sciences 1, Zoology 2, plus one from Bacteriology 2, Botany 2, or Entomology 1)	16
Physical sciences: including 13 units of chemistry and 10 units of physics and/or mathematics	23
Animal science (Animal Science 2)	3
<i>Depth Subject Matter</i>	48-49
Biochemistry (Biochemistry 101A-101B or Physiological Sciences 101A-101B)	6-7
Nutrition (Nutrition 110)	5
Physiology (Physiology 110A, 110B)	6
Genetics (Genetics 100A-100B)	6
Animal science:	25
Choose 7 units from Animal Science 114, 115, 116, and 117.	
Choose 18 units from Biochemistry 102; Genetics 107, 107A, 107B, 107C, 108, 131; or Animal Science 21, 31, 123, 124, 190, 197T, 198, 199; Epidemiology and Preventive Medicine 111; Nutrition 117, 121, 122, 123; Physiology 111A, 111B, 121, 121L, 130, 148, 149.	
<i>Breadth Subject Matter</i> †	20
Social science and humanities and/or art of communication. . . .	20
<i>Unrestricted Electives</i>	69-70
Selected by the student according to individual interests and objectives. Advisers will provide lists of recommended courses and will assist in the selection therefrom.	
Total Units for the Degree	180

APPLIED BEHAVIORAL SCIENCES prepares students for creative work with people in helping them improve their social and their physical environments. The study of human social behavior together with the study of processes and strategies of social change are emphasized. Knowledge of the behavioral and environmental sciences is integrated with the development of skills necessary to apply this knowledge to the solving of complex social problems. The curriculum is intended primarily for students whose career goals are oriented toward public and community service. Community development, education, environmental design, and inter-group relations are examples of fields offering opportunities for employment of graduates in a wide variety of settings. The preparatory subject matter is designed to provide foundations of knowledge in the natural and social sciences and the humanities and to develop skills of inquiry and creative endeavor. The student and his adviser select course sequences most appropriate for the student's educational and career goals. *The Applied Behavioral Sciences majors are student-designed programs and are available upon special application after admittance to the college through an entry major such as Exploratory.*

* For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Bachelor of Science Major Requirements

UNITS

<i>Preparatory Subject Matter</i>	48
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- A minimum of 12 units in each of the following areas^o
- Inquiry: intellectual skills of inquiry and critical analysis.
 - Ecological-Environmental Studies: understanding the dynamic interaction of man and his environment.
 - Personal and Social Behavior: understanding the dynamics of human relationship extending from the individual to the international level.
 - Creative Expression: the student explores and develops his own creative powers, intellectual and aesthetic.

<i>Depth Subject Matter</i>	60
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- Individualized program, including senior project, to be determined by student and advisory committee.†

<i>Breadth Subject Matter</i>	32
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- Additional units in one or more of the areas in Preparatory Subject Matter above.

<i>Unrestricted Electives</i>	40
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Total Units for the Degree	180
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Other Requirements. *Admission:* Development, in consultation with adviser, of a statement of academic and career objectives and a plan for attaining stated goals. *Graduation:* Minimum of one year in residence in the major and satisfactory completion of supervised field experience, internship, thesis, or other creative activity.

ATMOSPHERIC SCIENCE is the study of the physics of meteorological processes, including: general circulation of the atmosphere and weather systems; mass and energy transfers at the planetary surface and within the atmosphere; solar and terrestrial radiation; turbulence and diffusion; condensation and precipitation mechanisms; cloud physics and weather modification; air pollution meteorology; and developments in modern meteorological instrumentation. This field is based on applied mathematical physics, and is strongly relevant to environmental biology and human ecology. Numerous career opportunities exist in the federal and state governments, research and development in the private sector, and education. Examples of career areas are air-pollution forecasting and control, weather modification, hurricane and severe weather forecasting and research, weather satellite meteorology, and numerical weather forecasting. The course of study provides a mathematical and physical science background on which the student can build a career in research, education, resource management, or various areas of direct problem solving. In addition to a broad background in meteorology, the major includes a minor area to be chosen from either mathematics, environmental studies, resource management, or a physical or biological science.

Many students specialize in particular areas of atmospheric science through graduate study.

^o List of suggested courses in each of these areas may be obtained from the Department of Applied Behavioral Sciences.

† It is recommended that a student take 15-20 units in the Applied Behavioral Sciences course series.

Bachelor of Science Major Requirements*	UNITS
<i>Preparatory Subject Matter</i>	65
Mathematics (including Mathematics 21A, 21B, 21C, 22A, 22B, 22C)	21
Physics (Physics 4A, 4B, 4C, 4D)	16
Chemistry	10
Biology and botany (Biological Sciences 1, Botany 2)	10
English and/or rhetoric	8
<i>Depth Subject Matter</i>	30
Resource sciences	6
Atmospheric science (Atmospheric Science 110A, 110B, 110C, 120, 121A, 121B, 123, 124)	24
<i>Breadth Subject Matter</i>	28
Social sciences and humanities electives†	28
<i>Restricted Electives</i>	21
Resource and environmental sciences electives	7
Coordinated group of courses (minor area) to be chosen with adviser's approval from mathematics, environmental studies, resource management, or a physical or biological science	14
<i>Unrestricted Electives</i>	36
Total Units for the Degree	180

AVIAN SCIENCES is the study of birds and the ways in which they relate to and are useful to man. The major provides a balanced program for students interested in birds—including the study of avian wildlife and their environments, production and marketing of domestic birds and eggs, and basic and applied laboratory research on birds—and a broad knowledge of biological science. Students may seek careers in health-oriented research, the teaching of biology, wildlife management, domestic and foreign agricultural extension and advisory services, governmental agencies or a diversified and progressive poultry industry. The flexibility of the program and the close personal interaction between students, faculty, and specialists in the field permit students to play a large role in selecting and designing their own course work. They may specialize in a program which leads to a B.S. degree that qualifies them for a particular job; or they may choose a program to meet other broader intellectual and cultural interests. Independent study, undergraduate research, and work-learn experiences are features emphasized in the program. Students may also undertake further training in graduate or professional programs in animal physiology, genetics, nutrition, or veterinary medicine.

Bachelor of Science Major Requirements*	UNITS
<i>Preparatory Subject Matter</i>	46
Biological sciences (Biological Sciences 1, Bacteriology 2, Animal Science 1, 2, and/or Plant Science 1 or 2)	15
Chemistry (Chemistry 1A, 1B, 8A and/or 8B)	13
English and/or rhetoric (choose from English 1, 2, 3, 4A, 4B, 5, and/or Rhetoric 1, 3)	8

* For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Mathematics (Mathematics 13)	4
Physics (Physics 2A and 2B or 2C)	6
Depth Subject Matter	51
Biochemistry (Biochemistry 101A, 101B)	6
Genetics (Genetics 100A, 100B)	6
Nutrition (Nutrition 110)	5
Physiology (Physiology 110A, 110B)	6
Laboratory units in above listed subjects	4
Specialized courses related to avian species	24
Breadth Subject Matter	24
Social sciences and humanities electives†	24
Restricted Electives to supplement or expand any of the above areas	30
Unrestricted Electives †	29
Total Units for the Degree	180

With the **BACTERIOLOGY** major, a B.S. degree can be obtained in either the College of Agricultural and Environmental Sciences or the College of Letters and Science. For the list of major and breadth requirements please refer to pages 148 and 222.

The **BIOCHEMISTRY** major is suitable for students who plan to pursue a professional career in biochemistry, to do graduate work in biochemistry or another biological science, or who intend to apply to schools of medicine, dentistry, medical technology, or veterinary medicine.

This major can be adopted by students in either the College of Agricultural and Environmental Sciences or the College of Letters and Science.

Bachelor of Science Major Requirements*

	UNITS
Preparatory Subject Matter	57-62
Biological sciences (Biological Sciences 1)	5
Chemistry (Chemistry 1A-1B-1C, 5; or 4A-4B-4C)	15-19
Mathematics (Mathematics 16A-16B-16C and one additional course, e.g. 13; or 21A-21B-21C and one additional course, e.g. 131A)	12 minimum
Physics (Physics 2A-2B-2C and 3A-3B-3C or 4A-4C-4D)	12 minimum
At least one course or course sequence from the following:	
Bacteriology 2, 3, 105A-105B, 105AL-105BL (5 units will be credited toward restricted upper division electives);	
Botany 2; Zoology 2; Physiology 101-101L	5-6
English and/or rhetoric	8
Foreign language: No foreign language required but students are strongly urged to complete at least 12 units of college level foreign language or attain placement in the appropriate course by examination.	
Depth Subject Matter	44
Biochemistry 101A-101B, 101L, 108	14

* For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

‡ A student may take one quarter of work-learn experience for a maximum of 15 units.

Genetics 100A–100B	6
Organic chemistry: Chemistry 128A–128B–128C, 129A–129B–129C	15
Physical chemistry: Chemistry 110A–110B–110C; or 107A– 107B, 108	9
<i>Breadth Subject Matter</i>	28
Social sciences and humanities†	28
<i>Restrictive Electives</i>	12
Upper division courses in biochemistry or related areas such as chemistry, biological sciences, zoology, botany, genetics, bacteriology, food science, nutrition, physics, mathematics, engineering, etc. At least one course must be in a biological science other than biochemistry. Recommended: at least one additional course in biochemistry or chemistry, in addition to those required above as depth subject matter. No more than 3 units of courses numbered 198 and 199 may be used.	
<i>Unrestricted Electives</i>	34–39
Total Units for the Degree	180

The **BIOLOGICAL SCIENCES** major leads to a B.S. degree in either the College of Agricultural and Environmental Sciences or the College of Letters and Science. For the list of major and breadth requirements please refer to pages 148 and 227.

The **BOTANY** major leads to a B.S. degree in either the College of Agricultural and Environmental Sciences or the College of Letters and Science. For the list of major and breadth requirements please refer to pages 148 and 228.

CHILD DEVELOPMENT is an appropriate undergraduate major for students who plan to work with people in a wide variety of situations—in teaching, counseling, or in welfare or community agencies for children and youth. It is valuable preparation for working with the “normal” child as well as the disadvantaged, the retarded, the handicapped, and the gifted. It is also an appropriate major for those students planning to pursue advanced degrees in the behavioral sciences. Students of Child Development observe infants, children, and their parents in a variety of situations: in real life, in films, and on closed-circuit television. They may participate in study projects with children from different socioeconomic and cultural backgrounds who need special counseling or educational services. They study intelligence, personality, and special abilities. The emphasis is on the interrelationship of the child, his family, and the community.

The number of students in this major may have to be restricted due to limitations in resources.

The major provides academic preparation for those who plan to pursue a teaching credential.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Bachelor of Science Major Requirements	UNITS
<i>Preparatory Subject Matter</i>	42
Cultural anthropology	4
Introductory psychology	13
Introductory sociology	8
Supervised observation of children	2
General biology	4
Nutrition	3
Physiology	4
Statistics	4
<i>Depth Subject Matter</i>	37-38
Human Development 131, 133A, 133B, 136, 137, 139, 140, 141, 142, and 133L or 136L	32-33
Human genetics	5
<i>Breadth Subject Matter</i>	20
English composition	4
English 103	4
History 17A-17B or 174A-174B	8
Physics or chemistry	4
<i>Restricted Electives</i>	4
To supplement the depth subject matter students should complete at least 4 units of upper division psychology.	
<i>Unrestricted Electives</i>	76-77
<hr style="width: 100%; border: 0.5px solid black;"/>	
Total Units for the Degree	180

The **COMMUNITY NUTRITION** program prepares students for work with public and private community agencies dealing with normal nutrition, therapeutic nutrition, malnutrition, and related social problems. Areas of learning include the biological and behavioral sciences, food, nutrition science, and community nutrition. The major provides flexibility that enables students to qualify for graduate admission into a master's degree program in Public Health Nutrition, which would greatly increase the career opportunities.

By selecting appropriate additional courses†, students may also fulfill the academic requirements for admission to an approved internship in Dietetics.

Bachelor of Science Major Requirements*	UNITS
<i>Preparatory Subject Matter</i>	44-45
Written expression (English 1, 2, or 5)	4
Oral expression (Rhetoric 1 or 3)	4
Statistics (Mathematics 13 or Economics 12)	4-5
Chemistry 1A-1B, 8A-8B	16
Biology (Biological Sciences 1)	5
Physiology with laboratory (Physiology 101, 101L)	6
Bacteriology with laboratory (Bacteriology 2, 3)	5
<i>Depth Subject Matter</i>	42
Nutrition 102A, 102B, 102L	9
Nutrition 116A-116B	6

* For conveniences in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*

† To fulfill the academic requirements for an internship in Dietetics add: Biochemistry 101A-101B, Economics 11A-11B, and Institution Management 125, 126, 127.

Nutrition 118-118L, 119	7
Foods 120	3
Foods 100A-100B, 101A-101B	9
Consumer Economics 141, 142	8
Breadth Subject Matter	43
Principles of economics (Economics 1A)	5
General psychology (Psychology 1A)	5
Sociology, social problems, race relations, social systems in rural and urban society (Sociology 3, 130, 143, 144)	16
Cultural anthropology (Anthropology 2)	4
Applied Behavioral Sciences 47, 151B	6
Human Development 137	4
Methods of teaching (Applied Behavioral Sciences 161)	3
Unrestricted Electives	51-52
The following courses are recommended depending upon a student's specific career objectives: Economics 1B; Biochemistry 101A-101B; Nutrition 114; Foods 134; Human Development 131; Institution Management 125, 126, 127; Applied Behavioral Sciences 151A; International Agricultural Development 10.	
Total Units for the Degree	180

The major in CONSUMER FOOD SCIENCE is designed to provide students with a background in the biological and social sciences sufficient to prepare them for careers dealing with the utilization of foods by the consumer. Emphasis is placed on both the biological properties of foods and on the socio-economic and cultural aspects of foods as they relate to consumer acceptability and use. Students are provided with sufficient range in study of the biological, natural, and social sciences to prepare them for a variety of careers dealing with the utilization of food by the consumer. Employment opportunities include research and development, marketing and product control, extension service, journalism, and community service.

The major provides academic preparation for those who plan to pursue a teaching credential.

Bachelor of Science Major Requirements*

	UNITS
Preparatory Subject Matter	42
Biology (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A, 1B, 8A, 8B)	16
Microbiology (Bacteriology 2, 3)	5
Physics (Physics 10 or 2A, 2B, 2C)	4
Statistics (Mathematics 13)	4
Written or oral expression (choose from English 1, 2, 5, and/or Rhetoric 1)	8
Depth Subject Matter	49
Courses in foods and food science and technology, including Foods 100A, 100B, 101A, 101B and Food Science and Technology 107A, 107B	32
Nutrition 102A, 102B, 102L or equivalent (Nutrition 110)	9
Consumer Economics 141, 142	8

* For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.

<i>Breadth Subject Matter</i>	24
Courses from at least three of the following:	
cultural anthropology, economics, psychology, sociology, applied behavioral sciences	24
<i>Unrestricted Electives</i>	65
Recommended additional courses: Biochemistry 101A, 101B, 123; Foods 120, 134, 135; Food Science and Technology 1, 101, 103, 113, 131; a course in institution management; a course in physiology.	
Total Units for the Degree	180

The **CROP PROTECTION** major focuses on the study of sciences related to the control of agricultural pests. The philosophy on which the program is predicated is that increased production and quality of food and fiber is possible through the control of harmful insects, nematodes, plant disease, and weeds. To gain competence in diagnosing ills of agricultural crops and prescribing treatment, students in this major pursue studies in plant physiology and pathology, weed science, entomology, nematology, agricultural engineering, toxicology, and wildlife. Career opportunities are available as research technicians and in technical sales and service with chemical companies, food processing firms, farm adviser offices, and grower organizations.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	42
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Zoology (Zoology 2)	6
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Mathematics, statistics	4
Physics (Physics 2A, 2B)	6
<i>Depth Subject Matter</i>	47
Plant science (Plant Science 1)	3
Soil and water science (Soil and Water Science 1)	3
Agricultural engineering (Agricultural Engineering Technology 133)	1
Environmental toxicology (Environmental Toxicology 180)	3
Wildlife and fisheries biology (Wildlife and Fisheries Biology 151)	3
Plant physiology (Botany 111A, 111B)	6
Entomology (Entomology 110, 112, 130)	12
Nematology (Nematology 100)	4
Plant pathology (Plant Pathology 120, 125)	8
Weed science (Botany 107)	4
<i>Breadth Subject Matter</i>	20
English and/or rhetoric	8
Social sciences and humanities electives†	12
<i>Restricted Electives</i>	28
To provide a specialization in the following: agronomy, floriculture, landscape horticulture, nursery management, pomology, vegetable crops, or viticulture.	

* For convenience in program planning, the usual courses taken to satisfy the requirements are shown. Equal or more comprehensive courses are acceptable.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

<i>Unrestricted Electives</i>	43
Total Units for the Degree	180

DESIGN emphasizes textiles, costume, graphics, interiors, and environmental concerns. Graduates will be prepared for further professional study, for teacher credential programs, and for the satisfaction of being a creative member of society. The major will allow for maximum exploration of alternatives in design or maximum specialization in a craft or professional area. The program offers a general design education, exploring design areas without definite boundary, stimulating maturity in aesthetic judgment and the pleasure of skill in one's craft. The areas of emphasis are intended as preprofessional explorations of ideas and processes. An important component of this major is the interaction with other environmental and behavioral sciences.

Extensive consultation with appropriate faculty advisers is a requirement of this program, allowing students to develop their own majors but assuring that each student will pursue a cohesive course of study.

The number of students in this major may have to be restricted due to limitations in resources.

Bachelor of Science Major Requirements

	UNITS
<i>Preparatory and Depth Subject Matter</i>	60
Individualized program in design courses, to include at least 36 upper division units, to be determined by the student and faculty adviser*	
<i>Breadth Subject Matter</i>	81
Natural sciences	27
Humanities	27
Social sciences†	27
<i>Unrestricted Electives</i>	39
Total Units for the Degree	180

The major in **DEVELOPMENT, RESOURCE, AND CONSUMER ECONOMICS** is designed to prepare students for careers in one or more of the following areas: the economics of community, regional and international development; the economics of human resources; the economics of natural resources; and consumer economics. This major enables the student to prepare for further studies at the graduate level as well as to pursue career opportunities in government agencies on all levels, non-profit organizations, social agencies, research organizations, and with firms employing economists with this background. New directions of economic application of theory and research to social problems are reflected in this major. Flexibility is provided by options which allow the student to focus either on the *natural and agricultural sciences* or on the *social sciences*.

* List of advisers and sample programs in each area of emphasis may be obtained from the Department of Applied Behavioral Sciences.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Bachelor of Science Major Requirements*		UNITS
<i>Preparatory Subject Matter</i>		36
English (choose from 1, 2, 3, 4A, 4B, and 5)	4	
Rhetoric (1 or 2) or English	4	
American History and Institutions†	8	
Economics (1A-1B or 2A-2B-2C)	10	
Mathematics (including Mathematics 13 and 16A)	10	
<i>Depth Subject Matter</i>		38-40
Theory (Agricultural Economics 100A-100B-100C, Economics 101)	14	
Quantitative Methods: choose two courses from Agricultural Economics 106A, 106B, 155	6	
Research (Agricultural Economics 190A, 190B)	4	
Policy and planning: choose four courses from Agricultural Economics 120, 148; Economics 125A, 125B, 130A, 130B, 152; Applied Behavioral Sciences 151A, 151B	14-16	
<i>Breadth Subject Matter</i>		32
Natural sciences (including mathematics beyond Preparatory Subject Matter requirement) and agriculture (excluding agricultural economics)	12 minimum	
Social sciences (excluding economics), history, and philosophy	12 minimum	
<i>Restricted Electives</i> to supplement or expand one or more of the following areas		20
Specialization requirement (select one or more from the following in the desired area of specialization)**		
Development economics: Agricultural Economics 148		
Natural resource economics: Agricultural Economics 147, 176		
Human resource economics: Agricultural Economics 150		
Consumer economics: Consumer Economics 141, 142		
<i>Unrestricted Electives</i>		52-54
Total units for the degree		180

The **DIETETICS** major provides students with training in normal and therapeutic nutrition, biological and social sciences, foods, communication, and management. This major fulfills the academic requirements for admission into a dietetic internship which the student must complete before qualifying for registration as a Dietitian. Dietitians are sought for administrative, therapeutic, teaching, research, and public service positions in hospitals, schools, clinics, and other food-centered institutions. Many dietitians are self-employed as dietary consultants. Students will be qualified for admission to graduate programs in dietetics, nutrition science, public health nutrition, and food service management.

Bachelor of Science Major Requirements*		UNITS
<i>Preparatory Subject Matter</i>		41-42
Written expression (English 1, 2, 5)	4	
Oral expression (Rhetoric 1, 3)	4	

* For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*

** Additional restricted electives to be recommended by adviser.

† Students meeting the American History and Institutions requirement may substitute Social Science and Humanities as interpreted under the Social Science and Humanities requirement.

Statistics (Mathematics 13)	4
Physics (Physics 2A or 10)	3-4
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Biology (Biological Sciences 1)	5
Bacteriology with laboratory (Bacteriology 2, 3)	5
<i>Depth Subject Matter</i>	53
Biochemistry 101A, 101B	6
Physiology with laboratory (Physiology 101, 101L)	6
Foods 100A, 100B, 101A, 101B	9
Nutrition 110, 111, 111L, 114, 116A, 116B	20
Institution Management 125, 126, 127	12
<i>Breadth Subject Matter</i>	23-24
Principles of economics (Economics 1A)	5
Sociology or cultural anthropology	4
General psychology (Psychology 1A or 10)	4-5
Principles of learning or methods of teaching (Applied Behavioral Sciences 161)	3
Principles of accounting (Economics 11A-11B)	7
Completion of course in computer logic or programming.	
<i>Unrestricted Electives</i>	61-63
The following courses recommended depending upon the student's specific career goals: Epidemiology and Preventive Medicine 150; Food Science and Technology 1, 104, 108A-108B; Foods 120, 134, 135; Consumer Science 100; Nutrition 117, 118, 118L, 190; Plant Science 2; Viticulture and Enology 3.	

Total Units for the Degree 180

The **ENTOMOLOGY** major provides students an opportunity for extensive study of insects—their behavior, classification, structure, and physiology. Some of the special branches of entomology are: transmission of plant and animal pathogens, control of insects with natural enemies and chemicals, and management of honeybees for honey production and crop pollination. Excellent employment opportunities are available in managerial and technical positions with agricultural chemical companies and state and federal agencies concerned with insects and their control. Some entomology graduates prepare to teach zoology, biology, and entomology in high schools and junior colleges.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	73
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Zoology (Zoology 2)	6
Bacteriology (Bacteriology 2)	4
Genetics	4
Plant pathology, plant or animal physiology, or biochemistry ...	4
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Mathematics, including statistics	7
Physics	4
Earth or atmospheric science	3
Electives in biological sciences (exclusive of entomology)	15

* For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.

<i>Depth Subject Matter</i>	28
Entomology 1, 101, 102, 103, 104, and 109 or 105 and another upper division course in entomology which requires a collec- tion of insects	28
<i>Breadth Subject Matter</i>	36
English and/or rhetoric	8
Electives in social sciences and humanities†	28
<i>Unrestricted Electives</i>	43
	180
Total Units for the Degree	180

The ENVIRONMENTAL PLANNING AND MANAGEMENT major provides opportunities to study the interrelationships between man and his environment through a common core of courses, and the development of special competence in one of the following areas:

The area of *Park and Recreation Administration* emphasizes the formulation and implementation of policy and the administrative process in the allocation, development, management, and use of outdoor environments.

Environmental Planning emphasizes the systematic use of information to develop alternatives for decisions on the form, function, and future of urban and natural areas.

Landscape Management emphasizes the development, maintenance, and operation of natural and manmade landscapes and facilities.

The *Environmental Education* area emphasizes the communication of ecological awareness and understanding.

The Environmental Planning and Management advisers have found that career experience makes a student more effective as a student and, after graduation, more desired as an employee. They therefore recommend, and may require, early career experience through work-learn internships, summer jobs, or the taking of Planned Educational Leave for a year of work.

Graduates can expect career opportunities in a variety of public agencies and private enterprise, including: park administration, resort management, city planning, outdoor education, landscape contracting, recreation resource planning, landscape management, and environmental interpretation.

Bachelor of Science Major Requirements*

	UNITS
<i>Common Core Courses</i>	80-88
Chemistry (Chemistry 1A or 10)	4-5
Physics (Physics 2A or 10)	3-4
Geography, geology, or soil and water science (Geography 1, Geology 1, Soil and Water Science 2, Soil Science 88, or Water Science 10)	6-7
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Wildlife biology or zoology (Wildlife and Fisheries Biology 2 or Zoology 2)	4-6

* For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Statistics (Mathematics 13)	4
Sociology (Sociology 1 or Anthropology 2)	4-5
Cultural geography (Geography 2 or Anthropology 2)	4
Psychology (Psychology 1A or 1C)	3-5
Principles of economics (Economics 1A, 1B, or 2A).....	4-5
Expository writing (English 1).....	4
Public speaking (Rhetoric 1 or 3)	4
Humanities elective	4
Environmental quality: Environmental Planning and Management 1	3
Landscape design: Environmental Planning and Management 20 and 22	6
Urban and regional planning: Environmental Planning and Management 110	4
Outdoor recreation: Environmental Planning and Management 116	4
General ecology: Environmental Studies 100	4
<i>Depth Subject Matter</i>	
<i>Park and Recreation Administration Option</i>	35
Introduction to environmental plants: Environmental Horticulture 6	3
Landscape horticulture: Environmental Horticulture 128A, 128B..	6
Recreation policy: Environmental Planning and Management 122 .	4
Planning of recreation environments: Environmental Planning and Management 134	3
Design of recreation environments: Environmental Planning and Management 136	3
Park operations: Environmental Planning and Management 144 ...	4
Urban or natural resource economics: Economics 125A, 125B or Agricultural Economics 147	4
Public administration (Political Science 181 or 182)	4
Environmental awareness or work and leisure: Environmental Studies 170 or Sociology 160	4
<i>Landscape Management Option</i>	32
Landscape construction: Environmental Horticulture 104	3
Taxonomy and ecology of environmental plants: Environmental Horticulture 105	4
Landscape horticulture: Environmental Horticulture 128A, 128B .	6
Entomology (Entomology 110)	4
Plant Pathology 120	4
Ecology of cultivated plants: Plant Science 101	3
Elementary accounting	4
Environmental awareness: Environmental Studies 170	4
<i>Environmental Education Option</i>	20-23
Introduction to environmental plants: Environmental Horticulture 6	3
Animal ecology (Environmental Studies 110, 116 or Zoology 125) ..	3-5
Plant ecology (Botany 101 or 117 or Plant Science 101)	4
Conservation of natural resources: Geography 161	4
Environmental interpretation: Environmental Planning and Management 160	3
Natural resource economics: Agricultural Economics 147	4
<i>Environmental Planning Option</i>	36
Environmental awareness (Environmental Studies 170).....	4
History of urban form (Art 168)	4

Urban geography (Geography 155)	4
Urban economics (Economics 125A or 125B)	4
Urban society (Sociology 143)	4
Drafting and perspective (Design 21)	4
Local government and politics (Political Science 100)	4
Cartography or interpretation of aerial photography (Geography 105 or 106)	4
Public mechanisms for controlling land use (Environmental Studies 160)	4
<i>Individual Requirements</i>	26-50
Courses selected with adviser's approval to complement each student's program option in this major.	
<i>Unrestricted Electives</i>	30
Total Units for the Degree	180

The FERMENTATION SCIENCE major is a program of study of the fundamental and applied sciences related to the use of microorganism and cell cultures as production and processing agents. A broad interdisciplinary food-related training may be combined with specializations in *enology* (wine studies), *brewing*, or *fermentation* of other foods and beverages such as cheese, sauerkraut, etc. Industrial fermentations as utilized in the production of drugs, enzymes, solvents, acids, and vitamins; waste management; expansion of food supply; and purification of the environment are further opportunities for study. Courses may be selected with the consultation of advisers to qualify for supervisory, technical, research, sales, or executive positions.

Background for graduate study leading to the M.S. degree in Food Science and the Ph.D. degree in microbiology, agricultural chemistry, or biochemistry is also provided.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	65
Biochemistry (Biochemistry 101A, 101B)	6
Biology (Biological Sciences 1)	5
Chemistry (Chemistry 1A, 1B, 1C, 5, 8A, 8B)	25
Mathematics (Mathematics 13, 16A, 16B)	10
Microbiology (Bacteriology 2, 3)	5
Physics, mathematics or approved physical or natural sciences† ..	6
Written or oral expression (English 1, 2, 5, and/or Rhetoric 1).....	8
<i>Depth Subject Matter</i>	30
Choose from: Viticulture and Enology 3, 123, 124, 125, 126, 140, 217; Food Science and Technology 102, 104, 104L, 105, 106, 106L, 111, 235, 235L; Biochemistry 123; Botany 155; Bacteri- ology 101, 105A, 105B, 105AL, 105BL, 130A-130B-130L, 230, 250; Engineering: Agricultural 245; Nutrition 122; Environ- mental Toxicology 10, 180; Physiology 103; Water Science 116.	

* For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.

† Chemistry 5, and 107A-107B are recommended here or as part of the Restricted Electives. Those intending to work toward a doctorate are advised to substitute Chemistry 128A-128B-128C, 129A-129B-129C for 8A-8B and Chemistry 110A-110B-110C for 107A-107B.

<i>Restricted Electives</i>	30
Selected according to student's educational goal and upon approval of adviser.	
<i>Breadth Subject Matter</i>	30
Social sciences and humanities or others as approved by adviser†	
<i>Unrestricted Electives</i>	25
Total Units for the Degree	180

The major in **FOOD BIOCHEMISTRY** stresses the principles of chemistry and biochemistry as related to the constituents of foods and the changes which occur in the constituents before and during storage and on processing. Particular emphasis is placed on the role of and changes in the carbohydrates, lipids, proteins, enzymes, and nucleic acids and their effect on the quality attributes of foods. Through the appropriate choice of both electives and in-depth courses in food science and technology, the major offers broad education to students planning careers in food processing, food research, and other food related fields.

The major also offers excellent preparation for graduate work in agricultural chemistry, biochemistry, nutrition, medicine, and the life sciences.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	78-83
Biochemistry (Biochemistry 101A, 101B)	6
Biology (Biological Sciences 1)	5
Chemistry, one year general and analytical chemistry (Chemistry 1A-1B-1C, 5 or 4A-4B-4C), one year organic chemistry including at least one laboratory course (Chemistry 128A-128B-128C, 129A), and two quarters of physical chemistry (Chemistry 107A-107B or 110A-110B)	32-36
Mathematics, including one year of calculus (Mathematics 15, 16A, 16B or 21A, 21B, 21C) and one course from Mathematics 13, 16C, 29, 22A, 22B, 22C	12
Microbiology (Bacteriology 2 and 3; Botany 2 or Zoology 2 may be substituted)	5-6
Physics, any course except Physics 10 and including at least one laboratory course (Physics 2A, 2B, 2C and 3A, 3B, 3C; or 4A, 4B, 4C)	10
English or rhetoric	8
<i>Depth Subject Matter</i>	27
Food Science and Technology, including 101, 103, 113, and 125 ..	23
Biochemistry 123	4
<i>Breadth Subject Matter</i>	22
Social sciences and humanities, including 4 additional units of English or rhetoric†	22
<i>Restricted Electives</i>	28
Three upper division courses from biochemistry, plant or animal physiology, and bacteriology (e.g., Biochemistry 102, 108, 122;	

* For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Physiology 100A, 100B; Bacteriology 130A-130B; Food Science and Technology 104) and two upper division courses from environmental toxicology, public health, and nutrition15
 Other courses in area of food biochemistry13

Unrestricted Electives20-25

Total Units for the Degree 180

The focus of the **FOOD SCIENCE** major is on the maintenance of product quality, especially in terms of controlling chemical and microbiological changes during processing and between processing and consumption. Emphasis in the major is given to the important roles of engineering, biological, physical, and behavioral sciences in the development of new food sources, food processing methods, and the evaluation, improvement, packaging, and distribution of food. Students also may specialize in *Food Processing* or *Food Technology and Management*. Graduates qualify for careers in supervisory, technical, sales, and executive positions in food processing, food research, and other food-related fields, or may qualify for graduate study leading to the M.S. degree in Food Science or the Ph.D. degree in such fields as agricultural chemistry, microbiology, biochemistry, and nutrition.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	61
Biology and microbiology (Biological Sciences 1, Bacteriology 2, 3)	10
Chemistry and biochemistry (Chemistry 1A, 1B, 1C or 4A, 4B, 4C; 8A, 8B; Biochemistry 101A, 101B)	27
Mathematics and physics (Mathematics 13, 19; Physics 2A, 2B, 2C)	16
Written or oral expression (choose from English 1, 2, 5 and/or Rhetoric 1)	8
<i>Depth Subject Matter</i>	28
Food science (Food Science and Technology 1, 49, 103, 104, 104L, 105, 110A, 111, 131)	28
<i>Breadth Subject Matter</i>	28
Social sciences and humanities electives†	28
<i>Restricted Electives</i> suggested for students who elect to follow one of the three programs below	38
<i>General Program:</i>	
Food science and related courses	38
<i>Food Technology and Management:</i>	
Agricultural economics and economics	33
Related courses	5
<i>Food Processing:</i>	
Mathematics and physics	12
Food Science and Technology 110A, 110B, 130	9
Related courses	17

* For convenience in planning your program the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equal or more comprehensive courses will be accepted upon approval by adviser.

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Unrestricted Electives 25

Total Units for the Degree 180

The **FOOD SERVICE MANAGEMENT** program prepares students for careers in management in commercial organizations such as hotels, restaurants, industrial cafeterias and contract food services, and also in public and private institutions such as hospitals, correctional institutions, schools and colleges. The major also provides an excellent background for the student who eventually plans to operate his own food service establishment. Areas of learning include the biological sciences with an emphasis on nutrition and food chemistry, as well as a strong background in economics and business management.

By selecting appropriate additional courses, students may also fulfill the academic requirements needed for admission to an approved internship in Dietetics.†

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	64
Written expression (English 1, 2, 5)	4
Oral expression (Rhetoric 1 or 3)	4
General principles of economics (Economics 1A, 1B or 2A, 2B, 2C) ..	10
Principles of accounting (Economics 11A-11B)	7
Concepts of computing (Mathematics 19)	3
Statistics (Mathematics 13 or Economics 12)	4
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Biology (Biological Sciences 1)	5
Physiology with laboratory (Physiology 101, 101L)	6
Bacteriology with laboratory (Bacteriology 2, 3)	5
<i>Depth Subject Matter</i>	52
Foods 100A, 100B, 101A, 101B, 134	12
Nutrition 102A-102B, 102L	9
Microbiology of food (Food Science and Technology 104)	3
Institution Management 125, 126, 127	12
Business law (Agricultural Economics 18)	4
Fundamentals of business management (Agricultural Economics 113, and 112 or 114)	8
Managerial accounting (Agricultural Economics 117)	4
<i>Breadth Subject Matter</i>	8
Two courses chosen from the following areas: cultural anthropology, psychology, sociology	8
<i>Unrestricted Electives</i>	56
The following courses recommended depending upon student's specific career goals: Applied Behavioral Sciences 151A- 151B; Agricultural Economics 130; Economics 134, 150, 151; Consumer Science 100; Epidemiology and Preventive Medicine 150; Food Science and Technology 104L, 108A- 108B; Plant Science 112; Foods 120; Viticulture and Enology 3.	
Total Units for the Degree 180	

* For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*

† To fulfill the academic requirements for an internship in Dietetics add: Biochemistry 101A-101B, Nutrition 116A-116B, and 3 units of principles of education.

The GENETICS major is designed to provide a broad background in the biological, mathematical, and physical sciences basic to the study of heredity and evolution. The major is sufficiently flexible to accommodate students interested in the subject either as a basic discipline in the biological sciences or in terms of its applied aspects in improving domestic plants and animals.

Students may elect this major either in the College of Agricultural and Environmental Sciences or in the College of Letters and Science.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	57-65
Biological sciences (Biological Sciences 1)	5
Two of the following courses or course sequences:	
Bacteriology 2 and 3 or 105A-105B; Botany 2; Zoology 2 . . .	9-12
Chemistry (Chemistry 1A-1B-1C or 4A-4B-4C; 8A-8B or 128A-128B-128C, 129A)	21-26
Physics (Physics 2A-2B-2C)	9
Mathematics (Mathematics 13; 16A-16B-16C or 21A-21B-21C) . . .	13
<i>Depth Subject Matter</i>	22-25
Biochemistry 101A-101B	6
Genetics 100A-100B-100L	7
Three additional courses in genetics	9-12
<i>Breadth Subject Matter</i>	36
English and/or rhetoric	8
Social sciences and humanities†	28
<i>Restricted Electives</i>	18-30
Six upper division courses in biological sciences or other fields relevant to genetics and related to student's interest, chosen with approval of adviser. (Recommended: one course in animal, plant, or microbial physiology; Mathematics 105A-105B or 130A-130B, or 131A-131B- 131C)	18-30
<i>Unrestricted Electives</i>	24-27
Total Units for the Degree	180

The HOME ECONOMICS major, through the study of the humanities; the biological, physical and social sciences; and specialized subject matter, provides an excellent background for professional home economists. Employment opportunities exist in governmental, industrial, and community agencies dealing with social services, private industry, extension services, and teaching at the secondary and junior college levels. The program encompasses the broad field of family and consumer sciences combining laboratory work with academic theory in such areas as child development, foods, nutrition, and textiles.

Graduates are qualified for admission to programs leading to a master's degree with study in the areas of child development, consumer economics, foods, nutrition, or textiles.

* For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

This major also provides academic preparation for those who plan to pursue a teaching credential.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	58-60
Biological and Physical Sciences:	
Biological Sciences 1	5
Chemistry 1A, 1B, 8A, 8B	16
Mathematics 13 or Economics 12	4-5
Additional course(s), recommended:	
bacteriology, physiology, or physics	4
Social Sciences and Humanities:	
Anthropology 2 or sociology	4
Introduction to design	4
Economics 1A	5
Written or oral expression (English 1, 2, 5 and/or Rhetoric 1) ...	8
Psychology 1A or 10	4-5
Additional course(s), recommended:	
Economics 1B or Psychology 1C	4
<i>Depth Subject Matter</i>	60
The following courses may be used to satisfy the depth subject requirement:	
Applied Behavioral Sciences 150	
Consumer Economics 141, 142	
Foods 100A, 100B, 101A, 101B	
Human Development 131, 133A, 133B, 136, 137	
Home Management 140, 140L	
Nutrition 102A, 102B, 102L	
Textiles and Clothing 6, 7, 17A, 17B, 160, 172	
<i>Unrestricted Electives</i>	60-62
Total Units for the Degree	180

The **INTERNATIONAL AGRICULTURAL DEVELOPMENT** major provides opportunity for students to develop competence in a technical field and, in addition, to acquire those special qualities of mind and spirit requisite for effective performance in underdeveloped areas of the world. These individuals must be perceptive, sensitive, understanding, and possess knowledge of the social-political-economic-cultural relationships existing among people. Graduates concerned with resources development, whether American or foreign, will find opportunities in government service and commercial firms with overseas departments, providing a wide variety of career opportunities.

Students in this major may select their areas of technical specialization from any of the fields of interest broadly grouped in agriculture and the environmental sciences. A wide selection of courses emphasizing development in the humanities, social sciences, and economics is available to students in order to develop some understanding of the broad cultural and economic environments in which agriculture operates in particular areas outside the United States.

* For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.

Bachelor of Science Major Requirements*	UNITS
<i>Preparatory Subject Matter</i>	52
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Physics	4
Mathematics, statistics (Mathematics 13)	4
Economics	5
Biological sciences (animal or plant physiology, bacteriology, biochemistry, botany, genetics, zoology)	15
English and/or rhetoric	8
<i>Depth Subject Matter</i>	27
International agricultural development (International Agricultural Development 101 or 102, 190, and other courses with international development emphasis)	27
<i>Breadth Subject Matter</i>	23
Social sciences and humanities	23
<i>Restricted Electives</i>	50
Agricultural and other science electives	12
Economics or agricultural economics	6
Humanities and social science courses relevant to an understanding of development	17
Foreign language or demonstrated proficiency in a single foreign language equivalent to passing Course 4.....	15
<i>Unrestricted Electives</i>	28
Total Units for the Degree	180

The NUTRITION SCIENCE major provides organized study in nutrition and relevant biological and physical sciences as preparation for 1) graduate study in nutrition, including the nutrition of species or groups, such as human, domestic animal, avian, and wildlife; 2) professional study of medicine, veterinary medicine, and other health sciences; 3) technical work in nutrition in animal, food, and pharmaceutical industries; 4) journalism and technical writing; and 5) health education. It is assumed that students will be advised and will take additional courses appropriate to their specific interest.

Bachelor of Science Major Requirements*	UNITS
<i>Preparatory Subject Matter</i>	53
Biochemistry (Biochemistry 101A, 101B or Physiological Sciences 101A, 101B)	6
Biology with laboratory (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A, 1B, 1C, 5, 8A, 8B)	25
Microbiology with laboratory (Bacteriology 2, 3)	5
Statistics (Mathematics 13)	4
Written or oral expression (choose from English 1, 2, 5 and/or Rhetoric 1)	8
<i>Depth Subject Matter</i>	20
Select from Nutrition 110, 111, 111L, 114, 116A, 116B, 117, 121, 122, 123, 190, 198, and 199.	

* For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.

<i>Breadth Subject Matter</i>	20
Courses in social sciences and humanities.	
<i>Restricted Electives</i>	47
Biochemistry laboratory (Biochemistry 101L, 102, 123 or Physiological Sciences 102A, 102B)	3-5
Calculus or physics (excluding Physics 10)	6
Foods and food science	6
Physiology with laboratory (Physiology 110A, 110B, 111A, 111B, or Physiology 101, 101L, plus an additional physiology course)	10
Additional nutrition or related biological and physical sciences	19-21
<i>Unrestricted Electives</i>	40
Total Units for the Degree	
	180

The **PHYSIOLOGY** major is designed to provide students with an understanding of the vital functions of living organisms and includes a systematic study of the functional properties of tissues and organs and comparison of processes among different kinds of animals. It will provide the foundations for a challenging career in physiology and also serve as a basis for further training in schools of human and veterinary medicine, medical technology, pharmacy, dentistry, optometry, and other health sciences. Students interested in research and advanced teaching may use the program as preparation for continued study leading to the M.S. and Ph.D. degrees.

This major can be adopted by students in either the College of Agricultural and Environmental Sciences or the College of Letters and Science.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	47-48
Chemistry (Chemistry 1A-1B-1C, 5, 8A-8B)	25
Mathematics (Mathematics 13, 16A-16B-16C or Physiology 108)	13-14
Physics (Physics 2A-2B-2C)	9
<i>Depth Subject Matter</i>	33
Physiology, including Physiology 100A-100B, 100L, 101L, 110A-110B, 111A-111B	33
<i>Breadth Subject Matter</i>	16
Social science and humanities (including 8 units of English and/or rhetoric)	16
<i>Restricted Electives</i>	30
Upper division units which must include either biochemistry and morphology or mathematics, chemistry, physics, and/or engineering. Program should be developed in consultation with major adviser.	
<i>Unrestricted Electives</i>	53-54
Total Units for the Degree	
	180

* For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.

The objective of the **PLANT SCIENCE** major is to train students in the biological and physical sciences as applicable to the technology required for the production and maintenance of plants. Students may specialize in agronomy, floriculture, landscape horticulture, nursery management, plant pathology, pomology, vegetable crops, or viticulture, or prepare for graduate work in the plant sciences. Occupational opportunities exist in nursery and greenhouse management, farming, technical and sales positions in agricultural business and associated enterprises (such as equipment and supply companies), as well as in private, state, and federal service in consulting or research.

Bachelor of Science Major Requirements*

UNITS

<i>Preparatory Subject Matter</i>	36
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Mathematics (statistics)	4
Physics (Physics 2A and 2B or 2C)	6
<i>Depth Subject Matter</i>	34
Plant science (Plant Science 1, 2)	7
Soil and water science (Soil and Water Science 2)	3
Entomology (Entomology 110 or 112)	4
Nematology and/or weed science	4
Genetics (Genetics 100A, 100B)	6
Plant pathology (Plant Pathology 120)	4
Plant physiology (Botany 111A, 111B)	6
<i>Breadth Subject Matter</i>	20
English, rhetoric, or technical writing	8
Social sciences and humanities electives†	12
<i>Restricted Electives</i>	45
Courses in specialization and the natural sciences supportive of major. Specialization may be taken in: agronomy, floriculture, landscape horticulture, nursery management, plant pathology, pomology, vegetable crops, and viticulture.	
Students wishing to prepare for graduate training should elect at least 24 units from the following: Bacteriology 2; Biochemistry 101A, 101B, 101L; Botany 105, 108, 117, 130, 130L; Mathematics 15, 16A, 16B, 16C; Physics 2C; and Zoology 2.	
<i>Unrestricted Electives</i>	45

Total Units for the Degree 180

PREFORESTRY students who intend to major in either *General Forestry* or *Wood Science and Technology* may be admitted to the School of Forestry and Conservation located on the Berkeley campus, following completion of the sophomore year. The programs offered at Davis provide full preparation for admission to the School. To qualify for such admission, a student must complete at

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† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

least 84 quarter units of credit with a grade-point average of C or higher. In addition, he must satisfy the prescribed preparatory subject matter requirements for the majors.

For full details on the majors in General Forestry, Wood Science and Technology, and in the Conservation of Natural Resources please consult the *Announcement of the School of Forestry and Conservation*, which may be obtained from the School of Forestry and Conservation, 145 Mulford Hall, Berkeley, California 94720.

PREVETERINARY MEDICINE. The College of Agricultural and Environmental Sciences has traditionally provided preveterinary students with advisers as part of the preparatory program in preveterinary medicine. By their very nature all preparatory advising programs culminate in the choice of a major. For a variety of reasons preveterinary students have been reluctant to give appropriate attention to the choice of a major and have continued to think of the preveterinary advising programs as a major.

In order to correct this misconception the College has discontinued its formal preprofessional listing for veterinary medicine in this Catalog. It has not, however, forsaken its obligation to provide preprofessional advising. Students interested in satisfying the requirements for the School of Veterinary Medicine have two programmatic options. They may enroll in the Exploratory program or select any of the established majors (see pages 74–111). All advisers in the College are apprised of the requirements for admission to veterinary school and will help the student integrate these requirements into the program of the major. Students desirous of advice beyond the competence of the individual adviser can be referred to an adviser with special knowledge of matters related to veterinary medicine. These advisers may be contacted through the College Office, 228 Mrak Hall, the Dean's office at the School of Veterinary Medicine, or the Preprofessional Health Sciences Advising office, second floor, South Hall.

RANGE AND WILDLANDS SCIENCE is the study of the biological and physical components of land resources which are used mostly for grazing domestic livestock, but which also provide wildlife habitats, watersheds, recreation, and open space.

The major provides background in the biological, physical, and social sciences. Comprehensive study in the plant, animal, soil, and resource sciences supplements the core of range management courses. Students learn to integrate the knowledge of a variety of specialized fields as a basis for land management oriented toward the multiple use concept and the maintenance of environmental quality.

The field is broad and diverse. Graduates, especially those with some experience, may be employed as consultants, ranch managers, or ranchers. They may also qualify for the position of Range Conservationist in governmental agencies such as the Forest Service, Soil Conservation Service, and the Bureau of Land Management. In addition, the training provided by this major should provide an excellent background for natural resource management positions. Job experi-

ence, in-service training, and formal education beyond the bachelor's degree may lead to advanced professional positions in research, education, or management.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	44-45
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Physics (Physics 2A or 10)	3
Mathematics (Mathematics 13, 16A)	7
Economics (Economics 1A or Agricultural Economics 1)	4-5
Production of cultivated plants (Plant Science 2)	4
<i>Depth Subject Matter</i>	65-71
Plant Science 102	4
Physical geography (Geography 1) or Geology (Geology 1)	3-4
Meteorology (Atmospheric Science 20 or Agricultural Engineering Technology 111)	3
Soil science, soil and water science and/or water science (Soil and Water Science 2 and two upper division courses from Soil Science, Soil and Water Science and/or Water Science) ..	8-10
Agronomy 112-112L	3-4
Animal science (Animal Science 2, 118A)	6
Nutrition 103 or Wildlife and Fisheries Biology 108	4
Resource sciences (Resource Sciences 100, 190)	4
Plant ecology (Plant Science 101 or Botany 117)	3-4
Animal physiology, zoology or botany	6
Range Management 1, 100, 103, 105, 133, 198, 199	18
<i>Breadth Subject Matter</i>	32
English and/or rhetoric	8
Social sciences and humanities electives†	12
Upper division social science courses in at least two of the following: agricultural economics, economics, geography, or political science	12
<i>Unrestricted Electives</i>	32-39
Total Units for the Degree	180

The RENEWABLE NATURAL RESOURCES major is designed for general education relating to the use, development, management and protection of our land, water, air, sunlight, plant, and animal resources. Students with definite interests in ecology and conservation, but uncertain as to specialization, may find this major particularly attractive. Essential social, biological, and physical sciences are combined with a large block of electives to allow for individualized programs emphasizing different aspects of resource availability and use.

The major will prepare the student for participation as an enlightened citizen in resource issues of public concern. Positions in general areas of resource use

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† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

and conservation may be open to graduates; and, with appropriate electives, the major can provide adequate preparation for graduate study in the resource sciences.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	73
Biology (Biological Sciences 1)	5
Choose two courses from: Animal Science (Animal Science 1, 2) and/or Plant Science (Plant Science 1, 2)	6
Additional courses in the biological sciences	14
English and/or rhetoric	8
Physics and chemistry	22
Mathematics (Mathematics 13)	9
Soil and/or water science	6
Geology or physical geography	3
<i>Breadth Subject Matter</i>	30
Biological, physical, environmental sciences electives	18
Social sciences and humanities electives†	12
<i>Depth Subject Matter</i>	36-37
Resource Sciences 100	3
Agricultural Economics 147 or 148	3-4
<i>Restricted Electives</i>	30
Resource-oriented courses, including at least one appropriate upper division course from three of the following areas: animal science, atmospheric science, botany, economics or agricultural economics, civil or agricultural engineering, environmental horticulture, environmental planning and management, environmental studies, environmental toxicology, geography, plant sciences, range management, resource sciences, soil and/or water science, wildlife and fisheries biology, zoology, or others with concurrence of adviser.	
<i>Unrestricted Electives</i>	40-41
Total Units for the Degree	180

SOIL AND WATER SCIENCE is concerned with the use and protection of our land and water resources. The major is designed for students wishing to prepare for a career involving these resources as well as for those who have a more general interest in their use and protection, but whose educational objectives are less sharply focused. While the major has a "core" of required courses, programs can be designed to meet the needs of students having different objectives. For example, those wishing to emphasize resource use and management would include more than the minimum number of units of physical and biological sciences, while those more interested in resource allocation and land-use planning would choose more courses in the social, political, and economic areas. The flexibility of this major makes possible a wide variety of career opportunities which include managerial and technical positions with agribusinesses such as

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equipment and supply companies, farm management, and positions involving advising, planning, land appraisal, research, and teaching with private, district, county, state, federal, and international organizations dealing with soil and water development, use, and conservation.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	47
Biology and botany	9
Mathematics (including introductory computer programming)....	9
Chemistry and physics (Chemistry 1A-1B or 4A-4B-4C, and Physics 2A-2B and 3A-3B, or 4A-4B-4C)	18
Economics or agricultural economics	3
English and/or rhetoric	8
<i>Depth Subject Matter</i>	54
Resource sciences (Resource Sciences 100).....	3
Soil and/or water science (including Soil and Water Science 2, 130, 140, and 3 units of Soil and/or Water Science 199)	26
Physical sciences, biological sciences, and/or mathematics with approval of adviser	25
<i>Breadth Subject Matter</i>	17
Social sciences and humanities†	17
<i>Restricted Electives</i> to supplement or expand areas of student interest with approval of adviser	27
<i>Unrestricted Electives</i>	35
Total Units for the Degree	180

The **TEXTILES** major is concerned with studying the chemical and physical properties, applications, and care of fibers and fabrics; their use in design; and the socioeconomic aspects of clothing. Two options are offered: *Consumer Textiles* stresses the *social science* aspects of textiles and clothing and can lead to careers in teaching, extension service, merchandising, design, and journalism; and *Textile Science* places more emphasis on the *scientific disciplines* related to textiles and, in addition to the preceding opportunities, can lead to careers in research and development, technical service, marketing, and product control.

With this major students will be qualified to enter graduate programs with specializations in Textiles or Textile Science.

Bachelor of Science Major Requirements*

	UNITS
<i>Preparatory Subject Matter</i>	32-35
Sociology (Sociology 1)	4
Cultural Anthropology (Anthropology 2)	4
Statistics, one course (Mathematics 13, Economics 12, Education 114)	4-5
Written or oral expression (English 1, 2, 5, and Rhetoric 1)	8

* For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Economics, principles, one course (Economics 1A, 1B, or 2A)	4-5
Psychology, introductory course (Psychology 1A or 10)	4-5
Chemistry, one course (Chemistry 10)	4
<i>Depth Subject Matter</i>	43-44
Textiles and Clothing 6, 7, 17A, 17B, 162, 162L, 170, 172, 197	26
Design 143, 170A, 170B	11
History of art or design, one course	3-4
Consumer Science 100	3
<i>Restricted Electives</i>	42
Choose from courses: Agricultural Economics 18, 112, 113; Applied Behavioral Sciences 150; Consumer Economics 141, 142; Design 142A, 142B, 160A, 160B; Economics 1A, or 1B, or 2B, 2C, 11A, 11B; Mathematics 19; Physics 10; Psychology 145; Sociology 25, 148; Textiles and Clothing 47.	
<i>Unrestricted Electives</i>	59-63
<i>Textile Science Option</i>	
<i>Preparatory Subject Matter</i>	44-49
Cultural Anthropology (Anthropology 2)	4
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Physics (Physics 2A and 2B, or 10)	4-6
Introductory Psychology (Psychology 1A or 10)	4-5
Statistics, one course (Mathematics 13, Economics 12, Education 114)	4-5
Written or oral expression (English 1, 2, 5, and Rhetoric 1)	8
Economics, principles, one course (Economics 1A or 2A)	4-5
<i>Depth Subject Matter</i>	31
Textiles and Clothing 6, 7, 160, 161, 161L, 162, 162L, 172, 197	24
Consumer Economics 141	4
Consumer Science 100	3
<i>Restricted Electives</i>	44
Choose from courses: Agricultural Economics 18, 112, 113; Bacteriology 2; Biological Sciences 1; Chemistry 1C, 5, 128A, 128B, 128C; Consumer Economics 142; Design 143; Economics 1B, or 2B, 2C; Mathematics 15, 16A, 16B, 19; Physics 2C; Textiles and Clothing 17A, 17B, 47, 170.	
<i>Unrestricted Electives</i>	56-61
Total Units for the Degree	180

The **WILDLIFE AND FISHERIES BIOLOGY** major deals with the interface between the needs of man and wildlife which must be maintained for the sake of future generations, both as to recreation and to food supply. Certain species of wildlife are threatened because they cannot adapt to man's activities, whereas others have thrived so well under man-made changes in the environment that their numbers must be controlled. Emphasis is placed on biological and physical sciences, with specialization in wildlife or fisheries. This program prepares students for careers as wildlife or fisheries biologists, animal control specialists, game technicians, or, following additional academic preparation, for careers in research and administration in those areas.

Bachelor of Science Major Requirements*

UNITS

<i>Preparatory Subject Matter</i>	60
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 1C, 8A, 8B)	21
Mathematics (Mathematics 13, 16A-16B or 21A-21B, 105A)	14
Physics (Physics 2A, 2B, 2C)	9
Zoology (Zoology 2)	6
<i>Depth Subject Matter</i>	57-66
Biochemistry (Biochemistry 101A, 101B or Physiological Sciences 101A, 101B)	6-7
Ecology (Entomology 104 or Zoology 125)	3-4
Genetics (Genetics 100A, 100B)	6
Nutrition	4
Animal physiology (upper division courses)	6
Zoology (Zoology 105 or 106)	4-5
One course selected with adviser's approval from: Zoology 116, 136, 137, 147, 148; Environmental Studies 100, 116, 140	4-5
Additional courses:	
<i>Wildlife Biology</i> specialization	4
Botany 117 or Range Management 100	4
or	
<i>Fisheries Biology</i> specialization	9
Entomology (Entomology 116)	3
Mathematics (Mathematics 19, 105B)	6
Courses in the Major	20
Wildlife and Fisheries Biology 101	5
Upper division courses selected with adviser's approval from:	
Wildlife and Fisheries Biology 110, 110L, 111, 111L, 120, 121, 122, 135, 135L, 151, 152	15
<i>Breadth Subject Matter</i>	20
English and rhetoric (English 1, Rhetoric 1)	8
Social science and humanities†	12
<i>Unrestricted Electives</i>	34-43
Total Units for the Degree	180

The **ZOOLOGY** major leads to a B.S. degree in either the College of Agricultural and Environmental Sciences or the College of Letters and Science. For the list of major and breadth requirements please refer to pages 148 and 477.

* For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Faculty of the College of Agricultural and Environmental Sciences

In order to better meet its educational responsibilities, the faculty of the College of Agricultural and Environmental Sciences is organized into a variety of overlapping administrative formats and units. Most individuals are associated with one or more undergraduate teaching divisions, graduate groups, and research departments. Since many of these units are not places where faculty can physically be found, but only coordinating devices, the uninitiated often are confused by them. The faculty list which follows is organized according to research departments. Each member of the faculty listed under a department designation can be most conveniently reached through his departmental address:

AGRICULTURAL ECONOMICS

Harold O. Carter, Ph.D., Chairman of the Department
Department Office, 118 Voorhies Hall 752-1515

Professors:

Harold O. Carter, Ph.D.
Gerald W. Dean, Ph.D.
Daniel B. DeLoach, Ph.D. (*Emeritus*)
Jerry Foytik, Ph.D.
Benjamin C. French, Ph.D.
Varden Fuller, Ph.D.
Trimble R. Hedges, Ph.D.
Gordon A. King, Ph.D.
Sylvia Lane, Ph.D.
Elmer W. Learn, Ph.D.
Samuel H. Logan, Ph.D.
Alexander F. McCalla, Ph.D.
*Chester O. McCorkle, Jr., Ph.D.
J. Herbert Snyder, Ph.D.
Stephen H. Sosnick, Ph.D.

Associate Professors:

²Hoy F. Carman, Ph.D.
Warren E. Johnston, Ph.D.
Gordon C. Rausser, Ph.D.

Assistant Professors:

Daryl Carlson, Ph.D.
David E. Hansen, Ph.D.
Theodore P. Lianos, Ph.D.
Quirino Paris, Ph.D.

Lecturers:

Lee Garoyan, Ph.D.
Stanley S. Johnson, Ph.D.
Charles McGahan, LL.B., J.D.
Charles V. Moore, Ph.D.
Edith H. Parker, A.B.
Doyle Reed, Ph.D.

AGRICULTURAL ENGINEERING

John R. Goss, M.S., Chairman of the Department
Department Office, 2030 Bainer Hall 752-0102

Professors:

Norman B. Akesson, M.S.
Roy Bainer, M.S., LL.D. (*Emeritus*)
William J. Chancellor, Ph.D.
Kinsell L. Coulson, Ph.D.
Robert B. Fridley, M.S.
John R. Goss, M.S.
John C. Harper, Sc.D.
S. Milton Henderson, M.S.
Clarence F. Kelly, D.Sc. (*Emeritus*)
Robert A. Kepner, B.S.
Coby Lorenzen, Jr., M.S. (*Emeritus*)
Allan A. McKillop, Ph.D.
Loren W. Neubauer, Ph.D. (*Emeritus*)
Michael O'Brien, Ph.D.

Herbert B. Schultz, Ph.D.
Wesley E. Yates, M.S.

Associate Professors:

Roger E. Garrett, Ph.D.
Stanton R. Morrison, Ph.D.
Leonard O. Myrup, Ph.D.

Assistant Professors:

Louis D. Albright, Ph.D.
Thomas H. Burkhardt, Ph.D.
John J. Carroll, III, Ph.D.

Lecturers:

Pictiaw (Paul) Chen, Ph.D.
John B. Dobie, M.S.

NOTE: For key to footnote symbols, see page 191.

AGRONOMY AND RANGE SCIENCE

Paulden F. Knowles, Ph.D., Chairman of the Department
Department Office, 131 Hunt Hall 752-1703

Professors:

John P. Conrad, Ph.D. (*Emeritus*)
Ray C. Huffaker, Ph.D.
Subodh K. Jain, Ph.D.
Paulden F. Knowles, Ph.D.
Horton M. Laude, Ph.D.
Robert S. Loomis, Ph.D.
R. Merton Love, Ph.D.
Ben A. Madson, LL.D. (*Emeritus*)
Duane S. Mikkelsen, Ph.D.
*Maurice L. Peterson, Ph.D.
Charles W. Schaller, Ph.D.
Francis L. Smith, Ph.D. (*Emeritus*)
Ernest H. Stanford, Ph.D.
William A. Williams, Ph.D.
Frederick P. Zscheile, Jr., Ph.D.

Associate Professors:

Calvin O. Qualset, Ph.D.
Charles A. Raguse, Ph.D.

Lecturers:

R. William Breidenbach, Ph.D.
Beecher Crampton, M.S.
M. B. Jones, Ph.D.
†Donald W. Rains, Ph.D.
Earlene A. Rupert, Ph.D.
J. Neil Rutger, Ph.D.
Donald E. Seaman, Ph.D.
Barbara D. Webster, Ph.D.

ANIMAL PHYSIOLOGY

Verne E. Mendel, Ph.D., Chairman of the Department
Department Office, 196 Briggs Hall 752-0203

Professors:

James M. Boda, Ph.D.
Ray E. Burger, Ph.D.
Walter E. Howard, Ph.D.
Frederick W. Lorenz, Ph.D.
Edward A. Rhode, Ph.D.
Arthur H. Smith, Ph.D.
Irving H. Wagman, Ph.D.

Assistant Professors:

John M. Horowitz, Jr., Ph.D.
Barbara A. Horwitz, Ph.D.
Hiram W. Li, Ph.D. (*Acting*)
Peter B. Moyle, Ph.D.
Dennis G. Raveling, Ph.D.
Robert G. Schwab, Ph.D.

Associate Professors:

Harry W. Colvin, Jr., Ph.D.
Verne E. Mendel, Ph.D.
Dorothy E. Woolley, Ph.D.

Lecturers:

Robert W. Brocksen, Ph.D.
William M. Longhurst, Ph.D.
Charles M. Winget, Ph.D.

ANIMAL SCIENCE

Magnar Ronning, Ph.D., Chairman of the Department
Department Office, 130 Animal Science 752-1250

Professors:

R. L. Baldwin, Jr., Ph.D.
G. Eric Bradford, Ph.D.
Floyd D. Carroll, Ph.D.
Harold H. Cole, Ph.D. (*Emeritus*)
Perry T. Cupps, Ph.D.
William N. Garrett, Ph.D.
Irving I. Geshwind, Ph.D.
Paul W. Gregory, Sc.D. (*Emeritus*)
Hubert Heitman, Jr., Ph.D.
Carroll E. Howell, M.S. (*Emeritus*)
Max Kleiber, D.Sc. (*Emeritus*)
Robert C. Laben, Ph.D.
Glen P. Lofgreen, Ph.D.

James H. Meyer, Ph.D.
Wade C. Rollins, Ph.D.
Magnar Ronning, Ph.D.
William C. Weir, Ph.D.
James F. Wilson, LL.D. (*Emeritus*)

Associate Professors:

C. Robert Ashmore, Ph.D.
Graham A. E. Gall, Ph.D.
Verne E. Mendel, Ph.D.
James G. Morris, Ph.D.
David W. Robinson, Ph.D.

Assistant Professors:

J. Warren Evans, Ph.D.
Gary P. Moberg, Ph.D.

APPLIED BEHAVIORAL SCIENCES

Orville E. Thompson, Ph.D., Chairman of the Department
 Department Office, 206 Walker Hall 752-0770

Professors:

Jack D. Forbes, Ph.D. (*Applied Behavioral Sciences and Anthropology*)
 Glenn R. Hawkes, Ph.D.
 Milton Hildebrand, Ph.D. (*Applied Behavioral Sciences and Zoology*)
 Elwood M. Juergenson, Ph.D. (*Emeritus*)
 David B. Lynn, Ph.D.
 Orville E. Thompson, Ph.D.
 Emmy E. Werner, Ph.D.

Susan Crockenberg, Ph.D.
 Dolph E. Gotelli, M.A.
 Lawrence V. Harper, Ph.D.
 Alan B. Horowitz, Ph.D.
 Debra Huckins, M.A.
 Sarah Hutchison, M.Ed.
 George Kagiwada, Ph.D.
 Robert B. Yoshioka, Ph.D.

Lecturers:

Barbara A. Adams, M.P.H.
 Kenneth J. Baker, Ph.D.
 Michael Y. Corbett, M.A.
 Isao Fujimoto, M.A.
 Peter C. Leung, M.S.
 Jovina Navarro, M.S.
 Helge B. Olsen
 David Risling, M.A.
 JoAnn A. Stabb, M.A.
 Jane N. Welker, M.A.

Associate Professors:

Mary C. Regan, Ph.D.
 Katherine W. Rossbach, M.A.

Assistant Professors:

Louise M. Bachtold, Ed. D.
 Brenda K. Bryant, Ph.D.
 Frances Butler, M.A.
 Gerald L. Casimere, M.A. (*Acting*)

AVIAN SCIENCES

C. Richard Grau, Ph.D., Chairman of the Department
 Department Office, 109 Asmundson Hall 752-1300

Professors:

Ursula K. Abbott, Ph.D.
 Hans (Johannes) Abplanalp, Ph.D.
 Vigfus S. Asmundson, Ph.D. (*Emeritus*)
 Ray E. Burger, Ph.D.
 C. Richard Grau, Ph.D.
 F. Howard Kratzer, Ph.D.
 Frank X. Ogasawara, Ph.D.
 Wilbor O. Wilson, Ph.D.

Associate Professors:

Daniel W. Peterson, Ph.D.
 Pran N. Vohra, Ph.D.
 Barry W. Wilson, Ph.D.

Lecturers:

Dorothy C. Lowry, M.A. (*Biological Sciences*)
 Leo C. Norris, Ph.D.
 Allen E. Woodard, M.S. (*Poultry Science*)

BIOCHEMISTRY AND BIOPHYSICS

Jack Preiss, Ph.D., Chairman of the Department
 Department Office, 149 Briggs Hall 752-3611

Professors:

Sterling Chaykin, Ph.D.
 Eric E. Conn, Ph.D.
 Richard S. Criddle, Ph.D.
 Roy H. Doi, Ph.D.
 Lloyd L. Ingraham, Ph.D.
 Jack Preiss, Ph.D.
 Irwin H. Segel, Ph.D.
 Paul K. Stumpf, Ph.D.

Associate Professors:

George E. Bruening, Ph.D.
 Jerry L. Hedrick, Ph.D.

Assistant Professors:

Michael E. Dahmus, Ph.D.
 Marilyn E. Etzler, Ph.D.
 Adolphus P. Toliver, Ph.D.

COLLEGE-WIDE PROGRAMS

Verne H. Scott, Ph.D.

Bixby Work-Learn Office, 105 TB-10 752-2861

Lecturers:

George F. Hanna, M.Ed. (104C TB-10)

Albert H. Lederer, B.S.

Joe J. Stasulat, Ph.D.

Harry O. Walker, Ed.D.

CONSUMER SCIENCES

Bernard S. Schweigert, Ph.D., Acting Chairman of the Department

Department Office, 148 Everson Hall 752-0668

Professors:

Mary Ann Morris, Ph.D.

Howard G. Schutz, Ph.D.

Associate Professor:

S. Haig Zeronian, Ph.D.

Assistant Professor:

Howard L. Needles, Ph.D.

Lecturers:

Christine M. Bruhn, M.S.

Harold P. Lundgren, Ph.D.

Barbara V. Pontrelli, A.B.

ENTOMOLOGY

Oscar G. Bacon, Ph.D., Chairman of the Department

Department Office, 367 Briggs Hall 752-0475

Professors:

Oscar G. Bacon, Ph.D.

Stanley F. Bailey, Ph.D. (*Emeritus*)

Richard M. Bohart, Ph.D.

John E. Eckert, Ph.D. (*Emeritus*)

Albert A. Grigarick, Jr., Ph.D.

Harry H. Laidlaw, Jr., Ph.D.

William H. Lange, Jr., Ph.D.

Donald L. McLean, Ph.D.

Leslie M. Smith, Ph.D. (*Emeritus*)

Eugene M. Stafford, Ph.D. (*Emeritus*)

Francis M. Summers, Ph.D. (*Emeritus*)

Associate Professors:

Norman E. Gary, Ph.D.

Charles L. Judson, Ph.D.

G. A. H. McClelland, Ph.D.

Robbin W. Thorp, Ph.D.

Assistant Professor:

Warren R. Cothran, Ph.D.

Lecturers:

Richard W. Bushing, Ph.D.

Thomas F. Leigh, Ph.D.

Gary B. Pitman, Ph.D.

Richard E. Rice, Ph.D.

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ENVIRONMENTAL HORTICULTURE

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Bernard S. Schweigert, Ph.D.
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NOTE: For key to footnote symbols, see page 191.

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Harlan K. Pratt, Ph.D.

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Kenneth N. Paulson, Ph.D.

M. Allen Stevens, Ph.D.

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Harold P. Olmo, Ph.D.

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NOTE: For key to footnote symbols, see page 191.

College of Engineering

Engineering is the profession in which a knowledge of the physical, biological, and social sciences is applied in the utilization of the materials and forces of nature for the benefit of mankind. As such, engineering is oriented to

problems dealing with human needs. Students learn not only to observe and describe problems, but also to seek useful solutions. For this reason, engineering graduates are in demand not only for the engineering profession, but also in fields such as management, sales, operations, and manufacturing.

Seven undergraduate engineering curricula are offered at Davis: Aeronautical, Agricultural, Chemical, Civil, Electrical, and Mechanical Engineering, and Materials Science and Engineering. These are all four-year programs leading to the degree Bachelor of Science in Engineering. Within each curriculum, informal options are available through the selection of a suitable series of technical elective courses. In addition, a curriculum called Individual Engineering major is available for students who have specific career objectives which are not compatible with any of the seven curricula. Double majors (e.g., Mechanical Engineering and Electrical Engineering) also are possible.

Degree requirements for each of the undergraduate curricula are shown on subsequent pages. Graduate programs leading to the degrees Master of Engineering, Master of Science, Doctor of Engineering, and Doctor of Philosophy are also offered. In addition to the above-mentioned curricula, the College of Engineering offers graduate study in Applied Science. Detailed information on the graduate programs can be found in the *College of Engineering Graduate Study Bulletin*.

The four-year undergraduate program is divided into two parts. The first part (the Lower Division Program) is made up of mathematics, physics, chemistry, humanities and social sciences courses, and certain fundamental engineering courses. The Lower Division Program is essentially the same for all engineering curricula, with the principal exception of Chemical Engineering. The second part (the Upper Division Program) is made up of elective courses and a group of required technical courses pertinent to the intended major. Most of the senior year is elective, to be divided between technical and nontechnical courses. Engineering faculty advisers play a major role in helping students select those courses of importance to their individual goals.

Students cannot learn in four years all that one needs to know in any profession. The objective of the undergraduate programs in Engineering is to form an appropriate basis for a lifetime of learning. Extended learning after graduation, in the form of work experience, individual study, extension courses, or formal graduate study, is an essential part of engineering education. Integrated work-learn experience also is useful prior to graduation; undergraduates are encouraged and assisted in finding engineering employment in part-time internships during the school year, in summer jobs, and in the engineering cooperative education program.

ADMISSION TO FRESHMAN STANDING

General requirements for admission to the University begin on page 18. There are no separate or additional requirements for admission to the College of Engi-

neering. However, it is advisable that students who plan to study engineering include in their high school programs the following subjects:

	<i>Units</i>
Algebra*	2
Plane geometry*	1
Trigonometry*	½
Chemistry (physics is also recommended)	1

These subjects are prerequisite to certain basic courses in the freshman engineering program. A student who is admitted without this preparation will be required to make up equivalent work while in college. As a result, his graduation could be delayed.

In addition, a year of high school mechanical drawing is recommended but not required.

ADMISSION TO ADVANCED UNDERGRADUATE STANDING

Many students transfer to Davis after completing two years of work at a community college. It is possible to transfer with a sophomore status, but students who begin their studies at a community college are urged to complete the lower division program at that college before transferring. Students who have questions regarding their community college program should consult their adviser or contact the UC Davis College of Engineering Undergraduate Office directly.

The engineering curriculum at Davis is arranged so that a student completing the basic lower division curriculum in engineering at a California community college should be able to complete his work at Davis in two additional years. (See later section on Undergraduate Programs.) Records maintained over the years show that, on the average, engineering transfer students from the community colleges perform at an academic level virtually indistinguishable from that of those who began at Davis as freshmen.

A student who is admitted with less than 84 quarter units (or 56 semester units) of college work is classified in lower division standing, and is required to complete one of the two lower division programs listed in the section on degree requirements. Such a student is advanced to upper division standing on completion of 84 units.

A student who is admitted with 84 or more units is classified in upper division standing, but is required to have completed the minimum number of quarter units in the subjects specified in the following table before he is considered to have completed a Lower Division Program:

<i>Subject Areas</i>	<i>Minimum Quarter Units</i>
Mathematics (recommended: analytic geometry, calculus, differential equations, vector analysis).....	18
Physical and biological sciences (at least 10 units must be in chemistry for engineering and science students and at least 12 units in physics for engineering and science students)	27

* Or equivalent integrated courses covering same subject material.

Engineering (lower division subjects such as graphics, properties of materials, surveying, computer programming, statics, and circuit theory. Students preparing for the Chemical Engineering curriculum at Davis may elect to take only 12 units of engineering in their lower division program)	15
Humanities-social sciences (must be selected from a list of course groups approved by the Committee on Undergraduate Study, and must include the equivalent of English 1 and either Rhetoric 1 or 3)	16
Unspecified subjects (students preparing for the Chemical Engineering curriculum at Davis should take in their sophomore year quantitative analysis and one course in organic chemistry with laboratory)	8
	<hr/>
Total	84

A student who has completed the Lower Division Program on this basis is not required to take additional lower division courses, except those which are prerequisite to upper division courses in his curriculum.

The above subject requirements are minimum. Additional units must be added to these and the units listed in the respective Upper Division Program to total the minimum number of units (180 to 195) required for graduation under each curriculum.

ACADEMIC ADVISERS

In establishing the undergraduate programs in the College of Engineering, every effort has been made to provide for maximum flexibility consistent with rigorous preparation for professional practice or graduate study. The key to successful flexibility in an academic program is an effective system of advising. Every Engineering undergraduate is assigned to a faculty member for academic and career advising, and every (full-time) Engineering faculty member has 15 to 20 advisees. Adviser assignments are made and coordinated through the Undergraduate Office of the College. Initial assignments are made prior to the student's first term on campus, and each individual is encouraged to select and change to an adviser of his own choice whenever he has an alternative preference. A close relationship between the student and his faculty adviser can be one of the most important factors in a successful educational experience. New students who participate in the Summer Advising Program will have individual appointments with Engineering faculty advisers scheduled during the program. Other new students are asked to meet with their respective faculty advisers during the orientation period which precedes the first week of classes.

The system of faculty advising is complemented by a well-developed system of peer advising. Student advisers are available both in *The Student Center* in Bainer Hall and in *The First Resort* (the Peer Advising Center) in East Hall.

ENGINEERING UNDERGRADUATE OFFICE

The Undergraduate Office of the College, located in Room 2132 Bainer Hall, operates as a service center for Engineering students. Information and assistance

on academic, career, and personal matters are available either directly or through individual referral to other offices on campus.

CHOOSING A MAJOR

Many students who enter the College of Engineering have well-defined career objectives. Others do not. All students in Engineering are formally classified as *Engineering—Lower Division* until 84 quarter units of college work have been completed. The student's official designation of one of the Engineering curricula does not take place until the end of his sophomore year. However, students who plan to graduate under the *Chemical Engineering* curriculum need to make that decision during the freshman year and plan their entire program accordingly. During the first two years a student who is uncertain about his future choice of curriculum is encouraged to make use of the many sources of advising and counseling available to him. These include his faculty adviser, his instructors, the student advisers, the academic deans in the College Office, and personnel in the Counseling Center, the Office of Placement Services, and the Office for Student Development.

A number of freshmen courses in Engineering are designed to describe the role of the engineer in society and the similarities and differences among the branches of engineering. Included are: Engineering 3 (Introduction to Engineering Systems), Agricultural Engineering 1 (The Agricultural Engineer in Tomorrow's World), Chemical Engineering 1 (The Scope of Chemical Engineering), Civil Engineering 1 (The Civil Engineer in Society), Electrical Engineering 1 (Introduction to Electrical Engineering), and Mechanical Engineering 1 (Mechanical Engineering). Work-learn experiences in the form of internships, summer jobs, and cooperative study programs also are valuable aids in the evolution of a career objective.

Options

Within the formal curricula, informal options may be structured by selection of a suitable series of technical elective courses. Individual options are described in the sections on Engineering curricula. With the help of the faculty advisers, options other than those named may be tailored to suit the interests of individual students. Broader flexibility is available through the Individual Engineering Major, which is described in detail in the section on curricula.

Double Majors

Individual engineering students who can afford the time may enroll simultaneously in two engineering majors or in an engineering major and a nonengineering major of their choosing. Such double-major students must satisfy the requirements for both majors. Most of these students have found five years to be necessary for satisfying the requirements of double majors.

PLANNING A PROGRAM

The student is responsible for planning his own program. Many sources of assistance are available. Primary among these is the individual's faculty adviser. Program planning assistance is also available from the student advisers in the

Student Center in Bainer Hall and *The First Resort*, and through the Undergraduate Office of the College.

Degree requirements in Engineering are given on the following pages. The minimum number of required units ranges from 180 in some curricula to somewhat higher in others. The programs normally require twelve quarters of study at an average of approximately 15 units per quarter. Students may not enroll for less than 12 units, exclusive of physical education, without special approval from the Dean of the College. Continuing students may enroll for no more than 21 units and students in their first quarter of residence may enroll for no more than 17 units, unless authorized by the Dean.

Program Flexibility

In the Engineering Lower Division Program for all curricula except Chemical Engineering, only mathematics and four additional required courses are prerequisite to required upper division Engineering-prefix courses (as distinguished from Agricultural Engineering, Civil Engineering, etc., courses). The four courses are: Engineering 17, 35, Physics 4A, and 4C. (Exception: in the Materials Science and Engineering curriculum, Engineering 45 is prerequisite to Engineering 188.) These four courses and the lower division mathematics requirements should be completed in the first two years, and can be scheduled in only a limited variety of ways. The other required physics, chemistry, engineering, humanities, and social sciences courses in the lower division program are requirements for graduation, but their scheduling may be timed to suit the undergraduate program of the individual student.

In planning the four-year program care must be taken to observe course prerequisite requirements, or a delay in graduation may result. Course prerequisites are specified to help the student avoid courses for which he is unprepared, and to guide the instructor in the establishment of a starting point for a given course. The prerequisites for any course may be waived for good cause for individual students by the course instructor.

Suggested Course Priorities for First Quarter of Freshman Year

An extensive background in mathematics is prerequisite to the junior-year courses in the Engineering curricula. Therefore both students who are enrolled in Engineering and those who are considering possible future enrollment in Engineering should include mathematics in their program from the outset. A suggested sequence of course priorities for the first quarter of the freshman year is listed below:

1. Mathematics 11 (if not completed in high school)
2. Mathematics 21A (if not completed in high school)
3. Subject A (if not yet otherwise satisfied)
4. Other (Engineering 3 or 4, English 1, Rhetoric 1, or other Humanities-Social Sciences Electives; Chemistry 1A)

A sample freshman program is included in the section on graduation requirements.

Students who plan to graduate, or are considering the possibility of graduating, under the Chemical Engineering curriculum should take Chemistry 4A-4B-4C in their freshman year.

Expanded Course Outlines

The Undergraduate Office maintains a file of expanded course outlines for all courses offered by departments in Engineering. The file is maintained for student use.

Special Study Courses

Attention is directed to the Special Study courses (99 and 199) and to the Internship in Engineering courses (92 and 192) described in detail at the beginning of the section on "Courses of Instruction." Regulations of the Academic Senate limit to 5 the number of 99 and 199 units that a student may take in a given quarter.

University Extension Courses

Appropriate courses taken under University Extension may be used for degree credit. Simultaneous enrollment in resident courses and extension courses requires *prior* approval of the Dean of the College. Such approval will be given only for a limited number of credits. No grade points are assigned for courses completed in University Extension.

COOPERATIVE EDUCATION PROGRAM (WORK-LEARN)

Cooperative education programs in engineering have become widespread in the United States since their inception in 1906. In programs of this type, the students do all the normal academic work necessary for graduation and, in addition, work in engineering departments in industry or government. The student receives normal pay for the work assignment and may expect each assignment to entail responsibilities appropriate to his level of education or work experience. The complexity and challenge of each assignment is expected to increase with successive assignments and continued education.

The main purpose of the Davis cooperative education program is to provide opportunities for engineering students to observe and engage in the practical applications of engineering within a real engineering environment. The by-products of such a program are several. They include career guidance, financial assistance, postgraduate placement opportunities, contact with and understanding of professional engineers, and valuable experience, all of which produce students who are generally more mature and more capable and knowledgeable.

The general opinion among employers is that a minimum six-month commitment by the student is essential for each work assignment, although it is possible in some cases for an assignment to be for the three- or four-month summer period. Because of the time spent off campus, the time needed to complete the undergraduate program is extended to approximately five years, unless only summer assignments are involved. Students who have participated in the five-year program generally express the opinion that the advantages outweigh the disadvantages, and that it is very helpful financially.

Work assignments may start as early as the freshman year (sophomore standing is generally recommended) and may continue into a student's graduate program. The assignments may vary in fields of engineering and types of employers. The individual student's needs and desires are very important in planning his program; every effort is made to match the student and position for the best possible results.

Academic credit, in appropriate cases, is available through an internship course, Engineering 92 or 192.

Students who are interested in the cooperative education program should seek more detailed information from the College of Engineering Undergraduate Office.

DEGREE REQUIREMENTS

General University Requirements

The degree of Bachelor of Science is awarded to those candidates who satisfy the requirements of the University (pages 18–19) in regard to:

Subject A

American History and Institutions

Residence (see additional College requirement specified below)

Scholarship

Units

Application for Degree Candidacy

College of Engineering Requirements

Each candidate for the degree of Bachelor of Science in Engineering must satisfactorily complete an approved curriculum in Engineering. Detailed requirements for seven approved curricula (in Aeronautical, Agricultural, Chemical, Civil, Electrical, and Mechanical Engineering, and Materials Science and Engineering) are given on subsequent pages. Each of the curricula consists of a specified Lower Division Program (or, for students who transfer into the College with 84 or more quarter units, an approved equivalent program) and a specified Upper Division Program. As an alternative to following one of these curricula, a student may tailor an Individual Engineering Major with the help of his faculty adviser, and submit it to the College Committee on Undergraduate Study for approval. Requirements for the Individual Engineering Major are given on page 145.

The student is held responsible for planning his program and for satisfactory completion of graduation requirements.

Individual students, for good cause, may request waiver of particular degree requirements of the College of Engineering by submitting a Student Petition. Petitions, which are available in the Undergraduate Office, can be a valuable aid in solving individual program conflicts or other special problems. Such petitions may be approved only by the Undergraduate Study Committee or by majority vote of the entire faculty of the College, not by an adviser or dean. Five professors and five students serve on the committee.

Residence Requirement

Of the total units required for the Bachelor of Science in Engineering degree, at least the final 45 units characteristic of the student's curriculum must be completed while he is registered in the College of Engineering.

Credit by Advanced Placement Examinations

University credit allowed for College Entrance Examination Board (CEEB) Advanced Placement Examinations is counted in partial fulfillment of the requirements for the Bachelor of Science in Engineering degree to the extent that the UCD course equivalences (see page 161) satisfy parts of the student's chosen curriculum. Duplicate credit may not be earned in courses for which Advanced Placement Credit has been allowed.

Electives

There are four kinds of elective courses in all of the Engineering curricula: Unrestricted Electives, Technical Electives, Humanities-Social Sciences Electives, and Natural Sciences Electives.

Unrestricted Electives. Any course that may be counted for credit toward graduation is acceptable as an Unrestricted Elective in the Engineering curricula.

Technical Electives. These electives permit a student to develop a major area of emphasis within his chosen curriculum. Each Upper Division Program listing includes a group of "Suggested Technical Electives." Other technical courses may be elected. Courses in engineering, mathematics, and the physical and biological sciences are suitable, as are technical courses in the social sciences, such as accounting and urban planning. For credit toward the Technical Electives, courses in mathematics (except for Mathematics 22A and 24) and physics (except for Physics 4B and 4D) must be upper division courses. Technical Electives credit will be allowed for repeated Individual Study projects (course 199) only if the contents of the projects are substantially different from one another. Decisions regarding suitability of particular courses for Technical Elective credit are made in the Undergraduate Office on advice of the Undergraduate Study Committee.

Humanities-Social Sciences Electives. Humanities-Social Sciences Electives are intended to improve the effectiveness of the graduate as an individual and as a professional engineer in society. In general, any humanities course or social sciences course is suitable for credit as a Humanities-Social Sciences Elective. In this sense a course in, for example, statistical methods in sociology is considered to be technical rather than a social sciences course. Decisions regarding suitability of particular courses selected for credit in this category of electives are made in the Undergraduate Office on advice of the Undergraduate Study Committee.

Each Engineering degree program must include a minimum of 31 quarter units of study in the humanities and social sciences. These 31 units must be selected from the approved list shown below. English 1 and either Rhetoric 1 or 3 must be included. (Credit for English 1 and 6 additional units of Humanities-

Social Sciences Electives is given for a score of 5, 4, or 3 on the CEEB Advanced Placement Examination. See the preceding section.)

With certain specified exceptions, any course taken within the following subject areas is considered to be an acceptable Humanities-Social Sciences Elective:

American Studies	Geography (except courses 1, 3, 4, 105, 106, 107, 108, 162)
Anthropology	History
Applied Behavioral Sciences	Human Development
Art	Music (except course 10)
Asian American Studies	Philosophy
Black Studies	Political Science
Classics	Psychology (except courses 107, 108)
Dramatic Art	Rhetoric
Economics (except course 12)	Sociology (except 106)
English (except courses 25, 26)	
Foreign languages (all are accept- able)	

Not more than 4 units in any of the above listed courses which may be repeated for credit can be counted toward satisfaction of this requirement.

Natural Sciences Electives. The list of acceptable courses to satisfy the Natural Sciences Elective is much more restrictive than those of the Humanities-Social Sciences or Technical Electives. The following courses are acceptable:

Astronomy 1A, 1B	Genetics 10
Bacteriology 2	Mathematics 22A
Biological Sciences 1, 10	Physics 4B, 4D
Botany 2	Physiology 2
Chemistry 1C or 4C, 5, 8A, 8B	Zoology 2
Geology 1, 1L	

Students who do not have specific alternative interests should include Physics 4B and 4D among their Natural Sciences Elective courses. Courses selected should reflect the academic and career objectives of the student and should be chosen in consultation with his faculty adviser. Students may petition to substitute other courses, which may include upper division courses, to satisfy this elective. Courses to be counted toward the Natural Sciences Elective may not be taken on a Passed/No Record basis.

GRADING

Passed/No Record Option

A student registered in the College of Engineering may elect to enroll in not more than one course each quarter in which he shall be graded Passed (P) or No Record. In the event that a student does not pass a course under this option, no entry is made on his transcript. Options that are not exercised may *not* be accumulated for later use. Courses may be taken on this option in addition to courses offered only on a Passed or Not Passed basis.

In the Engineering curricula, only units taken to satisfy the requirements for Humanities-Social Sciences Electives (including English 1 and Rhetoric 1 and 3), Technical Electives, and Unrestricted Electives may be taken on a Passed or No Record basis. All others (including required courses and Natural Sciences Electives) must be taken on a letter-grade basis.

The following conditions must be met for the use of the Passed or No Record option. The student must:

1. be in good academic standing (not on probation or subject to academic disqualification);
2. be enrolled in a program of at least 12 units, including the course to be taken on this grading basis;
3. have the petition to take the course on this grading basis approved by the Dean or his designated representative.

The units earned in courses taken P/No Record are counted in satisfaction of degree requirements, but such courses are disregarded in determining the student's grade-point average. A student registered in the College of Engineering who enrolls in a course offered by any department of the University for a P/No Record grade receives a grade of P if his work in the course is of quality equivalent to a grade of C- or better, under the general letter-grade system. A course in which a grade of D or F has been recorded may not be repeated with the Passed or No Record option.

Passed/Not Passed Grading

Some courses are authorized to be given on a Passed or Not Passed basis *only* and are identified as such in course descriptions. These courses may be taken simultaneously with the courses for which a student exercises his Passed/No Record Option. An NP is recorded on the transcript for courses which would otherwise be graded D or F.

HONORS

Honors at Graduation

Honors at graduation may be awarded to students who have achieved distinguished scholarship records in all courses completed in the University. Students who display marked scholarship superiority may receive High Honors or Highest Honors. The minimum grade-point averages for Engineering students are as follows:

<i>Total quarter units completed at UC</i>	<i>Honors</i>	<i>High Honors</i>	<i>Highest Honors</i>
45- 89	3.50	3.65	3.80
90-134	3.40	3.55	3.70
135-	3.20	3.40	3.60

Dean's Honors List

The Dean's Honors List includes the names of all students who have completed 12 or more units in the University and earned a cumulative grade-point average of 3.2 or higher in all courses taken in the University.

LOWER DIVISION PROGRAMS

The Lower Division Programs for six of the seven curricula—Aeronautical, Agricultural, Civil, Electrical, and Mechanical Engineering, and Materials Science and Engineering—are the same with minor exceptions which are noted. The Lower Division Program for the Chemical Engineering curriculum is different because students who plan to graduate under that curriculum must include a larger number of chemistry courses in their program. A separate, equivalent Lower Division Program for Students who transfer into the College with 84 or more quarter units of college credit is included under the section entitled “Admission to Advanced Undergraduate Standing.”

LOWER DIVISION PROGRAM—ALL ENGINEERING CURRICULA EXCEPT CHEMICAL ENGINEERING

	<i>Units</i>	<i>Quarter Usually Taken</i>
Chemistry 1A–1B or 4A–4B (General Chemistry)	10	
Engineering 3 (Introduction to Engineering Systems)*	3	1 or 3
Engineering 4 (Engineering Graphics in Design)**	3	1 or 2
Engineering 5A (Engineering Applications of Computers).. . . .	3	2 or 3
Engineering 17 (Circuits).....	3	5 or 6
Engineering 35 (Statics).....	3	4 or 5
Engineering 45 (Properties of Materials).....	4	4 or 6
English 1 (Expository Writing)	4	
Rhetoric 1 (Introduction to Public Speaking) or 3 (Group Communication)	4	
Mathematics 21A†–21B–21C (Calculus)	12	1–2–3
Mathematics 22B (Differential Equations).....	3	5
Mathematics 22C (Vector Analysis).....	3	4
Physics 4A–4C–4E (General Physics).....	12	2–4–6
Natural Sciences Electives	12	
Humanities-Social Sciences Electives	8	
Unrestricted Electives‡	3	
Total	90	

* Engineering 3 is designed for freshman students. More advanced students may petition to substitute a Technical Elective for these 3 units.

** Students who graduate under the Electrical Engineering curriculum may substitute a 3-unit Unrestricted Elective in place of Engineering 4.

† Prerequisites to Mathematics 21A are two years of high school algebra, plane geometry, plane trigonometry, and analytic geometry (or course Mathematics 11, which may be taken concurrently with Mathematics 21A).

‡ Students who graduate under the Civil Engineering curriculum or the Forest Engineering option of the Agricultural Engineering curriculum take Civil Engineering 10 in place of 3 units of Unrestricted Electives.

Sample Lower Division Program

(Aeronautical, Agricultural, Civil, Electrical, and Mechanical Engineering and Materials Science and Engineering curricula)

<i>Freshman Year</i>	<i>Fall</i>		<i>Winter</i>		<i>Spring</i>
Chemistry 1A	5	Chemistry 1B	5	Engineering 4*	3
Engineering 3	3	Engineering 5A	3	Mathematics 21C	4
Mathematics 21A	4	Mathematics 21B	4	Electives**	9
		Physics 4A	4		
	<hr/>		<hr/>		<hr/>
	12		16		16
 <i>Sophomore Year</i>					
Engineering 35	3	Engineering 17	3	Engineering 45	4
Mathematics 22C	3	English 1	4	Rhetoric 1	4
Physics 4C	4	Mathematics 22B	3	Physics 4E	4
Elective**	4	Elective**	6	Elective**	4
	<hr/>		<hr/>		<hr/>
	14		16		16

LOWER DIVISION PROGRAM—CHEMICAL ENGINEERING CURRICULUM

	<i>Units</i>	<i>Quarter Usually Taken</i>
Chemistry 4A-4B-4C (General Chemistry)	15	1-2-3
Chemistry 128A (Organic Chemistry)	3	6
Chemistry 129A (Organic Chemistry Laboratory)	2	6
Engineering 3 (Introduction to Engineering Systems)†	3	1 or 3
Engineering 5A (Engineering Applications of Computers)	3	5
Engineering 17 (Circuits)	3	5
Engineering 35 (Statics)	3	4
English 1 (Expository Writing)	4	
Rhetoric 1 (Introduction to Public Speaking) or 3 (Group Communication)	4	
Mathematics 21A†-21B-21C (Calculus)	12	1-2-3
Mathematics 22A (Linear Algebra)	3	6
Mathematics 22B (Differential Equations)	3	5
Mathematics 22C (Vector Analysis)	3	4
Physics 4A-4B-4C-4D-4E (General Physics)	20	2-3-4-5-6
Humanities or Social Sciences Electives	11	
	<hr/>	
Total	92	

* Students who graduate under the Electrical Engineering curriculum may substitute a 3-unit Unrestricted Elective in place of Engineering 4.

** Elective courses must include 12 units of Natural Sciences Electives and 8 units of Humanities or Social Sciences Electives.

† Engineering 3 is designed for freshman students. More advanced students may petition to substitute a Technical Elective for these 3 units.

‡ Students who have not had analytic geometry must take Mathematics 11 concurrently with Mathematics 21A.

Sample Lower Division Program
(Chemical Engineering curriculum)

<i>Freshman Year</i>	<i>Fall</i>		<i>Winter</i>		<i>Spring</i>
Chemistry 4A	5	Chemistry 4B	5	Chemistry 4C	5
Engineering 3	3	Rhetoric 1	4	English 1	4
Mathematics 21A† ..	4	Mathematics 21B ...	4	Mathematics 21C ...	4
		Physics 4A	4	Physics 4B	4
	—		—		—
	12		17		17
 <i>Sophomore Year</i>					
Engineering 35	3	Engineering 5A	3	Chemistry 128A	3
Mathematics 22C ...	3	Engineering 17	3	Chemistry 129	2
Physics 4C	4	Mathematics 22B ...	3	Mathematics 22A ...	3
Humanities-Social		Physics 4D	4	Physics 4E	4
Sciences Elective ..	4	Humanities-Social		Humanities-Social	
		Sciences Elective ..	4	Sciences Elective ..	3
	—		—		—
	14		17		15

UPPER DIVISION PROGRAMS

AERONAUTICAL ENGINEERING CURRICULUM

Minimum Units Required: 180.

Aeronautical engineering is the application of scientific knowledge to flight or movement in the atmosphere. Specific objectives are the design, development, and manufacture of airplanes, V.T.O.L. aircraft, and high speed ground transportation systems. Within this context aeronautics becomes an essential branch of mechanical engineering in which knowledge in areas related to transportation is strengthened. For example, the aerodynamic and structural design of a high speed train and a low speed airplane have much in common. The undergraduate curriculum combines the study of basic engineering disciplines with courses in aerodynamics, propulsion, power plant structures, and control. A broad range of technical elective courses is available from which the student may select subjects of a more specialized nature.

The curriculum is organized to develop the student's ability to apply basic engineering principles in the design of engineering systems. This training is intended to prepare him for technical leadership in this rapidly changing field.

UPPER DIVISION PROGRAM—AERONAUTICAL ENGINEERING

	<i>Units</i>	<i>Courses</i>
Required Subjects		
Electronic circuits	4	Engineering 100
Applied mechanics	15	Engineering 102A, 102B, 103A, 103B, 104A
Applied thermodynamics	6	Engineering 105A, 105B
Vehicle aerodynamics	3	Mechanical Engineering 127

† Students who have not had analytic geometry must take Mathematics 11 concurrently with Mathematics 21A.

	<i>Units</i>	<i>Courses</i>
Systems	4	Mechanical Engineering 171
Structures	6	Engineering 104B, Civil Engineering 135
Vehicle stability	4	Mechanical Engineering 134
Vehicle design	4	Mechanical Engineering 128A, 128B
Laboratory	8	Mechanical Engineering 111, 126A, 126B
Mathematics	3	Engineering 180
Technical Electives*	16	
Humanities-Social Sciences Electives	15	
Unrestricted Electives	2	
Total	90	

Recommended Sequence of Courses

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 102A ..	3	Engineering 100 ...	4
Engineering 103A ..	3	Engineering 102B ..	3
Engineering 104A ..	3	Engineering 103B ..	3
Engineering 105A ..	3	Engineering 104B ..	3
Humanities-Social Sciences Elective ..	2	Engineering 105B ..	3
			4
			2
	14	16	16
 <i>Senior Year</i>			
Mechanical Engineering 126A ..	2	Mechanical Engineering 126B ..	2
Mechanical Engineering 127 ..	3	Mechanical Engineering 128A ..	2
Humanities-Social Sciences Elective ..	4	Mechanical Engineering 171 ..	4
Technical Electives ..	6	Humanities-Social Sciences Elective ..	3
		Technical Elective ..	4
	15	15	14

Two areas of interest in the field of Aeronautical Engineering are outlined in the following options. Each includes a suggested list of electives from which a student interested in a particular option can select.

* At least 12 units of Technical Electives must be chosen from the following list: Mechanical Engineering 121, 125, 126C, 135, 172, 185, 186; Engineering 190; Civil Engineering 133; Electrical Engineering 150. Other suggested Technical Electives: Mechanical Engineering 155; Applied Science 115, 135A, 144; Civil Engineering 131; Electrical Engineering 110A, 111A, 112A, 130A, 157A, 157B; Engineering 104C, 106, 188.

Low-Speed Aerodynamics

This option is intended for students who have an interest in the dynamics and aerodynamics of flight and should provide them with the background in aerodynamics, structures, and propulsion necessary to engage in design of low-speed aerodynamic vehicles.

Suggested Technical Electives: Mechanical Engineering 121, 125, 126C, 135, 172, 185, 186; Civil Engineering 131, 133, 138; Electrical Engineering 150, 157A, 157B; Engineering 104C, 188, 190; Applied Science 115.

Aeronautics and Transportation

Effective transportation requires vehicle operation under conditions which introduce many of the design problems that in the past have been considered unique to aeronautics. This option endeavors to provide students with the necessary background to work effectively in this expanding area of high-speed transport vehicle design and development.

Suggested Technical Electives: Mechanical Engineering 121, 125, 126C, 135, 172, 175; Civil Engineering 131, 133; Electrical Engineering 157A, 157B; Engineering 104C, 106, 190; Applied Science 115; Environmental Studies 102.

AGRICULTURAL ENGINEERING CURRICULUM

(Accredited by Engineers' Council for Professional Development.)

Minimum units required: all Agricultural Engineering options except Forest Engineering, 180; Forest Engineering, 195.**

Agricultural engineers apply engineering principles to problems of food and fiber production, storage, and processing; animal and plant environment; agricultural wastes management; soil and water control and conservation; and other phases of agriculture and related industries. Agricultural engineering is unique in that it requires a general understanding and appreciation of the biological, soil-management, and environmental aspects of agriculture in addition to a thorough knowledge of basic and applied engineering.

The Upper Division Program includes fundamental engineering courses in mechanics, fluid mechanics, thermodynamics, and electronics. It also contains a substantial number of Technical Electives, thus permitting the student to choose courses appropriate for specialization in *food engineering, forest engineering, power and machinery, processing, soil and water engineering, or structures and environment.*

Lower division students planning to follow the Agricultural Engineering curriculum are advised to select their Natural Sciences Electives from courses such as Biological Sciences 1, 10, Bacteriology 2, Botany 2, Physiology 2, Chemistry 8A, and 8B. Bacteriology 2 and Chemistry 8B are prerequisites to several of the suggested upper division Technical Electives for the *food engineering* option. A course in statistics (e.g., Mathematics 130A), taken during the sophomore year,

**A ten-week summer field program offered by the School of Forestry and Conservation at the UC Forestry camp in Plumas County provides a unique opportunity to develop an understanding of the whole series of related elements which constitute a forest environment. This summer program, which should be taken between the sophomore and junior years, accounts for the 15 additional units required for the Forest Engineering option as compared with other Agricultural Engineering options.

is recommended for the *forest engineering* option. The corresponding number of units of Humanities or Social Sciences Electives may be deferred to the upper division, replacing upper division Unrestricted Elective units.

Food Engineering

This specialization is concerned with the study of food processing, formulations of synthetic foods, food production, and food-related systems. The relationship of chemical and biological activity to the fundamental concepts involved in food processing and processing equipment are studied. The engineering sciences of fluid mechanics and heat and mass transfer, and their applications, are emphasized in the course of study.

Forest Engineering

This area of study is the application of engineering principles and silvicultural knowledge for the management of forests and forest land. Ecological, aesthetic, and recreation aspects of this renewable natural resource are integrated into systems for the production of wood products. Students study systems and equipment for forest production and harvesting, reforestation, forest waste management, forest recreational development, soil and water control and conservation, developing forest road systems, materials handling in the forest and at the sawmill, and other phases of forestry. This option is administered with the cooperation of the School of Forestry and Conservation at Berkeley. Two or three quarters of the junior year are spent on the Berkeley campus.

Power and Machinery

This area of specialization is concerned with the design, development, and application of field machines and power units for crop production. The economic aspects of mechanization and the effects of machines on soils, crops, and people are considered. Procedures for developing machine components and synthesizing them into engineering systems are studied.

Processing

This area of specialization is concerned with converting raw agricultural products into feed and seed products or stabilizing them for storage and subsequent use. The fundamental concepts of drying, sorting, cleaning, handling, storage, size reduction, and the biological and physical characteristics of agricultural materials are studied. The engineering sciences of heat and mass transfer and fluid mechanics are applied in the analysis, design, and development of processing systems and operations.

Soil and Water Engineering

This area of study is concerned with those aspects of soil and water that depend upon a blending of agricultural and environmental sciences with engineering. The planned development, use, and management of agricultural land and water resources involves consideration of new concepts in hydraulics, hydrology, irrigation and drainage systems, water and soil quality, and plant-soil-water relations. This option is administered with the cooperation of the Department of Water Science and Engineering.

Structures and Environment

This area of specialization is concerned with the design of agricultural structures and with analysis of their functional effectiveness, efficiency of space and labor utilization, and economic value to an overall enterprise. The structure is considered as a means of providing an optimum environment for animal production, product storage and conditioning, or crop production in greenhouses. Agricultural wastes management, environment modification, and micrometeorology are studied.

UPPER DIVISION PROGRAM—AGRICULTURAL ENGINEERING*Courses Common to all Agricultural Engineering Options:*

	<i>Units*</i>	<i>Courses</i>
Required Subjects		
Applied mechanics	9 (10)	Engineering 102A, 103A, 104A (or Mechanical Engineering 104A and Civil Engineering 165A, 130 at Berkeley, respectively)
Applied thermodynamics	3 (4)	Engineering 105A (or Mechanical Engineering 105A at Berkeley)
Design	3	Civil Engineering 132A or 145, or Mechanical Engineering 150
Electronic circuits	4 (3)	Engineering 100 (or Electrical Engineering 100A at Berkeley)
Professional responsibilities	3	Engineering 190
Humanities-Social Sciences		
Electives	15	
Unrestricted Electives**	4 (3)	
Total	41	

All Agricultural Engineering Options Except Forest Engineering:

Required Subjects		
Applied mechanics	6	Engineering 104B; 102B or 103B
Engineering economics	3	Engineering 106
Technical Electives	40	15 units must be selected from the Agricultural Engineering and Water Science courses in the list of suggested Technical Electives. These 15 units must include one course listed in boldfaced type from each of three groups. In addition, the Technical Electives must include at least two courses from the list of suggested Agricultural and Biological Sciences electives, one of which must be an upper division course.
Total	90	

* Units in parentheses are for equivalent courses taken at the Berkeley campus.

** The electives are to be distributed among Technical, Humanities-Social Sciences, and Unrestricted Elective subjects as indicated in the Upper Division Program.

Forest Engineering Option:

Required subjects

Silviculture	5
Forest regulation and planning	4
Forest utilization facilities ...	3
Summer field courses	15

General Forestry 125*
General Forestry 113*
General Forestry 103*
General Forestry 100A*, 100B*, 100C*

Technical Electives37

12 units must be selected from the list of General Forestry and Wood Science courses in the list of suggested Technical Electives. These 12 units must include General Forestry 110A, 110B, or 114. In addition, one course in engineering design, such as Agricultural Engineering 114, 119, 125, 126, or 132 must be selected.

—
Total 105

All Agricultural Engineering Options—Except Forest Engineering

Sample Sequence of Courses

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 102A ...	3	Engineering 102B	Civil Engineering
Engineering 103A ...	3	or 103B	132A or 145† ...
Engineering 104A ...	3	Engineering 104B ...	Electives**
Electives**	6	Engineering 105A ...	12
—	—	Electives**	—
	15	—	—
		15	15
<i>Senior Year</i>			
Electives**	15	Engineering 100 ...	Engineering 190 ...
		4	3
		Engineering 106 ...	Electives**
		3	12
		Electives**	—
		8	—
	—	—	—
	15	15	15

Forest Engineering Option

Sample Sequence of Courses

<i>Junior Year</i>	<i>Summer</i>
General Forestry 100A*	6
General Forestry 100B*	5
General Forestry 100C*	4
	—
	15

* Offered by the Berkeley campus.

** The electives are to be distributed among Technical, Humanities-Social Sciences, and Unrestricted Elective subjects as indicated in the Upper Division Program.

† Or Mechanical Engineering 150 (3 units), normally taken in the fall of the senior year.

<i>Junior Year</i>	<i>Fall</i>		<i>Winter</i>		<i>Spring</i>
Electrical Engineering 100A*	3	Civil Engineering 165A*	3	Civil Engineering 130*	4
General Forestry 125*	5	General Forestry 103*	3	Electives**	11
Mechanical Engineering 104A*	3	General Forestry 113*	4		
Mechanical Engineering 105A*	4	Electives**	5		
	15		15		15
 <i>Senior Year</i>					
Mechanical Engineering 150†	3	Electives**	15	Engineering 190	3
Electives**	12			Electives**	12
	15		15		15

Suggested Technical Electives:

Agricultural and Biological Sciences—Agronomy and Range Science 100; Animal Science 2; Biochemistry 101A, 101B; Biological Sciences 10; Botany 2; Physiology 149; Plant Science 2, 112; Soil and Water Science 2; Vegetable Crops 100, 101.

Food Engineering—Agricultural Engineering 132, 141; Applied Science 115; Biochemistry 101A, 101B; Chemistry 107A, 107B, 110A; Chemical Engineering 151; Electrical Engineering 150; Engineering 103B, 105B; Epidemiology and Preventive Medicine 150; Food Science and Technology 104, 108A, 111, 131; Mathematics 105A; Mechanical Engineering 186.

Forest Engineering—Agricultural Economics 176; Agricultural Engineering 114, 116, 118, 119, 125, 126, 132; Agricultural Engineering Technology 111; Atmospheric Science 120, 123; Civil Engineering 160, 171; Geography 161; General Forestry 101*, 102*, 110A*, 110B*, 114*; Mathematics 22A; Mechanical Engineering 114, 121; Resource Sciences 100; Soil and Water Science 140; Water Science 120, 141; Wood Science 131*.

Power and Machinery—Agricultural Economics 140; Agricultural Engineering 114, 116, 118, 119, 141; Applied Science 115; Civil Engineering 131, 132A; Engineering 105B, 122, 140, 184; Mathematics 105A; Mechanical Engineering 114, 115, 121, 151, 155.

Processing—Agricultural Engineering 132, 141; Applied Science 115; Chemistry 107A; Electrical Engineering 150; Engineering 105B, 186; Food Science and Technology 111; Mathematics 105A; Mechanical Engineering 185, 186.

Soil and Water—Applied Science 115; Civil Engineering 141, 142, 144; Soil and Water Science 140; Water Science 110A, 110B, 141, 160.

* Offered by the Berkeley campus.

** The electives are to be distributed among Technical, Humanities-Social Sciences, and Unrestricted Elective subjects as indicated in the Upper Division Program.

† Or Civil Engineering 132A (3 units) or 145 (3 units), normally taken in the spring of the senior year.

Structures and Environment—Agricultural Engineering 125, 126; Agricultural Engineering Technology 111; Applied Science 115; Atmospheric Science 20, 123, 124; Civil Engineering 131, 132B, 132C, 133, 134, 142, 147, 148; Mechanical Engineering 186; Water Science 120.

CHEMICAL ENGINEERING CURRICULUM

(Accredited by Engineers' Council for Professional Development.)

Minimum units required: 183.

Chemical engineering is concerned with application of the principles of chemistry and engineering to the production of useful products. The products of the process industries range from antibiotics to zirconium, from petroleum to plutonium, from agricultural chemicals and foods to synthetic plastics. In addition, chemical engineers are increasingly concerned with chemical and engineering processes related to the environment, food production, and medicine. Preparation for careers in chemical engineering requires an understanding of both engineering and chemical principles to develop proficiency in conceiving, designing, and operating new processes.

The chemical engineering curriculum has been planned to give students a sound knowledge of engineering and chemical sciences so that they may achieve competence in treating not only current technical problems but also those that will arise in the technologies of the future. In the junior year, attention is focused on basic engineering courses, particularly thermodynamics, fluid mechanics, and energy transfer. In the senior year these fundamentals are drawn together and applied in a study of mass transfer phenomena and processes, process design, and process dynamics. The program is strengthened and broadened with introductory courses in the electrical and mechanical sciences.

The curriculum provides for 18 credit hours of Technical Electives which allow for special training in an area of particular interest. To assist students in planning their program several possible optional course programs have been outlined. For students pursuing the normal Chemical Engineering program, Chemistry 111A and 128C are particularly recommended and also selections from the following list should be considered for the remaining units: Applied Science 115, 116; Mathematics 24, 118A, 118B, 118C, 130A, 130B; and Chemical Engineering 159. Following are the recommended programs for students electing to specialize in one of the Chemical Engineering options. Students are encouraged to review their selected Technical Electives with their adviser to insure their program is tailored to their own specific needs.

Environment Engineering

The environment engineering option prepares the student to deal with problems of environmental quality by developing his knowledge of fundamental chemical and transport phenomena, that is, chemical reaction processes coupled with fluid mechanics, heat transfer, and mass transfer. Such a foundation in basic chemical engineering science, plus the usual chemical engineering analysis and design courses, along with other courses involved specifically with environmental topics, prepares the student to seek employment with industry or gov-

ernment. For this option six courses should be selected from the following list: *Air Environment*—Atmospheric Science 121A, 121B, 122, 123; Civil Engineering 149, 242, 244; Environmental Toxicology 110; *Water Environment*—Bacteriology 2; Biochemistry 101A, 101B; Civil Engineering 147, 148, 240, 243A, 243B, 243C; Water Science 120.

Premedical and Prebiomedical Engineering

This option has been specifically designed so that a student may prepare himself for graduate work in biomedical engineering or meet the undergraduate requirements for entrance into medical school. Because of the emphasis on the natural sciences and their application to fluid mechanics, mass transport, heat transfer, thermodynamics, reaction kinetics, and process dynamics, the student is unusually well prepared to understand similar problems in living systems. Many biological phenomena such as blood flow, passive solute transport, and energy exchange can be dealt with using the theoretical tools learned as an undergraduate student. The inclusion of both organic and physical chemistry in the curriculum allows the student to complete the premedical requirements and also to complete the requirements for a Bachelor of Science degree in Chemical Engineering. Chemistry 129B and one additional course in English must be taken in order to meet the premedical requirements. The biology preparation requirement for either premedical or biomedical engineering can be met by choosing courses from the following list: Biological Sciences 1; Zoology 2, 100; Genetics 115; Physiology 110A, 110B, 111A, 111B; and Physiological Sciences 101A–101B or Biochemistry 101A–101B.

Food Process Engineering

This option is designed to prepare students to do graduate work in food science and technology and to work in the food processing industry. Technical elective courses should be chosen from the following: Food Science and Technology 104, 104L, 106, 113, 130, 198; Bacteriology 2; and Biochemistry 123.

Applied Chemistry

The chemical engineering curriculum includes an important core of chemistry courses. Students can take advantage of this background to build a strong program in chemistry by choosing electives from among the advanced undergraduate courses chosen from the following: Chemistry 111A, 121, 124, 128C, 129B, 129C, 130, 131, and 150.

Applied Mathematics

The mathematics specialization is designed both to strengthen the student's understanding of the foundations of engineering science and to improve his ability to treat complex engineering problems. Courses in abstract algebra, advanced calculus, and the theory of differential equations provide a sound theoretical background, while courses in analytical and numerical analysis provide the techniques for solving a wide range of engineering problems. Recommended technical electives should be chosen from the following: Mathe-

matics 24, 118A, 118B, 118C, 119, 127A, 127B, 127C, 128A, 128B, 128C, 130A, 130B, 132A, 132B, 185A, 185B; Applied Science 115; Engineering 180; and Chemical Engineering 159.

UPPER DIVISION PROGRAM—CHEMICAL ENGINEERING

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemical Engineering 151 ..	3	Chemical Engineering 150A. 3	Chemical Engineering 150B. 3
Chemistry 110A	3	Chemical Engineering 152A. 3	Chemical Engineering 152B. 3
Chemistry 128B	3	Chemistry 110B	3
Engineering 102A ..	3	Technical Elective ..	3
Humanities-Social Sciences Elective .	4	Humanities-Social Sciences Elective .	4
	—		—
	16	16	16
<i>Senior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemical Engineering 154A. 3		Chemical Engineering 154B. 3	Chemical Engineering 155B. 2
Chemical Engineering 157	4	Chemical Engineering 155A. 2	Chemical Engineering 156B. 3
Engineering 100	4	Chemical Engineering 156A. 3	Chemical Engineering 158... 3
Technical Elective ..	3	Technical Elective ..	6
	—		—
	14	14	15

CIVIL ENGINEERING CURRICULUM

(Accredited by Engineers' Council for Professional Development.)

Minimum units required: 180.

Civil engineering is devoted to the improvement of the human environment for the purposes of making human activities productive, safe, and enjoyable, and providing aesthetically pleasing surroundings. The profession contributes directly to humanity's continued health and well-being by the design of systems that provide plentiful supplies of healthful and potable water; freedom from disease-carrying wastes; land-, water-, and air-transportation; housing and other structures; flood control; and large recreational facilities. Civil engineers plan and design all or major portions of these systems that so enhance the quality of human life.

The programs in civil engineering include *Civil Engineering Planning, Environment Engineering, Structural Engineering and Mechanics, and Water Resources Engineering*. These options are interrelated, and flexible programs are developed for individual students. Every option is designed to program educational preparation for real and significant contributions to humanity.

Civil Engineering Planning

The programs are directed toward planning of resources utilization and development projects and planning of community, economic, and environmental development and redevelopment programs on an urban or regional scale. Civil engineering planning requires a basic understanding of the principles of engineering, economics, law, planning concepts and techniques, environmental sciences, public administration, and politics. Planning implies the formulation of program objectives; development of engineering, economic, and social data constraining alternative choices; and preparation of alternative plans that include a variety of options and opportunities for reformulation as circumstances change. Students are encouraged to plan their programs early with the aid of advisers and to complement the suggested technical electives with courses in the humanities and social sciences.

Environment Engineering

The programs are concerned with improving and maintaining the qualities of the air, land, and water environments that affect the health and well-being of man in the face of increasing population and expanding industrial activity. The program is based on a firm basic science and civil engineering foundation and emphasizes the design of waterborne, solid, and airborne waste management systems, the design of potable water-supply systems, and environment monitoring.

Structural Engineering and Mechanics

The programs are concerned with the conception, design, and construction of structures. Structural engineering involves buildings, bridges, highways, dams, economics of the construction industry, and construction practices. Consideration is given to the response of structures not only to gravity loading but also to earthquake and wind loading. Structural mechanics emphasizes the more analytical aspects of structural engineering. Principles of structural analysis applicable to structures of all kinds, from office buildings to space vehicles, are examined. Special topics include the mechanics of deformable bodies and the theory of elasticity.

Water Resources Engineering

The programs include Hydraulics, Irrigation and Drainage, and Water Resources Systems Design. *Hydraulics* is concerned with flow in pipe and open-channel water-distribution systems and through hydraulic structures, and depends upon a strong foundation in fluid mechanics, systems analysis, and hydrology. *Irrigation and Drainage* provides a unique program aimed at the solution of water-oriented agricultural problems by emphasizing the application of hydrologic sciences, hydraulic engineering, agricultural sciences, and systems analysis to the design and operation of irrigation and drainage projects. Special topics include study of water-soil-plant relations, water rights, land preparation and water application, water quality, and soil and water pollution. *Water Resources Systems Design* is concerned with the comprehensive development of water resources for multiple use. Emphasis is placed on principles of planning,

analysis, and engineering design and operation as related to the water needs and wastes of industry, agriculture, recreation, and other activities. The program may include elective courses in geography, hydrology, economics, and the politics of water resources.

UPPER DIVISION PROGRAM—CIVIL ENGINEERING

	<i>Units</i>	<i>Courses</i>
Required Subjects		
Electronic circuits	4	Engineering 100
Applied mechanics	9	Engineering 102A, 103A, 104A
Applied thermodynamics	3	Engineering 105A or Chemistry 110A
Structures	6	Engineering 104B; Civil Engineering 131
Soil mechanics	5	Civil Engineering 171, 172
Water supply and pollution control	9	Engineering 103B; Civil Engineering 142, 148
Civil engineering design	6	Civil Engineering 132B; Civil Engineering 132A or 145
Economics	3	Engineering 106 or Agricultural Economics 148
Mathematics	5	Selected from Mathematics 22A, 24, 128A, 128B, 128C, 130A, 130B, 131A, 131B, Applied Science 115 or Engineering 180.
Technical Electives	21	12 units must be selected from Engineering courses
Humanities-Social Sciences		
Electives	15	
Unrestricted Electives	4	
Total	90	

Sample Sequence of Courses*

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 100	4	Engineering 103A ..	3
Engineering 102A ..	3	Engineering 104B ...	3
Engineering 104A ..	3	Engineering 105A ..	3
Elective**	5	Elective**	6
			Civil
			Engineering 131 ..
			3
			Civil
			Engineering 132B .
			3
			Civil
			Engineering 171 ..
			3
			Engineering 103B ...
			3
			Elective**
			3
	15	15	15

* Study list arrangements are governed only by course prerequisites and the schedule of quarters in which a given course is offered. The arrangement of courses in this sample program satisfies both criteria, and lists the courses in what is probably the easiest order academically. Other course sequences are possible.

** The 40 units of electives are to be distributed among Humanities-Social Sciences Electives and Technical Electives as indicated in the Upper Division Program.

Senior Year

Civil		Civil	Electives**	15
Engineering 142 . .	3	Engineering 132A . .		
Civil		Civil		
Engineering 172 . .	2	Engineering 148 . .	3	
Electives**	10	Engineering 106 . . .	3	
		Elective**	6	
	15		15	15

Suggested Technical Electives:

Because of the direct concern of professional civil engineering for the quality of human life, civil engineering majors are encouraged to include courses such as Economics 125A, 125B, 130A, and 130B, Environmental Planning and Management 110, and Political Science 108, 109A, 109B, and 186 among their Technical Electives. Other Technical Electives of possible interest to majors in all four of the programs include Applied Science 115, Engineering 180, Mechanical Engineering 175, and Sociology 141 and 170. Additional suggested courses for students in each of the options are as follows:

Civil Engineering Planning: Agricultural Economics 148, 155; Civil Engineering 137, 143, 160; Economics 125A, 125B, 130A, 130B; Engineering 106; Geography 106; Mathematics 130A, 130B; Environmental Planning and Management 110; Political Science 181; Sociology 170; Water Science 150.

Environment Engineering: Applied Science 115; Atmospheric Science 120, 121A, 121B, 122, 123; Bacteriology 2; Biochemistry 101A, 101B; Chemical Engineering 154A, 154B, 156A, 156B; Chemistry 8A, 110A, 110B; Civil Engineering 145, 146, 147, 149; Mechanical Engineering 175, 185; Water Science 120.

Structural Engineering and Mechanics: Agricultural Engineering 125, 126; Civil Engineering 132C, 133, 134, 135, 137, 138, 160, 173, 174; Engineering 122, 183, 184, 187, 188; Mathematics 185A, 185B.

Water Resources Engineering: Chemistry 5; Civil Engineering 141, 143, 144, 145, 146; Electrical Engineering 112A, 150; Mechanical Engineering 185; Soil and Water Science 103; Water Science 10, 110A, 116, 141, 150, 160.

ELECTRICAL ENGINEERING CURRICULUM

(Accredited by Engineers' Council for Professional Development.)

Minimum units required: 180.

Present-day electrical engineering embraces a broad spectrum of disciplines based upon the physical and mathematical sciences. Electrical engineering encompasses such diversified fields as automation and control, information processing and computers, micro-miniaturization of circuits and components, instrumentation, communications and microwaves, and stimulated energy emission by means of quantum effects (masers and lasers). Work in these fields is being

** The 40 units of electives are to be distributed among Humanities-Social Sciences Electives and Technical Electives as indicated in the Upper Division Program.

applied to medicine, communications, transportation, education, and business.

The variety of course offerings in the department permits the student to prepare himself for graduate study in electrical engineering, or for a career as a practicing engineer. In the electrical engineering curriculum close correlation between theory and experiment is emphasized.

The course of study in electrical engineering allows the student maximum flexibility to pursue studies in a special technical area of his choice or in a wide range of topics. Required courses insure his attainment of a broad background in basic electrical engineering. The engineering core courses for the lower division provide a strong foundation for the specialized topics to follow. In addition, a specified group of upper division courses in electromagnetic field theory, systems, and solid-state electronics prepares the student for the Technical Electives of his choice.

Technical Electives are a substantial part of the upper division curricula and may be used to develop a specialty within the program. They may be selected from a wide range of courses in electrical engineering, other engineering fields, mathematics, and the physical and biological sciences. Typical fields of specialization are biomedical engineering, computer science, high-frequency phenomena and devices, information and control, solid-state devices and physical electronics, and systems and circuits.

Biomedical Engineering

Biomedical engineering is a rapidly growing field which applies engineering concepts to the measurement of biological systems, the processing of biological data, and the description or modeling of biological processes. The field encompasses the design and operation of instruments used in biology and medicine.

Computer Science

Computer science deals with the design, application, and theory of computing machines. Specific areas such as switching theory, theory of automata, programming languages, artificial intelligence, and sequential machines are all part of the increasingly important field of computer science.

High-Frequency Phenomena and Devices

High-frequency phenomena and devices deals with the study of the generation and transmission of high-frequency electromagnetic waves and the interaction of these waves with matter and includes the design of useful devices based on these interactions.

Information and Control

Information and control is concerned with the transfer and processing of information, and the use of information to control processes. An understanding of the transfer of information is basic to modern communication such as radio, radar, television, and data communications such as deep space telemetry. The principles of control underlie industrial automation and the control of vehicles.

Solid-State Devices and Physical Electronics

Solid-state devices and physical electronics is the study of electrons in the presence of electric and magnetic fields and of quantum electronic effects. Among the devices included are transistors, diodes, vacuum tubes, lasers, masers, and traveling wave tubes.

Systems and Circuits

Systems and circuits encompasses a large body of engineering knowledge. A study of systems includes engineering as well as nonengineering systems such as sociological and economic systems. Circuit theory is the systematic analysis of the properties of electric networks.

UPPER DIVISION PROGRAM—ELECTRICAL ENGINEERING

Courses Common to all Electrical Engineering Options:

	<i>Units</i>	<i>Courses</i>
Required Subjects		
Electronic circuits and systems	12	Engineering 100, Electrical Engineering 110A, 110B, 111A
Applied mechanics	3	Engineering 102A
Applied thermodynamics	3	Engineering 105A
Electromagnetics	3	Electrical Engineering 130A
Linear systems	6	Electrical Engineering 112A, 112B
Physical electronics	6	Electrical Engineering 140A, 140B
Mathematics	3	Mathematics 22A*
Professional responsibilities ...	3	Engineering 190
Total	39	

All Electrical Engineering Options (Except Computer Science):

	<i>Units</i>	<i>Courses</i>
Required Subjects		
Electronic circuits and systems	2	Electrical Engineering 111B
Electromagnetics	3	Electrical Engineering 130B
Technical Electives†	29	
Humanities-Social Sciences		
Electives	15	
Unrestricted Elective	2	
Total	90	

* Students who have taken Mathematics 22A to satisfy the Natural Sciences Elective requirement for the Lower Division Program must substitute a 3-unit mathematics course of their choice.

† The Technical Electives must include: 1) 3 units of an upper division mathematics or physics course; 2) one Technical Elective course, taken after completion of Engineering 100, which includes work in an electrical laboratory.

Computer Science Option:**Required Subjects**

Switching theory	3	Electrical Engineering 172
Computer organization	3	Electrical Engineering 174
Programming	3	Choice of Electrical Engineering 176, 177, Applied Science 115, Mathe- matics 129A, or 129B (must be taken on a letter-grade basis)
Technical Electives†	25	
Humanities-Social Sciences Electives	15	
Unrestricted Elective	2	
Total	90	

The Upper Division Program consists of required courses and elective courses. The required courses are coordinated sequences of courses that form the basis of all branches of electrical engineering. These courses are taken as early as possible, in order to prepare the student for Technical Elective courses in his area of interest. A typical upper division program, showing a suitable ordering of the required courses, is shown below.

Sample Sequence of Courses

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 100	4	Engineering 102A	3
Engineering 105A	3	Electrical Engineering 112A	3
Electrical Engineering 130A	3	Electrical Engineering 130B**	3
Mathematics 22A*	3	Electrical Engineering 140A	3
Elective**	2	Elective	3
	15		15
 <i>Senior Year</i>			
Electrical Engineering 110A	3	Electrical Engineering 110B	3
Electrical Engineering 111A	2	Electrical Engineering 111B**	2
Elective	10	Elective	10
	15		15
			15

There are three kinds of electives in the Electrical Engineering curriculum: Technical Electives, Humanities or Social Sciences Electives, and Unrestricted

† The Technical Electives must include: 1) 3 units of an upper division mathematics or physics course; 2) one Technical Elective course, taken after completion of Engineering 100, which includes work in an electrical laboratory.

* Students who have taken Mathematics 22A to satisfy the Natural Sciences Elective requirement for the Lower Division Program must substitute a 3-unit mathematics course of their choice.

** A student in the computer science option takes Electrical Engineering 172 in the fall quarter of the junior year, and takes Electrical Engineering 174 and a choice of Applied Science 115, Electrical Engineering 176, or Mathematics 129A-129B in place of Electrical Engineering 111B and 130B.

Electives. Twenty-nine units of Technical Electives may be selected, with the counsel of the faculty adviser, from upper division courses in engineering, physics, and mathematics to suit the student's interests or career objectives; other acceptable courses are indicated below. The choice of Technical Electives must include at least three units of upper division physics or mathematics. In addition, one of the Technical Elective courses taken after the student has completed Engineering 100 must include work in an electrical laboratory. This requirement can be satisfied by enrolling in a course consisting entirely of laboratory work, a course which combines lectures and laboratory, or an appropriate experimental individual study project under faculty supervision. The department has facilities for laboratory work in a large number of specialties.

Suggested Technical Electives:

Upper division courses in engineering, chemistry, mathematics, physics, and the biological sciences are in general acceptable for these electives. The student is *strongly encouraged* to review his program of Technical Electives with his adviser to insure that it will meet his educational objectives. The Technical Elective offerings corresponding to the major options of electrical engineering are given in the following list. A student may sample a number of these areas, or he may prefer to specialize.

Biomedical Engineering: Chemistry 5, 8A, 8B, 107A, 107B; Physiological Sciences 101A, 101B; Biological Sciences 1; Zoology 2, 121A, 121B; Physiology 101, 110A, 110B, 111A, 111B; Physical Education 104A, 104B; Human Physiology 151; Engineering 103A, 103B; Electrical Engineering 150, 157A, 157B, 182, 184.

Computer Science: Mathematics 108A, 125, 128A, 128B, 128C, 129A, 129B, 131A, 131B, 131C, 168; Applied Science 115; Electrical Engineering 173, 175, 176, 177; Human Physiology 151; Engineering 103A, 103B.

High-Frequency Phenomena and Devices: Mathematics 185A, 185B; Applied Science 115; Electrical Engineering 131A, 131B, 131C, 133, 145A, 145B, 145C; Physics 104A, 104B.

Information and Control: Mathematics 118C, 131A, 131B, 131C, 151A, 151B, 151C, 185A, 185B; Applied Science 115; Electrical Engineering 157A, 157B, 172, 174, 182, 184.

Solid-State Devices and Physical Electronics: Mathematics 118C; Applied Science 115; Engineering 130, 142, 188; Electrical Engineering 131A, 131B, 131C, 145A, 145B, 145C, 175; Physics 104A, 104B.

Systems and Circuits: Applied Science 115; Mathematics 127A, 127B, 127C, 128A, 128B, 128C, 185A, 185B; Electrical Engineering 116, 117, 157A, 157B, 182; Physics 104A, 104B.

MATERIALS SCIENCE AND ENGINEERING CURRICULUM

Minimum units required: 180.

Materials engineering is directed towards an understanding of the structure, properties and behavior of materials, including bio-materials. The demand for

materials for high-speed transportation systems, for surgical and dental implants, for new generation of power plants where components are subjected to radiation and elevated temperatures, for solid-state electronic devices in computer and communication technology, etc., has broadened the search for new and improved materials with capabilities well beyond those attainable with common metals, alloys, and ceramics. The development of these new materials and understanding of materials presently in use demand a thorough knowledge of the basic engineering and scientific principles such as crystal structure and diffraction, elastic and plastic behavior, thermodynamics, phase relationship and reaction rates, and physical and chemical behavior of engineering materials.

The undergraduate program provides the materials engineer with the background for activities in research, processing, and utilization of materials and also provides preparation for graduate work in materials science. The services of materials engineers are required in a diverse array of engineering operations, e.g., from the impact and fracture behavior of automobiles to fatigue behavior of aircraft frames, from creep and corrosion behavior in petrochemical refineries to radiation induced damage in nuclear power plants, and from the manufacturing and fabrication of steel and other basic structural materials to the doping of semiconductors to obtain optimum electrical response. Materials engineers are also increasingly involved in the search for bio-materials and in the solution of pollution problems resulting from metallurgical smelting practices.

The curriculum is based on a common core of courses basic to engineering, taken during the first two years, which provides a strong foundation in the basic and unifying concepts in engineering. The third and fourth years are devoted to the further study of fundamental subjects and the introduction of specific materials courses, which provide a broad base in materials science and prepare the student for the Technical Electives of his choice. These Technical Electives form a very significant part of the program and can be used to emphasize specific areas such as mechanical metallurgy, electronic materials, design and processing, ceramic and high temperature materials, automatic control, environmental engineering, bio-materials, computational methods, etc. These electives can be chosen from a wide range of courses in mechanical engineering, other engineering disciplines, mathematics, geology, physics, chemistry, and biological sciences.

UPPER DIVISION PROGRAM—MATERIALS SCIENCE AND ENGINEERING

Required Subjects	Units	Courses
Electronic circuits	4	Engineering 100
Applied mechanics	9	Engineering 102A, 103A, 104A
Applied thermodynamics	7	Engineering 105A, 130
Materials in design	4	Engineering 140
Materials science	7	Engineering 142, 188
Controls and systems analysis . .	4	Mechanical Engineering 171
Laboratory	4	Mechanical Engineering 123A, 123B
Applied mathematics	9	Engineering 180, Physics 104A, 104B

Required Subjects	Units	Courses
Technical Electives	25	
Humanities-Social		
Sciences Electives	15	
Unrestricted Electives	2	
	Total	90

Recommended Sequence of Courses

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>		
Engineering 102A ..	3	Engineering 100	4	Engineering 140	4
Engineering 104A ..	3	Engineering 130	4	Engineering 180	3
Engineering 105A ..	3	Technical Elective ..	7	Humanities-Social	
Technical Elective ..	3			Sciences Elective ..	4
Elective	2			Technical Elective ..	3
	14		15		14
 <i>Senior Year</i>					
Engineering 103A ..	3	Mechanical Engineer-		Engineering 188	4
Engineering 142	3	ing 123A	2	Mechanical	
Physics 104A	3	Mechanical		Engineering 123B ..	2
Technical Elective ..	3	Engineering 171 ..	4	Technical Elective ..	6
Humanities-Social		Physics 104B	3	Humanities-Social	
Sciences Elective ..	4	Technical Elective ..	3	Sciences Elective ..	3
		Humanities-Social			
		Sciences Elective ..	4		
	16		16		15

Suggested Technical Electives:

Twenty-five units of Technical Electives may be selected in order to complete the undergraduate materials science and engineering program. By the selection of appropriate Technical Electives and Humanities and Social Sciences Electives, a student may orient his program to suit his interests and also his career objectives, i.e., production and development, applied research, basic research, teaching, management, etc. Upper division courses in engineering, chemistry, physics, mathematics, and biological sciences are, in general, acceptable as Technical Electives; however, to insure that his educational objectives will be met, the student is strongly encouraged to select these electives only after reviewing his program with his adviser. The following Technical Elective courses and the suggested areas of specialization are guidelines to assist the student and his adviser in the preparation of study lists. A student may elect to take courses from a number of these areas or he may wish to specialize.

Electronic materials: Electrical Engineering 130A, 140A, 140B, 145A, 145B, 145C; Physics 121.

Materials design and processing: Engineering 104B, 104C, 106, 184; Mechanical Engineering 111, 115, 121, 150, 151, 155; Civil Engineering 137.

Automatic control and systems analysis: Mechanical Engineering 155, 172; Electrical Engineering 150, 157A, 157B, 182.

Physics of solids: Physics 115A, 115B, 140A, 140B; Electrical Engineering 145A, 145B, 145C.

Environmental engineering: Mechanical Engineering 175; Atmospheric Science 120, 122, 123; Biochemistry 101A, 101B; Water Science 120; Chemistry 8A; Civil Engineering 149.

Chemical corrosion: Chemistry 110A, 110B, 110C, or 107A, 107B; Chemical Engineering 151, 152A, 152B.

Heat transfer: Engineering 105B; Mechanical Engineering 186; Chemical Engineering 150A, 153.

Biomedical engineering: Chemistry 107A, 107B; Biological Sciences 1; Zoology 2; Physiology 110A, 110B, 111A, 111B; Electrical Engineering 150; Human Physiology 151; Physical Education 104A, 104B; Mechanical Engineering 175.

Computers: Applied Science 115; Electrical Engineering 173, 175, 176, 177; Mathematics 129A, 129B, 130A, 133, 168.

MECHANICAL ENGINEERING CURRICULUM

(Accredited by Engineers' Council for Professional Development.)

Minimum units required: 181.

The modern mechanical engineer uses basic science in the design and manufacture of complex engineering systems. This requires the application of physical and mechanical principles in the development of machines, energy conversion systems, materials, and equipment for guidance and control. Preparation for this broad field of engineering requires a thorough knowledge of mathematics, physics, chemistry, fluid mechanics, thermodynamics, heat transfer, mass transfer, electricity, manufacturing processes, properties of materials, and economics.

The mechanical engineering curriculum is based on a common core of engineering courses taken in the first two years. The third year is spent in further study of fundamental courses, and in the fourth year the student may tailor his studies to his own interests by selecting courses in controls and systems analysis, fluid mechanics, heat transfer, thermodynamics, mechanical design, or materials science. With the range of electives available, the student can prepare himself for graduate study in mechanical engineering, or obtain a broad background for entering engineering practice at the bachelor's level.

UPPER DIVISION PROGRAM—MECHANICAL ENGINEERING

	<i>Units</i>	<i>Courses</i>
Required Subjects		
Electronic circuits	4	Engineering 100
Applied mechanics	12	Engineering 102A, 102B, 104A, 104B
Applied thermodynamics	6	Engineering 105A, 105B
Fluid mechanics	6	Engineering 103A, 103B
Mechanical design	6	Mechanical Engineering 121, 150
Controls and systems analysis .	4	Mechanical Engineering 171
Laboratory	8	Mechanical Engineering 111, 123A, 123B

Professional responsibilities . . .	3	Engineering 190
Applied mathematics	3	Engineering 180
Technical Electives	22	
Humanities-Social		
Sciences Electives	15	
Unrestricted Electives	2	
	—	
	Total	91

Recommended Sequence of Courses

<i>Junior Year</i>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engineering 102A ..	3	Engineering 100	4
Engineering 103A ..	3	Engineering 102B ..	3
Engineering 104A ..	3	Engineering 103B ..	3
Engineering 105A ..	3	Engineering 104B ..	3
Elective	2	Engineering 105B ..	3
	—		—
	14	16	14
 <i>Senior Year</i>			
Mechanical		Engineering 190	3
Engineering 150 ..	3	Mechanical	
Mechanical		Engineering 123A..	2
Engineering 171 ..	4	Humanities-Social	
Technical Electives ..	9	Sciences Electives..	7
	—	Technical Electives .	7
	16		—
			16

The electives are to be distributed among Technical, Humanities-Social Sciences, and Unrestricted Electives as indicated in the Upper Division Program.

Current areas of interest in mechanical engineering are outlined in the following options. Each includes a suggested list of electives from which a student interested in a particular option can select.

Creative Design

The creation and improvement of products, processes, or systems which are mechanical in nature are the primary goals of a professional mechanical engineer. It is the designer's responsibility to create a practical product or process which will meet the requirements of the marketplace. The engineer-designer must have a solid and relatively broad background in the basic physical and engineering sciences and have the ability to organize and solve a variety of problems. In addition to having technical competence, the designer must be able to consider the socioeconomic consequences of his design. He must consider such factors as possible impact on the environment, product safety, reliability, and economics.

Suggested Technical Electives: Mechanical Engineering 114, 115, 128A, 128B, 135, 137, 151, 155, 172, 175, 185, 186; Applied Science 115; Civil En-

gineering 131, 135; Engineering 104C, 115, 122, 140, 184; Agricultural Engineering 116, 118, 119, 132.

Environmental Technological Systems

The objective of this option is to provide the student with the background necessary for developing mathematical models of man's impact on his environment. Geophysical, living systems, and social environments are the subjects of study. It is expected that the student will become a competent specialist in dynamic system analysis while gaining breadth in ecology and social system analysis. Examples of specific topics of study are: 1) generation, transport, and effects of pollution; 2) interspecies and intraspecies conflict and cooperation; 3) urban dynamics.

Suggested Technical Electives: Mechanical Engineering 172, 175, 185, 186; Civil Engineering 147, 149; Electrical Engineering 112A, 112B, 184; Environmental Studies 100; Zoology 116, 155; Engineering 115.

Power, Propulsion, and Pollution

This option is specifically designed for students who would like to work in the fields of electric power generation, propulsion for transportation, and energy conversion, where the impact of potential pollution on the environment is assuming increasing importance in the design stage.

The program of study is based on the fundamentals of fluid mechanics, thermodynamics, and heat transfer with applications to such diverse components as combustion engines, gas turbines, heat exchangers, nuclear reactors, MHD power generators and so forth.

Suggested Technical Electives: Mechanical Engineering 125, 135, 137, 175, 185, 186; Applied Science 115, 135A; Electrical Engineering 130A, 130B.

System Dynamics and Control

Modern engineers are increasingly concerned with the performance of integrated dynamics systems in which it is not possible to optimize component parts without consideration of the overall system in which they will be used. This option is concerned with the modeling, analysis and simulation of all types of dynamic systems and with the use of automatic control techniques to change the dynamic characteristics of systems in useful ways. The emphasis in this program is on physical systems: from the domains of the engineering sciences represented in mechanical engineering, but the techniques for studying systems apply equally well to social, economic, and other dynamic systems.

Suggested Technical Electives: Engineering 122; Mechanical Engineering 114, 115, 134, 172, 175, 185, 186; Electrical Engineering 112A, 112B.

INDIVIDUAL ENGINEERING MAJOR

Minimum units required: 180.

Any student who has a definite career objective that is not compatible with one of the named curricula may, with the help of his adviser, propose an In-

dividual Engineering Major. The student, on approval of his adviser, must submit his complete program of study, including a statement of objectives, to the Undergraduate Study Committee of the College of Engineering for final approval. A student must enter this program at least three quarters before his anticipated graduation date, preferably no later than the second quarter of his junior year. Such a program must include at least the following minimum number of quarter units in the specified subject areas:

<i>Subject Areas</i>	<i>Minimum Quarter Units</i>
Mathematics	18
Physical and biological sciences (including at least 12 units of physics and 10 units of chemistry for engineering and science students)	27
Analytic mechanics and strength of materials	6
Applied thermodynamics	3
Applied electricity and magnetism	5
Properties of materials	4
Engineering design	5
Humanities-Social Sciences	31

Graduate Study

The Departments of Agricultural Engineering, Applied Science (Davis-Livermore), Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering offer courses of study leading to the degrees of Master of Science and Doctor of Philosophy. These programs are particularly appropriate for those wishing to prepare themselves for careers in teaching, research or analytical design. Professional programs emphasizing design and leading to the degrees of Master of Engineering and Doctor of Engineering are offered by the Departments of Agricultural Engineering, Civil Engineering, and Mechanical Engineering, and the degree of Doctor of Engineering is offered by the Department of Electrical Engineering.

At both master's and doctoral levels, the student plans his course of study with the help of an adviser or guidance committee. He is permitted wide latitude in the selection of courses and thesis subjects so long as his program is purposeful and well-integrated.

The graduate courses offered in the College of Engineering are described in the departmental listings (pages 264-289).

General information on graduate study may be found in the *Announcement of the Graduate Division* which can be obtained by writing to the Dean of the Graduate Division. Detailed information on graduate engineering programs is contained in the bulletin *Graduate Study in Engineering* which can be obtained from the Associate Dean, Graduate Studies, College of Engineering. Students interested in programs in Applied Science should request a copy of the *Announcement of the Department of Applied Science* from the Department of Applied Science.

College of Letters and Science

The College of Letters and Science offers curricula that enable the student to pursue fundamental knowledge primarily for its own sake and to learn basic intellectual disciplines. Programs of study in the College expose the student to man's social, aesthetic, and material achievements, as well as to the challenge of his ethical, political, and physical environment. In many cases the pursuit of knowledge will also lead the student to an appreciation of the individual's capacity for unique creative expression. Such a liberal education has increasing vocational value, since more and more career opportunities presuppose a basic letters and science degree; nevertheless, the main emphasis in the College rests on the ends of living rather than on the means. A well-balanced liberal education, including specialized knowledge in his major field, prepares the graduate for a satisfying life whatever his career.

Graduation from the College of Letters and Science presupposes fulfillment of the general University requirements. In addition, to achieve its educational objectives, the College has established certain specific standards relating to scholarship, senior residence, and unit distribution within the student's program of study. The two most important standards determining the unit-distribution pattern are those which relate to the Breadth Requirements, and to the Departmental Major Requirement. The *Breadth Requirements* are designed to provide a broad background of knowledge and to promote awareness of the variety of interdependencies of knowledge. The *Major Requirement* enables the student to gain intellectual depth and competence in his chosen field of specialization. Requirements of the major program are determined and administered by the separate departments, or, in the case of interdepartmental or individual majors, by an interdepartmental committee or group.

The College offers the undergraduate degrees of Bachelor of Arts and Bachelor of Science. These degrees are conferred upon completion of the University, College, and major requirements, detailed on the succeeding pages. **Every student is responsible for seeing that he meets these requirements for graduation.**

The study program or unit load may be easily changed within the established deadlines. Dropping courses after the deadline must be justified to the satisfaction of the Dean of the College. In all cases, however, the student has the sole responsibility for initiating these changes. The student also has the full responsibility throughout the academic term to apprise himself of the quality of his performance by means of consultation with his instructors during their designated office hours.

The specific subject requirements for the bachelor's degree may be satisfied only by:

1. UC courses taken in regular or summer session periods.
2. Courses for which transfer credit is granted from another college or university.
3. Regular UC courses taken on a concurrent enrollment basis through University Extension.
4. Note: Subject to prior written approval, the Dean of the College may permit

students in residence to enroll in University Extension courses. A maximum of 9 units may be taken for elective credit only. Such units and courses may not be applied toward fulfillment of the breadth, foreign language, upper division or senior residence requirements of the college. No grade points are assigned for courses completed in University Extension.

UNIVERSITY REQUIREMENTS

All candidates for the bachelor's degree are obligated to satisfy these University requirements (pages 37-39):

- Subject A
- American History and Institutions
- Scholarship
- Residence (for additional College stipulations, see page 150)
- Policies governing maximum unit credit from community colleges (see page 21)
- Application for Degree Candidacy (see filing deadlines, page 7)

COLLEGE OF LETTERS AND SCIENCE REQUIREMENTS

Breadth Requirements

1. *English Reading and Composition Requirement, A.B. and B.S. degrees:* Satisfied by passing an essay examination in English composition. The examination, administered at announced intervals, should be taken during the final quarter of the sophomore year, i.e., after completion of 70 units, or as soon as possible thereafter.

Prerequisite: satisfaction of Subject A Requirement.

2. *Foreign Language* (for details of this requirement, see page 155).

A.B. degree: 12 units or the equivalent in one language. *B.S. degree:* none (some major programs, however, have specific language requirements or recommendations).

3. *Area Requirements* (see page 158 for classification of courses).

<i>A.B. degree</i>	<i>Units</i>	<i>B.S. degree:</i>	<i>Units</i>
Humanities	} 52	Natural Sciences	90
Natural Sciences		Humanities	} 20
Social Sciences		Social Sciences	
(A minimum of 12 units and a maximum of 20 units in any one area, e.g., 20-20-12; 20-18-14; 20-16-16)		(A total of 20 units in either area or in combination)	
			110

Unit Distribution Requirements

Satisfactory completion of a minimum of 180 units is required for graduation. (A minimum of 75 units must be completed in institutions beyond the community college level.)

1. At least 150 units must be completed in courses given by teaching departments in the College of Letters and Science (page 158) or included on a list of selected courses offered by other Colleges and Schools (pages 159–160).

2. Of the 150 units in (1) above, at least 54 units must be in upper division course work (courses numbered 100–199). For the A.B. degree, a minimum of 12 of the 54 required upper division units must be outside the major department (not applicable to interdepartmental or individual majors).

3. A combined total of 30 units may be offered toward the bachelor's degree from the following categories:

- a. Units other than those (1) offered by teaching departments in the College of Letters and Science (see page 158), and (2) included on the "Letters and Science List of Approved Courses in Other Colleges" (pages 159–160).
- b. Units taken in all military science courses.
- c. Physical Education 5 and not more than 6 units in Physical Education 1.
- d. Not more than 9 units in 300–400 series courses.
- e. Not more than 9 units in University Extension courses.

4. Total degree credit in *special study courses* (99, 194H, and 199) may not exceed 5 units in any one quarter, with the exception of those students whose programs have been approved by the Independent Studies Board (see page 189). A student is eligible to take the upper division courses, 194H and 199, for credit, only after he has accumulated 84 units.

Scholarship Requirements

In addition to the general University requirement of a C average (2.0) for all University work, the College stipulates separate University averages of at least C for (1) all courses required for the major and (2) all upper division courses required for the major.

At the option of the department or interdepartmental committee administering the major, students failing to meet the above conditions may be denied the privilege of pursuing that major.

Probation and Disqualification

(See page 35.)

Readmission After Disqualification

Disqualified students should contact the Dean of the College well in advance concerning the requirements to be met before their readmission can be considered. Ordinarily, an agreement involving improved performance in a University of California Summer Session is mandatory.

Passed or No Record Option

The intent of this option is to encourage exploration by alleviating grading pressures in areas in which a student has little or no previous experience. New students and continuing students in good standing (not on probation or subject to academic disqualification) who are registered for at least 12 units, may take one course each quarter on a Passed or No Record basis. A part-time student

in good standing wishing to take a course on this basis must consult with the Dean's Office. More than one Passed or No Record course may be taken in a quarter if a student has accumulated unused options. There is one option for each quarter completed on the Davis campus while in good standing.

P grades are awarded for work otherwise qualifying for A, B, or C grades (C is the lowest passing grade for which a P can be awarded). Passed units are counted toward the degree, but neither a P grade nor a No Record affects a student's grade-point average. The unit value of a P grade is included in the *total units completed* on the transcript; it is not reflected in the *units attempted* column, the figure used for computing the grade-point average. No Record grades are not recorded on the transcript. (See also page 34.)

Passed or No Record Enrollment Procedure: Passed or No Record petitions are available in the Dean's Office, 150 Mrak Hall, between the dates listed below and must be filed in person. No signature other than the student's is required on the petition.

A student may change his enrollment in a particular course from the letter-grade basis to the Passed or No Record option up to the end of the fifth week of each quarter.

Some courses are graded upon completion of a two or three-quarter sequence (In-Progress grading). If electing the Passed or No Record option in this instance, the student files a petition only in the final quarter of the sequence.

File petitions in the Dean's Office between the following dates.

Fall quarter 1973: October 22 through October 26

Winter quarter 1974: February 4 through February 8

Spring quarter 1974: April 29 through May 3

Graduating seniors as well as any other student planning to undertake graduate or professional studies should consult an adviser before enrolling on a Passed or No Record basis in a course required in the major program.

Some courses are authorized to be given on a Passed/Not Passed only basis and are identified as such in course descriptions. A grade of P is recorded for courses passed; an NP is recorded for work which would otherwise have earned a grade of D or F. Students may petition to take a Passed/Not Passed graded course on a Passed or No Record basis if they have an available option.

Residence Requirement

All candidates for the bachelor's degree must complete 35 of the final 45 quarter units in residence in the College of Letters and Science. No more than 18 of the 35 may be earned in UCD Summer Session courses. While up to ten of the final 45 quarter units may thus be credited from another college in the University or from another accredited institution, any student planning to take senior-year work elsewhere must consult with the Dean or his staff and the major department before undertaking such work. He should realize that a delay in granting the degree may result, since credit is not allowed until an official transcript is received from the institution attended.

Students entering the College in advanced standing from another institution

or from another college or school within the University must complete 35 units of which at least 27 units must be in upper division courses offered by departments in Letters and Science, including at least 18 units in the major program.

Three terms is the minimum residence at the University. Each Summer Session period may be used in satisfaction of one half a term of residence.

Subject to prior approval of their major department or curriculum committee, students participating in the Education Abroad Program (EAP) may satisfy the residence requirement by one of two options:

1. Within the 45 units preceding entrance into the EAP, 35 units must be completed in residence in this College; no more than 18 of these units may be taken in Summer Session courses.

2. Within the final 90 units to be applied toward the degree, a total of at least 35 must be completed while registered in this College. Of these 35 units, at least 12 must be completed in residence in this College after returning from abroad. With this option, no more than 55 units taken abroad may be applied toward the unit requirement for graduation.

Requirements in the Major

The number of upper division units a student must complete in the subject of his major varies among departments, the requirement ranging from 36 to 45 units. Major programs are designed by the faculty of the College to insure that all students pursuing the same major will acquire certain knowledge in common. In addition, advanced students are encouraged to engage in independent study within the major.

A student may declare his major at the end of his freshman year; he must do so by the time he has completed 84 units.

A student may change from one major to another with the approval of the Dean of the College and with the consent of the department or committee in charge of the new major. Petitions for Change or Declaration of Major are available in the offices administering respective major programs. Office locations are printed in the *Class Schedule*. After the beginning of the senior year, a student may not transfer from one major program to another, or from one degree program (B.S. or A.B.) to another.

Three types of programs satisfy requirements for the major: departmental, interdepartmental, and individual major programs.

A. Departmental Majors. The requirements for departmental major programs are described in detail under departmental listings. Major programs leading to a Bachelor of Arts degree are offered in the following departments; those departments also offering programs leading to a Bachelor of Science degree are indicated by an asterisk (*):

Anthropology*	Chemistry*	Geography
Art History	Dramatic Art	Geology*
Art Studio	Economics	German
Bacteriology*	English	Greek
Botany*	French	History

Italian	Physical Education	Rhetoric
Latin	Physics*	Russian
Mathematics*	Political Science	Sociology
Music	Political Science:	Spanish
Oriental Languages	Public Service	Zoology*
Philosophy	Psychology*	

A Bachelor of Science degree is offered in Biochemistry (see page 80), Genetics (see page 94), Physiology (see page 97).

B. Interdepartmental Majors. These programs are intended for students interested in broader scope than that provided by a departmental major. Interdepartmental major programs leading to a Bachelor of Arts degree are offered in:

- Afro-American (Black) Studies (see page 192)
- American Studies (see page 201)
- Biological Sciences (see page 227)
- Comparative Literature (see page 242)
- East Asian Studies (see page 253)
- Humanities (see page 350)
- International Relations (see page 352)
- Liberal Arts (see page 364)
- Linguistics (see page 364)
- Physical Sciences (see page 413)
- Religious Studies (see page 442)
- Russian Literature and History (see page 452)

The Biological Sciences and the Physical Sciences programs can also lead to a Bachelor of Science degree.

C. Individual Majors. The individual major is a program organized by the student himself in consultation with faculty advisers who are expert in the requisite fields of interest. The individual major permits students to pursue a specific academic interest which, for sound academic reasons, cannot be accommodated within the framework of an existing major program. Involving two or more departments, this major may consist of not fewer than 45 nor more than 54 upper division units selected predominantly from Letters and Science teaching departments.

A student who wishes to undertake an individual major should request the appropriate forms, which include detailed instructions, from the Dean's Office, 150 Mrak Hall.

After the final proposal has been prepared with the assistance of advisers of the student's choice, it is submitted with faculty letters of recommendation to the Dean's Office. The proposal is reviewed and forwarded to the Faculty Committee on Individual Majors for evaluation and final action.

A student may not elect an individual major after the beginning of the final quarter of his junior year.

Announcement of Candidacy Requirement

Filing for Candidacy. Each candidate for a degree must file an Announcement of Candidacy with the Registrar at the beginning of the quarter in which he plans to graduate. The filing deadlines are published on pages 7–8 of this catalog.

Senior Degree Check. During the final quarter of his junior year or no later than the first quarter of his senior year, each student should request a *Degree Check* from the Dean's Office. A statement indicating any unfulfilled *University* and *College* degree requirements will be sent to the student. Information about progress in completing requirements in the *major* should be obtained by conferring with a faculty adviser authorized for the major program.

PLANNING THE PROGRAM

Before instruction begins each quarter, the student should prepare a tentative program of study and, if in need of academic counsel, meet with an adviser to review his proposed program. The official course enrollment request must be filed with the Registrar according to the procedures described in the *Class Schedule*, available at the beginning of each quarter.

Undeclared Status. Entering freshmen and sophomores are officially designated as *Undeclared*. To ensure counseling by an appropriate academic adviser, however, each student is asked to indicate a field of interest or unofficial major while in undeclared status. (Preprofessional students see page 176.)

Declaration of Major. A student may declare his official major at the end of his freshman year; he must do so by the time he has completed 84 units. He obtains a Petition for Change or Declaration of Major at the departmental office of his chosen major and secures approval for admission to the major program. (Biological and Physical Science majors report to the Dean's Office.)

Study List Requirements

1. Unit limitations (also see *Class Schedule*):

12 units—minimum for all students (necessary to maintain full-time student status);

17 units—maximum for freshmen and transfer students in first quarter of residence;

21 units—maximum for all other Letters and Science students;

Included in minimum and maximum unit limitations—Subject A, other non-credit remedial courses, and repeated courses;

Not included in unit limitations—make-up work to remove incomplete grade.

2. 195 Unit Limitation:

Because of increasing enrollment pressures, a student may not remain in undergraduate status indefinitely. After having completed 195 units, one may continue as an undergraduate, for sound educational reasons, only with the Dean's permission. Approval must be obtained before course enrollment materials can be made available for the quarter following completion of 195 units.

3. *Change of Study List:*

Refer to the *Class Schedule* for change of study list procedures.

Adding courses. During the first two weeks of classes each quarter and with the permission of the instructor a student may file a petition to add a course to his study list. Thereafter, a \$3 administrative late fee is assessed for approved petitions.

Dropping courses. During the first five weeks of classes each quarter, a student may file a petition requesting to drop a course from his study list. After the fifth week of classes, a student may drop a course only with the Dean's approval, and only under exceptional, unforeseeable circumstances, e.g., personal illness (certified by the Student Health Service) or an unavoidable increase in hours of employment. Although each petition will be evaluated on its own merits, reasons generally regarded as insufficient justification for dropping a course after the fifth week include: (1) lack of interest or motivation, (2) anticipation of substandard grades due to poor class attendance or time-budgeting problems, (3) inability to assess performance before the deadline. A \$3 administrative late fee is assessed for petitions approved after the deadline.

Faculty Advising

The function of a faculty adviser in the College of Letters and Science is to counsel students on their overall program of studies, to assist them in acquiring a meaningful liberal education, and to ensure that they make normal progress toward completion of degree requirements. Both the faculty advisers and the Dean's Office are available for consultation on any academic matters.

1. *Entering students who participate in one of the summer advising programs* are assisted in planning their fall quarter program by a temporarily assigned summer adviser. During the fall or subsequent quarters, students wishing academic advice should request adviser assignment in the department administering the major they intend to pursue. Offices are listed in the *Class Schedule*.

a. *Other entering lowerclassmen* are assigned advisers following the Letters and Science Assembly scheduled during Orientation Week at the beginning of each quarter.

b. *Other entering upperclassmen* report directly to the departmental office of their major during Orientation Week. (Biological and Physical Sciences majors report to the Dean's Office.)

2. *All new students* are encouraged to contact an adviser. During their first three quarters in residence students are expected to consult an adviser frequently and discuss their proposed programs.

3. *Continuing students* having completed three quarters in residence in the College are no longer obligated to consult an adviser; they can elect to see an adviser when in need of counsel.

Peer Advising. The Academic Advising Intern Program (AAIP) provides academic peer advising in specific departmental and subject areas. (Also see page 54.)

The First Resort provides academic peer advising for all students. Student advisers employed in this program are available to answer questions, give advice, and bring students in contact with the persons or offices able to deal with their specific problem. During the quarter, *The First Resort* is open afternoons, Monday through Friday, with expanded office hours during orientation periods at the beginning of each quarter.

Entering Freshmen

Because of the wide choice of subjects open to the Letters and Science student, a sample first-year program is not feasible. The entering freshman should, however, be able to plan his first-year program satisfactorily by keeping in mind the following points.

1. **After the Subject A requirement has been met**, most students should consider taking English 1 during their first year and English 2, 3, 4A, 4B, or 5 their second year in preparation for the English Composition Examination. The examination should be taken during the final quarter of the sophomore year, i.e., after completion of 70 units, or as soon as possible thereafter.

2. **The foreign language requirement** should be completed by the end of the first or second year, as program priorities permit. This is particularly important for students attempting to qualify for the University's Education Abroad Program (junior year abroad). It may be satisfied by examination or completion of language courses as follows:

- a. *Placement Examination*: A student with only high school preparation may validate his knowledge of a foreign language by earning a satisfactory score on this examination. (Further information given below.)
- b. *Course completion in high school* (tenth, eleventh or twelfth grades): earn a B average for one year's work beyond the second-year course level. This option can be validated (as indicated by the high school transcript submitted at the point of admission to the University) by petitioning the Dean's Office, 150 Mrak Hall.
- c. *Course Completion in College (or the equivalent)*: A.B. degree—12 units in one language. B.S. degree—as required in the major program.
- d. *Proficiency Examination*: A student who has not completed the required level language course, but assumes he has attained equivalent knowledge, may elect to satisfy the language requirement by passing this examination. For information consult the appropriate foreign language department.

3. **The Area Requirements in the humanities, natural sciences, and social sciences**, for students enrolled in an A.B. program, require a total of 52 units; in the B.S. program, 110 units (see page 158 for the three Area Lists).

This area requirement is particularly important for the entering freshman who has not decided on a major. Careful consultation with his adviser and thoughtful selection from each of the three groups will help the student to determine his preference for a major. Entering freshmen who feel certain of their major field should consult the requirements of that major in planning their first-year program, as a first-year course may be a prerequisite for further studies in that field.

Foreign Language Placement Examination

A student electing to continue a language studied in high school who does not have advanced standing credit should take the Foreign Language Placement Test in that language. The placement test does not yield unit credit; it only determines whether the Foreign Language Requirement has been met or at which point in the elementary sequence the student should enroll. Full academic credit is allowed for each foreign language course taken without regard to foreign language preparation in high school.

A student with advanced standing credit in a language does not qualify to take the Placement Examination. He should consult his Status Card, which is issued by the Dean's Office prior to admission to the College, for indication of further language study required.

Inquiries about the language requirement or the possibility of credit being withheld for duplication of advanced standing credit should be made at the Dean's Office, Room 150, Mrak Hall.

Preparation for Admission to Professional Schools

The College of Letters and Science does not offer special preprofessional programs. A student who plans to prepare for a professional school undertakes a normal program leading to an A.B. or B.S. degree. Most courses required by a professional school are included in the requirements for the bachelor's degree; any additional courses needed may be taken as electives. The student should make himself aware of the requirements for his prospective professional school early in his career in order to plan a proper program (see page 176). He should follow the procedures governing declaration of majors outlined on page 153. Assistance in planning a program may be obtained from the Preprofessional Advising Office, South Hall.

WORK-LEARN PROGRAMS

Opportunities are available for valuable work-learn experiences for students in the College of Letters and Science. Such "learn-by-experience" activities are available in the form of internships in areas of government, business, and social services in a variety of public and private agencies. Participants frequently earn credit (as in the program of Public Affairs Internships in the Department of Political Science which offers courses 190A and 190B, and in courses such as Economics 189A-189B, Education 100, Rhetoric 192, and Psychology 181 or, in some cases, course 199). Both full-time and part-time internships are available with emphasis on off-campus programs.

Students interested in work-learn experience should inquire at the departmental offices or contact PROBE, Campus Work-Learn Center, South Hall.

THE TEACHING CREDENTIAL

The teacher-training program is administered by the Graduate Division. Certain undergraduate courses, however, are required as preparation for the program. Students interested in obtaining the elementary or general secondary

teaching credential should consult the appropriate adviser in the Department of Education as early as possible, preferably by the end of the freshman year (see also page 187).

HONORS

The Dean's Honors List

The Dean's Honors List includes the names of students having earned a minimum grade-point average of 3.3 during the preceding term. A study list of at least 12 units, exclusive of units taken on a Passed/Not Passed (or No Record) basis, is required. The list is posted quarterly in the foyer of Mrak Hall.

Honors Programs

Special honors programs are available in connection with certain major programs. These are described in the introduction to the department's course offerings. Interested students should consult their major advisers.

Baccalaureate Honors

The awarding of honors at graduation is based on the following minimum criteria:

	Honors	High Honors	Highest Honors
	<i>Average of All College Work</i>		
	3.3	3.5	3.7
Total UC units completed	<i>Average of UC Work</i>		
45- 89	3.5	3.7	3.9
90-134	3.4	3.6	3.8
135 and over	3.3	3.5	3.7

Recommendation from the major department, requested by the Dean's Office, is also required for students eligible for highest honors.

Awards for Academic Excellence

In addition to eligibility for the University Medal (see page 39) graduating seniors with distinguished scholastic records in the College may be recommended by the faculty for the Herbert A. Young Letters and Science Medal. Academic excellence is the primary basis for choosing the recipient of this award.

AREA REQUIREMENT LISTS

The undergraduate courses in the subjects listed below will be accepted in fulfillment of the area requirement of the College. A maximum of 10 units of *special study* courses, 99 and 199, can be offered toward the area requirement; courses marked with an H, or numbered 48, 98, 198, 197T, 197TC, or 300-400 may not be counted.

Units in a *foreign language* may be offered toward satisfaction of the Humanities Requirement as follows: A.B. candidates—a maximum of 6 of the 12 units

offered in satisfaction of the Foreign Language Requirement and all other foreign language units may be counted; B.S. candidates—all foreign language units.

Humanities

American Studies. A.B.: Equally divide *maximum* of 16 units between Humanities and Social Sciences. B.S.: 12 units allowed toward Social Sciences/Humanities requirement.

Art.

Classics.

Comparative Literature.

Dramatic Art.

English. All courses except 25 and 26 and *first* freshman-level course (i.e.,

English 1, 2, 3, 4A, 4B, or 5) completed. All subsequent courses in English counted toward humanities requirement.

Foreign Language (see above).

History.

Linguistics.

Music.

Philosophy.

Religious Studies.

Rhetoric.

Natural Sciences

Anthropology 1, 5, 150, 151, 152, 153, 154A, 154B, 155, 156.

Astronomy.

Bacteriology. All courses except 101.

Biochemistry and Biophysics.

Biological Sciences.

Botany.

Chemistry.

Entomology 1, 10.

Genetics.

Geography 1, 3.

Geology.

Human Anatomy 102, 102L.

Mathematics.

Physics.

Physiology.

Psychology 1B, 2A, 108, 129, 131, 150, 180A, 180B, 180D, 180C, 180K.

Zoology.

Social Sciences

American Studies. (see "Humanities" above).

Anthropology. All courses except 1, 5, 13, 150, 151, 152, 153, 154A, 154B, 155, 156, 195, 196.

Economics. All courses except 12.

Education. All courses except 114.

Geography. All courses except 1, 3, 105, 161.

Political Science.

Psychology. All courses except 1B, 2A, 103, 107, 108, 129, 150, 165, 180A, 180B, 180D, 180C, 180K.

Sociology. All courses except 46A, 46B, 46C, 106.

TEACHING DEPARTMENTS IN COLLEGE OF LETTERS AND SCIENCE

Animal Physiology*

Anthropology

Art

Bacteriology

**Biochemistry and
Biophysics**

Botany

Chemistry

Dramatic Art

Economics

Education

English

French and Italian

Genetics

Geography

Geology

German and Russian

History

* Courses offered by the Department of Animal Physiology are listed under Physiology.

Mathematics**Music****Philosophy****Physical Education****Physics****Political Science****Psychology****Rhetoric****Sociology****Spanish and Classics****Zoology**

A minimum of 54 upper division units (courses numbered 100–199) must be completed in courses offered by departments listed above or included below on the “Letters and Science List of Approved Courses in Other Colleges.” Courses in Afro-American (Black) Studies, American Studies, Biological Sciences, Comparative Literature, Integrated Studies, Linguistics, Oriental Languages, and Religious Studies are included in all College requirements involving Letters and Science teaching departments. Physiology (Animal) courses also satisfy the Letters and Science requirements. Military science units are acceptable only in the 30-unit limitation (see page 149).

LETTERS AND SCIENCE LIST OF APPROVED COURSES IN OTHER COLLEGES

The courses listed below, given by *other* colleges and schools on this campus, may be offered toward satisfaction of A.B. and B.S. degree requirements accordingly:

1. 150 of the 180 units required for the degree must be completed in courses given by Letters and Science Teaching Departments *or included* on this list.

2. Courses below which are numbered 100–199, may be counted toward the 54-unit upper-division requirement. Additionally, the A.B. degree candidate may count these toward the 12 upper-division units required outside the major.

3. These courses are *not included* in the 30-unit limitation of units that may be taken outside of the College of Letters and Science (see page 148).

4. These courses do not satisfy the Area Requirements (Natural Sciences/Humanities/Social Sciences) with the exceptions of Entomology 1, 10, and Human Anatomy 102, 102L which may be offered toward the Natural Sciences requirement.

Agricultural Economics 147, 176.

Anatomy 100, 170.

Animal Science 123.

Applied Behavioral Sciences 17, 160.

Asian American Studies 33, 110.

Atmospheric Sciences 20, 20L.

Avian Sciences 13, 13L.

Consumer Economics 141, 142.

Design 6A–6B, 142A–142B, 143, 144.

Engineering 3, 10, 17, 100, 102A–102B, 103A–103B, 104A–104B, 105A–105B, 110, 115, 122, 180, 187.

Engineering: Applied Science 115, 135A.

Engineering: Civil 141, 148, 149.

Engineering: Electrical 112A–112B, 130A–130B, 131A–131B–131C, 140A–140B, 145A–145B–145C, 155A–155B, 157A–157B, 172, 173, 174, 175, 176, 177, 182, 184.

Engineering: Mechanical 125, 127, 171, 172, 185, 186.

Entomology 1, 10, 104, 106, 119, 119L, 121.

Environmental Horticulture 105, 107, 115.

Environmental Planning and Management 1.

Environmental Studies 5, 10, 101, 102, 110, 133, 168, 180, 192.

- Environmental Toxicology** 10, 110, 180.
Epidemiology and Preventive Medicine 140, 150.
Foods 20.
Food Science and Technology 107A.
Human Anatomy 102, 102L.
Human Development 131, 136.
Native American Studies 113.
Nematology 110.
Nutrition 10, 102A-102B, 102L, 110, 111, 111L, 114.
Physiological Sciences 101A-101B, 102A-102B.
Plant Pathology 120.
Plant Science 101, 101D, 102.
Range Management 100.
Resource Sciences 2, 10, 10L, 100, 100L, 101, 110.
Soil Science 88, 120A-120B.
Soil and Water Science 1, 2, 101, 102, 130, 140.
Textiles and Clothing 161.
Veterinary Microbiology 126, 127, 128.
Viticulture and Enology 3.
Water Science 10, 106, 116, 120, 132, 141.

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT EXAMINATION CREDIT

Students earn 10 units credit toward the 180-unit bachelor's degree requirement for each CEEB Advanced Placement Examination satisfactorily passed during the junior year or senior year in high school.

Credit may not be earned in the University for courses which duplicate credit already allowed for advanced placement examinations as listed under *UCD COURSE EQUIVALENCES*, column below. See exception for biology and chemistry under *REMARKS*. Students who have not received exam results should carefully avoid enrolling in a UCD course for which credit may not be granted. Exam scores will be posted on the Letters and Science bulletin board (opposite Room 175, Mrak Hall) as soon as they are made available to the University. See chart below for details regarding course equivalences and breadth requirement credit allowed toward graduation.

EXAMINATION	SCORE	UCD COURSE EQUIVALENCES	CONTINUING COURSE	BREADTH CREDIT ALLOWED	REMARKS
English English	5, 4, 3	English I and 3		Humanities 4 units	No exemption from English Composition Examination.
Foreign Languages				Humanities	
French	5, 4, 3	French 6	French 30A or any upper division literature course.	4 units	
German	5, 4, 3	German 4, 6A or 6B	Any upper division course; German 101 strongly recommended.	4 units	The Foreign Language Requirement for the College of Letters and Science is satisfied by a score of 5, 4 or 3 on any language examination.
Latin	5, 4, 3	Latin 103	Determined by consultation with Classics adviser.	4 units	
Latin	5, 4, 3	Latin 102	Determined by consultation with Classics adviser.	8 units	
Spanish	5, 4, 3	Spanish 6	Spanish 27A; 101A may be taken concurrently.	4 units	
Humanities				Humanities	
American History	5, 4, 3	History 17A, 17B		8 units	Satisfies American History and Institutions Requirement.
European History	5, 4, 3	History 4B, 4C		8 units	
Music	5, 4, 3	No equivalent		4 units	
Natural Sciences				Natural Sciences	
Biology	5, 4	Biological Sciences 1, Botany 2, Bacteriol- ogy 2, Zoology 2	Any upper division course or, by option, any Biological Sciences "2" course.	10 units	Student has option of taking Bacteriology 2, Botany 2 and Zoology 2 for full unit credit.
	3	Biological Sciences 1	Any Biological Sciences course except "10" series.	10 units	
Chemistry	5, 4, 3	Chemistry 1A, 1B	See "Remarks."	10 units	Credit for Chemistry 1A and 1B equivalence may serve as prerequisite to 1C with instructor's consent; 1A and/or 1B may, however, be taken for full credit.
Mathematics	AB 5, 4, 3	Mathematics 11, 21A	Mathematics 21B	10 units	
	BC 5, 4, 3	Mathematics 11, 21A, 21B	Mathematics 21C	10 units	
Physics	5	Physics 10 or 2A, 2B	Determined by consultation with Physics adviser.	10 units	
	4	Physics 10 or 2A	Determined by consultation with Physics adviser.	10 units	
	3	Physics 10		10 units	

Summary Check List of Requirements for A.B. and B.S. Degrees:*(Read carefully details of requirements in all sections of the General Catalog.)***University Requirements**

- Subject A American History American Institutions

College Breadth Requirements*Bachelor of Arts Degree*

- English Composition Examination.
 Foreign Language: level of 12 units in one language.
 Natural Sciences, Social Sciences, Humanities: a total of at least 52 units with a minimum of 12 and a maximum of 20 in any one of the three areas.

Bachelor of Science Degree

- English Composition Examination.
 Natural Sciences: 90 units.
 Social Sciences, Humanities: a total of at least 20 units in either area or in combination.

Unit Requirements

- | | | | |
|--|---|---|--|
| 180 units
(Must include 75
in a four-year
institution.) | Must include at least
150 units.* | Must include at least 54
units in upper division
courses.* | For A.B.:
Must include 12
upper division
units outside
major depart-
ment.* |
| | | | |
| 180 units
(Must include 75
in a four-year
institution.) | May include 30 units in
courses outside L & S
Teaching Depts. and
not from approved
L & S List of Ap-
proved Courses in
Other Colleges. | May include a maximum
of 9 units in courses
numbered 300-499.

May include P.E. 5 and
maximum of 6 units of
P.E. 1. | |

* All units must be in Letters and Science Teaching Departments or on the "Letters and Science List of Approved Courses in Other Colleges" (see pages 158-159).

Major Requirements

Consult major adviser and appropriate departmental section of the *Catalog*.

Scholarship Requirements

An average of at least 2.0 for all units undertaken in the University of California and for:

- All lower- and upper-division courses required for the four-year major program.
 All upper division courses required for the major program.

Residence Requirement

In the University of California: At least three quarters.

In the College of Letters and Science:

- 35 of the final 45 units. No more than 18 of the 35 units may be in UCD summer session courses.
- 27 upper division units in courses offered in Letters and Science teaching departments, including 18 units in the major program.
- Education Abroad Program participants see page 57.

SUMMARY OF STUDENT SERVICES
Office of the Dean of the College, 150 Mrak Hall

The staff in this office assists students with questions concerning College requirements, scholarship (probation and disqualification), and other academic matters. Problems which cannot be resolved by staff assistants are referred to academic deans who are regularly available to students by appointment.

The staff also performs a number of regular functions:

1. It maintains a file of each student's academic record.
2. When a student transfers to Letters and Science from another institution, the Admissions Office determines the unit credit to be allowed for previous work; the College determines how the credit applies toward completion of breadth and unit credit for the bachelor's degree. A Status Card outlining this information is sent to each transfer student immediately prior to his enrollment.
3. It prepares a statement of remaining College requirements, on request, for senior students. (A student inquires about completion of major requirements with his faculty adviser or major department.)
4. It acts on petitions requiring Dean's approval; e.g., petitions for Declaration or Change of Major, Change of Study List (after established deadlines), Withdrawal, Readmission (on probation).
5. At the end of each quarter the deans review the records of all students who are subject to disqualification and recommend a student's dismissal from the College or continuation on probation.

School of Law

The School of Law offers a three-year professional curriculum leading to the degree of Juris Doctor. The fall of 1973 will see the school enroll its eighth class.

The program of the school is designed to combine the best features of traditional legal education with the development of new interests and approaches necessary for training lawyers to meet the demands of the coming decades. The three-year curriculum includes not only instruction to develop proficient legal practitioners, but also courses that reflect the general interests of the Davis campus in the environment, natural resources, agriculture, urban problems, and state government.

In general, the School offers opportunities for in-depth study of an area of law in an individualized program of classroom work, research and writing, and experience in the community. The School also seeks to promote critical evaluation of law and legal institutions in a broad perspective that requires the integration of non-legal disciplines with professional legal education.

The School is fully accredited by the American Bar Association, is a member of the Association of American Law Schools, and has a chapter of the Order of the Coif.

Preparation for the Study of Law

No specific college major is required for admission to the School of Law, and there is no prescribed prelegal program. The individual student's college record and Law School Admission Test score must, of course, demonstrate that the applicant is highly qualified for the study of law.

Pre-law students should plan a course of study that will give them a broad cultural background and include intensive work for a substantial period of time in a selected field of study. Pre-law students should develop the ability to communicate easily, persuasively, and accurately; to understand people and institutions; to gather and weigh facts; and to solve problems and think creatively. It is most important that pre-law students obtain mastery of the English language. They should be able to read rapidly and with comprehension and to express themselves clearly, completely, and concisely, both orally and in writing.

For additional information, see the official *Pre-Law Handbook*, published annually and prepared by the Law School Admission Council and the Association of American Law Schools. This book includes material on the law and lawyers, pre-law preparation, applying to law school, and the study of law, together with individualized information on most American law schools. It may be obtained at college bookstores or ordered from Educational Testing Service, Princeton, New Jersey 08540.

Requirements for Admission to the School of Law

Applicants for admission to the professional curriculum of the School of Law, leading to the degree of Juris Doctor, must evidence a record of sufficiently high caliber to demonstrate qualification for the study of law. A bachelor's degree or an equivalent degree from a college or university of approved standing must

have been earned prior to the time the applicant begins work in the School. The admission decision will be based upon a number of factors, including the applicant's previous accomplishments, academic performance and the score received on the Law School Admission Test. An applicant with an average lower than B+ (3.3) and an LSAT score below 600 should recognize that the chances of gaining admission are slight in the absence of major additional positive factors.

All applications are reviewed by the School of Law Admissions Committee. Students are admitted only on a full-time basis *and only in September*.

Law School Admission Test

All applicants are required to take the Law School Admission Test administered by the Educational Testing Service. Testing centers have been established for the convenience of applicants in all parts of the United States and in many foreign countries. Tests are given five times a year: February, April, July, October, and December. If at all possible, applicants should take the test by October and in any event not later than December, for admission in the following Fall. The completed test application blank, accompanied by the fee, must be received by the Educational Testing Service in Princeton *not less than 21 days before the date of the test*.

Applicants should write to: Law School Admission Test, Educational Testing Service, Princeton, New Jersey 08540, to obtain application forms, information about the test, specific test dates, and the location of testing centers.

Admission Procedures

1. Application for admission to the School of Law and to the Graduate Division of the University for the program leading to the degree of Juris Doctor should be made on forms which will be supplied by the School and should be addressed to: Office of the Dean, School of Law, University of California, Davis, California 95616. *The application must be accompanied by a \$20 nonrefundable application fee* in the form of a check or money order made payable to The Regents of the University of California. This School will waive the application fee upon receipt of evidence of payment of the fee to Boalt Hall, UCLA School of Law, or any Graduate Division of the University of California. Other schools of law affiliated with the University (excluding Hastings) may waive this fee if notified, at the time of application, that the fee has been paid at Davis. The last date for filing completed application forms is March 1 of the year in which admission is sought, but earlier filing is strongly recommended and will materially assist the School of Law Admissions Committee in its consideration of the application. No application will be considered if received in the Office of the Dean after March 1 of the year in which admission is sought.

2. The applicant must register with the Law School Data Assembly Service (LSDAS) no later than January 1 of the year in which admission is sought by completing and mailing the registration form supplied with each LSAT information packet. A transcript from each college or university attended should then be sent not to the School of Law but directly to: LSDAS, Educational Testing Service, Box 944, Princeton, New Jersey 08540.

The LSDAS will analyze the transcript and send a copy to the University of California, Davis, School of Law and other schools designated on the registration form. As soon as they are available, the applicant should submit to the School of Law (*not* to LSDAS) supplementary transcripts covering any work completed *after* the initial registration with LSDAS. With rare exceptions, *no action will be taken* on any application until college grades are submitted through the first semester or quarter of the applicant's senior year. In some instances, no action will be taken until second quarter senior year grades are submitted. Successful applicants will be required to submit directly to the School of Law a final transcript, showing the award of a bachelor's degree.

3. The applicant must also provide two letters of recommendation from disinterested and responsible persons to whom the applicant is well known. At least one of these letters should come from a faculty member under whom the applicant recently studied while in college. These letters of recommendation should be sent directly to the School of Law and must be received by the Office of the Dean before the Law School Admissions Committee can seriously consider the application.

4. The applicant must take the Law School Admission Test and request that the score be reported to the School. Applicants are urged to take the LSAT as early as possible and in no event later than December preceding the year in which admission is sought.

5. Applicants accepted by the School of Law are simultaneously admitted to the Graduate Division of the University for the program leading to the degree of Juris Doctor. Applicants intending to pursue studies leading to other graduate degrees, or who wish to become candidates for a Combined Degree Program, must make separate application to the Graduate Division of the University prior to commencing such studies.

6. Interviews with members of the Admissions Committee are not an established part of the Law School admission procedure.

Admission to Advanced Standing

Applicants who have completed at least one year of work in another approved law school may, in exceptional cases, be admitted to advanced standing with credit for not more than one year of such work. Usually no more than five transfer students are admitted to the relevant second-year class. No application for advanced standing will be considered until the Law School Admissions Committee has received transcripts for all prior law school work.

Application procedures for advanced standing are the same as described above with the addition of (1) a letter from the Dean of any law school previously attended indicating that the applicant is in good standing; (2) at least one letter of recommendation from a law professor; and (3) transcripts of all law school work. Committee decisions on applicants for admission to advanced standing are normally made in late July or August of the year in which admission is sought.

Students who have been disqualified at another law school will not be admitted to this School of Law.

Professional Curriculum and Degree

The course of study in the professional curriculum requires nine quarters for completion and extends over a period of three years. It is designed for full-time students only; no part-time or evening program is offered. New students are admitted only at the beginning of the fall quarter.

Students who have been admitted to the School as candidates for the professional degree and who have completed satisfactorily the professional curriculum of 126 quarter units and the required period of resident study will be recommended for the Degree of Juris Doctor.

The work of the first year is prescribed. This work provides the essential foundation for subsequent legal study and the satisfactory completion of the first-year courses is, in all cases, a prerequisite to courses of the second and third years. The work of the second and third years is elective. Students who fail to attain satisfactory grades may be required to withdraw from the School at the end of any academic year.

Courses taken in summer sessions in other accredited law schools may, with prior permission, be credited toward the units required for the professional degree.

The courses of the professional curriculum are listed on page 355.

Combined Degree Programs

Students with interests in areas such as anti-trust, business, labor law, criminal law, or ecology may find a joint degree involving law and another discipline such as economics, business, sociology, or science attractive. In order to encourage this kind of study the School, in conjunction with other schools and University departments, has established Combined Degree Programs. Under these programs a student may work toward a J.D. degree and a master's degree in another discipline at the same time. In some instances it may be possible to work on Ph.D. programs as well.

Normally a Combined Degree Program will take at least three-and-a-half to four years. Students in the program will usually be able to earn twelve quarter hours of law school credit for work in the related discipline and normally can complete the combined degrees in less time than would be required for earning the two degrees separately. The student pursuing a Combined Degree Program will usually take the first year of the program entirely in the School of Law. During the remaining years course work may be divided between the law school and the related discipline. The student must satisfy the admission requirements for both programs and must file applications with both units. Degree programs are presently available in combination with the Berkeley School of Business for the M.B.A. degree and with UCD departments for the M.A. degree in economics and sociology. The law school will seek to work out programs for students interested in other disciplines. Students interested in the Combined Degree Program may enroll at any time prior to the beginning of their third year in law school. Applicants for admission to the School of Law who are interested in pursuing a Combined Degree Program and have made separate application to the applicable school or department, should so indicate on the School of Law admission form.

School of Medicine

The School of Medicine will admit its sixth class to a course of professional instruction commencing fall quarter 1973.

The degree of Doctor of Medicine requires the satisfactory completion of a four-year course of study comprised of 15 consecutive quarters. Course work is conducted on the Davis campus, at the Sacramento Medical Center of the University of California, Davis, and in nearby affiliated hospitals.

The School is currently housed in interim facilities on the Davis campus. Planning for permanent facilities has reached an advanced stage and the permanent buildings will be constructed on the Davis campus on a 150-acre site dedicated to the health sciences.

Admission Policies

The class entering in the fall of 1973 will be limited to 100 students selected on the basis of academic achievement and promise as well as personal characteristics which lead the Admissions Committee to feel the candidates will not only be able to complete satisfactorily the requirements of the medical curriculum, but will also become excellent practitioners of the profession of medicine. Factors taken into consideration include an applicant's scholastic record to date; Medical College Admission Test performance; and reports of teachers, advisers, and interviewers with regard to intellectual capacity, motivation, emotional stability, and personal dedication.

The vast majority of openings in the entering class will be awarded to students who are legal residents of the State of California; however, a few out-of-state students will be accepted. The School of Medicine also participates in the program of the Western Interstate Commission for Higher Education. In this program are a number of states which do not offer professional graduate medical education within the state. Applicants from such states found eligible by both the School of Medicine and their own states are charged resident rather than non-resident tuition. Further information may be obtained by communicating with this Commission, whose address is University East Campus, 30th Street, Boulder, Colorado 80300.

The School of Medicine is fully cognizant of the need for increased opportunities in medical education for individuals from disadvantaged educational, cultural, and socioeconomic backgrounds. A special subcommittee of the Admissions Committee comprised of faculty and students has been appointed to identify and advise men and women from such backgrounds, to review applications from self-selected disadvantaged individuals, and to interview those whose applications indicate strong potential. The regular School of Medicine application procedures should be followed by disadvantaged applicants.

Transfer with Advanced Standing

A few places may be available for students in other medical schools who wish to transfer into the third year of the curriculum. Students are not considered for transfer into the second or fourth years of the curriculum. Students who wish

to apply for transfer should write directly to the Secretary of the Admissions Committee for applications. Applications may be submitted at any time. The third-year class commences its work early in July.

Students applying from foreign medical schools are required to submit the results of Part I of the examination given by the National Board of Medical Examiners.

Application Procedures

The School of Medicine participates in the centralized American Medical College Application Service (AMCAS). Application Request Cards are available from the medical school admissions office after March 15 of each year. (Applicants may also secure this form from other AMCAS-participating medical schools, or from their premedical advisers.) Applicants need submit only one application and one set of official transcripts to AMCAS, regardless of the number of member schools to which they are applying.

Upon receipt of the Application Request Card, AMCAS will send the applicant an Application for Admission, together with descriptive material and instructions. The completed application and other required credentials should be submitted directly to AMCAS for verification, reproduction, and immediate distribution to the medical schools designated by the applicant.

After the AMCAS application has been received by the School of Medicine, the admissions office will notify each applicant individually and request letters of recommendation and a nonrefundable application fee of \$20. These items should be sent directly to the Secretary of the Admissions Committee, School of Medicine, University of California, Davis 95616, and not to AMCAS. Recommendations can be in the form of a report by a premedical advisory committee at the college or university where the applicant is enrolled, or two individual letters from faculty members familiar enough with the applicant and his abilities to make a meaningful evaluation. It is suggested that one such letter be from a science instructor and the other from a non-science instructor. In addition, applicants may be requested to authorize their physician to furnish health information to the Admissions Committee.

Applications will be accepted by the Admissions Committee between July 1 and December 1. It is strongly recommended that applicants make an early request for their application materials from AMCAS and see that their supporting items reach the Committee as soon as possible after acknowledgment by the School of Medicine of receipt of their application from AMCAS. The Committee reviews only complete application files and schedules interviews for highly qualified applicants throughout the application period and beyond. Early processing is normally advantageous to the applicant.

A personal interview is required of an applicant before a place in the first-year class can be offered. However, because of the large number of applicants, it is not possible to interview each one and for this reason interviews are held only at the invitation of the Admissions Committee. It is highly desirable that interviews take place at the medical school, to provide applicants with firsthand knowledge of programs and facilities and to permit opportunities to meet some

of the students. Where circumstances warrant, interviews may be arranged by the Admissions Committee at other locations.

Applicants will be notified of the status of their applications for admission as early as December 1 of the application period. In some cases, a final decision may be deferred by the Admissions Committee until March of the following year. Every effort will be made to reach a decision as early as possible and to notify the applicant promptly.

Premedical Requirements

Arrangements for taking the Medical College Admission Test should be made at the institution at which the applicant is presently enrolled, and the Examining Board should be requested to forward the results to the Secretary of Admissions of this School. Information about the test can be obtained at the student's undergraduate college or directly from MCAT Registration, Box 414, Iowa City, Iowa 52240. It is desirable that the results of the test be available at the time of the review of the applicant's qualifications. The Admissions Committee recommends that, if feasible, tests be taken in the spring prior to application since the results of the fall examination are not received by this School until late November.

Applicants for admission to the professional curriculum must have satisfactorily completed a minimum of three years (90 semester units; 135 quarter units) of college level work in an accredited school in the United States or Canada. However, in most instances, completion of a four-year course of study leading to a bachelor's degree is recommended. A maximum of two years (60 semester units; 90 quarter units) of community college work may be credited toward this requirement.

Although a specific major in science is not necessary, the following course content at college level is required:

- a. English, one year or its equivalent.
- b. Biological Science, one year or its equivalent.
- c. General Chemistry, one year or its equivalent.
- d. Organic Chemistry, one year or its equivalent. If two or more undergraduate organic courses are offered, it is recommended that the applicant elect the more rigorous option.
- e. Physics, one year or its equivalent.
- f. Mathematics, through integral calculus.

Except in extraordinary circumstances, applications will be considered by the Admissions Committee only when the applicant's overall grade-point and his science grade-point each average 2.5 or higher (on a scale where one credit hour of A = 4 points). In calculating grade-point averages, such courses as physical education and military science, and courses taken for graduate degrees, will be excluded. Grades of D in any of the required courses cannot be accepted. Required courses may not be taken on a passed/not passed basis unless all courses at the applicant's undergraduate institution are graded on this basis.

Applications may be submitted on the basis of work completed plus work in progress. However, all academic requirements must be completed by June 30 of the year for which admission is sought.

Although the minimum scholastic requirements are stated in some detail, it should not be inferred that admission is assured each applicant who meets these requirements. In addition to a high level of academic competence many other factors which determine success in pursuing a career in medicine are given full weight by the Admissions Committee in reaching its final decision.

School of Veterinary Medicine

The degree Doctor of Veterinary Medicine is granted upon the candidate's completion of a course of college study usually requiring seven to eight years. The final four years must be spent in the professional veterinary medical curriculum.

Students planning a career in veterinary medicine should consider broadening their educational experience by completing the baccalaureate degree before applying to the professional school.*

Admission Requirements

Students must complete a minimum of 90 quarter units (60 semester units) of college work including the required courses listed on page 173 before they will be admitted to the School of Veterinary Medicine. In addition to satisfying the preprofessional course requirements, students should plan their program so that they can obtain a baccalaureate degree in four years. The School of Veterinary Medicine will accept the Passed/No Record option (subject to general campus and individual school and college requirements) only in courses taken under the restricted electives in social sciences and humanities and the additional electives in social sciences, humanities, or agriculture.

Many students who enter veterinary medical school are motivated toward some highly specialized field of veterinary medicine such as food-animal disease control, public health, laboratory animal medicine, exotic animal medicine, or biomedical research. To increase their breadth of preparation for a particular field of endeavor, students are urged to include in their elective programs courses that will provide additional background for the fields in which they may be interested. In order to obtain more information and guidance as to programs, such students should contact an adviser representing one of these special areas through the Dean's Office in the School of Veterinary Medicine. For example, a veterinarian engaged in food-animal practice will be largely employed as a herd health consultant or manager and will devote more time to improving the health and productivity of animals than to treating the sick. Thus, a student interested in this field would be encouraged to include courses that provide an additional background in nutrition, food-animal production, farm management, and agricultural economics. A student interested in zoo and wildlife medicine would be urged to select courses in evolution, genetics, animal ecology, and animal behavior. For the field of space medicine, courses in computer techniques, mathematics, and electronics would be highly desirable.

Applicants for admission to the School of Veterinary Medicine must have completed:

1. The Subject A and American History and Institutions requirements of the University.
2. At least 90 quarter units (or 60 semester units) of credit in the University of California or other accredited institution, including the prescribed subjects listed below.

* For additional information prospective students should write the Associate Dean of Student Services, School of Veterinary Medicine, University of California, Davis 95616.

3. Subject Requirements:	Quarter Units
Chemistry (general, qualitative, organic, and quantitative)	25
Genetics	3
Physics (general)	9
Biology, zoology, embryology	16
English composition and additional English or rhetoric	8
Restricted electives in social sciences and humanities	17
Additional electives in social sciences, humanities or agriculture . . .	12
	—
	90

Students completing the requirements in an institution other than the University of California, Davis, are urged to check carefully the catalog of their college to be sure they are taking courses comparable in content.

Following is a list of the course requirements as taught at the UCD campus.

<i>Required Courses</i>	<i>Total Units</i>
Biological Sciences 1(5)	5
Chemistry 1A, 1B, 1C, 5, 8A, 8B(5, 5, 5, 4, 3, 3)	25
English 1 and additional English or rhetoric(4, 4)	8
Genetics 100A(3)	3
Physics 2A, 2B, 2C(3, 3, 3)	9
Zoology 2, 100 including laboratory(6, 4, 2)	12
Restricted electives*(17)	17
Additional electives**(11)	11
	—
	90

Application Procedures

Students are admitted to the School of Veterinary Medicine in the fall of each year only. Completed applications must be filed with the School by November 1 in order to be considered for the fall of the following year. Students may apply before completing all requirements. However, all required courses must be completed prior to the beginning of classes in the School of Veterinary Medicine. Along with the application, an outline showing plans for completion of all required courses must be submitted. *Incomplete applications or applications lacking study plans will not be processed.* Application forms may be obtained between August 15 and the application deadline of November 1, from the Admissions Office, School of Veterinary Medicine, University of California, Davis 95616.

Admission to the School of Veterinary Medicine

Enrollment is limited, and applicants are selected on the basis of scholarship with particular emphasis placed on achievement in required science courses. In addition, candidates should have sufficient experience with animals and some aspect of the veterinary medical profession to justify their decision to pursue

* Must be in social sciences and humanities.
 ** In specifically social sciences, humanities, or agriculture.

a lifetime career in veterinary medicine. Comprehensive letters of recommendation are an important consideration in the review of applications. Men and women are considered on an equal basis. Applicants will be notified as soon as possible of their admission status.

Since scholastic achievement, particularly in the required courses, is a very important criterion for admission to the School of Veterinary Medicine, students are cautioned to use the Passed or No Record option sparingly.

In view of the pressures from residents of the State of California for admission to the School of Veterinary Medicine (i.e., there are 6 to 10 applications from residents for admission to each of the 94 first-year openings in the D.V.M. curriculum each year), and, since it is virtually impossible for a California resident to gain admission to a veterinary school elsewhere, it is the stated policy of the University that, with only rare exceptions, admission to the School is limited to residents of the State. In cases where exceptions are made, first preference is given to residents of states participating in the Western Interstate Commission for Higher Education (WICHE). Students residing in WICHE states that do not have a school of veterinary medicine who wish to participate in this program must be certified by their home state. For addresses of state certifying officers, write to the Western Interstate Commission for Higher Education, University East Campus, 30th Street, Boulder, Colorado 80300.

Admission in Advanced Standing

An applicant requesting admission to advanced standing in the School of Veterinary Medicine may be accepted under the following conditions:

1. He must furnish evidence that he was eligible for admission to the first quarter of the School of Veterinary Medicine.
2. He must show that he has satisfactorily completed courses equivalent in kind and amount to those given in the School of Veterinary Medicine in the quarter or quarters preceding that in which admission is desired.
3. He may be required to pass examinations in any or all subjects for which credit is asked.

Requirements for the Degree Bachelor of Science

After admission to the School of Veterinary Medicine, the student completes a four-year professional curriculum leading to the degree Doctor of Veterinary Medicine. At the end of the first two years of the professional curriculum, students who do not hold a baccalaureate are eligible to receive a Bachelor of Science degree in Veterinary Science provides that they:

1. Satisfy the general University requirements (pages 37-39).
2. Complete in the School of Veterinary Medicine all courses prescribed in the first two years of the professional curriculum. Exceptions may be made to students admitted in advanced standing.

Requirements for the Degree Doctor of Veterinary Medicine

1. The candidate for the degree Doctor of Veterinary Medicine must have completed the general University requirements for a baccalaureate degree (pages 37-39).

2. He must possess good moral character.

3. He must have studied veterinary medicine for the equivalent of twelve quarters of twelve weeks each. The last six quarters must have been spent in the University of California School of Veterinary Medicine.

4. He must maintain a grade-point average of 2.0 (a C average), computed on the total of all courses taken in the School; and he must have satisfactorily completed all required work as determined by the Faculty of the School.

The Degree Master of Preventive Veterinary Medicine

Applicants must hold the degree Doctor of Veterinary Medicine or equivalent degree from an accredited school of veterinary medicine and be recommended for admission by the faculty committee in charge of the program. Candidates for the degree must satisfactorily complete in residence a minimum of 36 quarter units of approved course work. The program, consisting of a group of required core courses and optional electives, is scheduled over a 12-month period beginning in August of each year. Admission is limited to the beginning date of the program each year. Specific fields of emphasis are epidemiology, medical statistics, information retrieval and analysis, and disease control and eradication. Options are also available for specialization in food hygiene, and in other veterinary medical areas related to preventive veterinary medicine. The program commences with 5 weeks of instruction in Elementary Statistics prior to the beginning of the fall quarter and is completed after a 10-week period of research and field studies subsequent to the completion of the spring quarter. Inquiries regarding the program should be directed to the Office of the Dean, School of Veterinary Medicine, University of California, Davis 95616.

The Degrees Master of Science and Doctor of Philosophy

General information regarding these degrees will be found in the *Announcement of the Graduate Division* which may be obtained from the Graduate Division at Davis. Additional detailed information may be obtained by writing to the Chairman of the department in which the candidate wishes to study.

Professional School Requirements and Preparation

Eligibility for admission to one of the University's professional schools or curricula is contingent upon the successful completion of an undergraduate program of preprofessional training of 2 to 4 years duration (depending upon unit requirements for specific schools). Announcements describing admission and course requirements for a particular school are available upon request by writing to the school of your choice in care of the appropriate University campus (see legend and addresses below).

Professional schools and curricula requiring 2 to 3 years of undergraduate preparation:

- School of Business Administration (B)
- School of Criminology (B)
- Curriculum in Cytotechnology (SF)
- Curriculum in Dental Hygiene (SF)
- Schools of Dentistry (LA, SF)
- School of Engineering (I)
- School of Engineering and Applied Science (LA)
- School of Forestry and Conservation (B)
- Curriculum in Medical Illustration (SF)
- Curriculum in Medical Technology (SF)
- Schools of Medicine (D, I, LA, SD, SF)
- Schools of Nursing (LA, SF)
- School of Optometry (B)
- School of Pharmacy (SF)
- Curriculum in Physical Therapy (SF)
- School of Public Health (LA, B)
- School of Veterinary Medicine (D)

Professional schools requiring a bachelor's degree in appropriate field of study for admission:

- Graduate Schools of Administration (I, R)
- School of Architecture and Urban Planning (LA)
- Graduate Schools of Business Administration (B, LA)
- Schools (or Departments) of Education (B, D, I, LA, R, SB, SC)
- Preparation for teaching credentials is available as follows:
 - Kindergarten-Primary (LA, SB)
 - Elementary Teaching (B, D, I, LA, R, SB, SC)
 - Secondary Teaching (B, D, I, LA, R, SB, SC)
 - Special Education (R)
 - Special Secondary (D, SB)
 - Junior College Teaching (B, LA, R, SB)
 - Pupil Personnel Services (B, SB)
 - School Librarianship (B, LA)
 - Special Services (LA, SB)
 - Supervision (B, LA)
 - Administration (B, LA)

Graduate School of Journalism (B)
Schools of Law (B, D, LA)
Hastings College of the Law (SF)
School of Librarianship (B)
School of Library Service (LA)
Graduate School of Public Affairs (B)
School of Public Health (LA, B)
Schools of Social Welfare (B, LA)
Scripps Institution of Oceanography (SD)

Legend and addresses of above schools:

(B) University of California, Berkeley, California 94720
(D) University of California, Davis, California 95616
(I) University of California, Irvine, California 92664
(LA) University of California, Los Angeles, California 90024
(R) University of California, Riverside, California 92502
(SD) University of California, San Diego, La Jolla, California 92037
(SB) University of California, Santa Barbara, California 93106
(SC) University of California, Santa Cruz, California 95060
(SF) University of California, San Francisco, California 94122

Direct inquires about schools and curricula in San Francisco (except Hastings College of the Law) in care of: Office of Student Admission.

Preprofessional Training

Preprofessional programs do not lead to a bachelor's degree. Since professional schools cannot accommodate all qualified applicants, students should prepare themselves for alternate careers. Hence, students are expected to pursue a major program while completing their preprofessional requirements.

With careful planning it is possible for students to undertake any one of a variety of majors. While most students interested in the health sciences will elect a major within the biological sciences, majors as varied as psychology, engineering, art, etc., can be equally acceptable. Law schools, in particular, do not prescribe any specific major program. Equal consideration is given to all qualified applicants completing a course of study which gives them a broad cultural background and includes intensive work for a substantial period of time in a selected field of study.

Preprofessional Advising

Students interested in Allied Health Sciences, Medicine, and Veterinary Medicine career opportunities may wish to consult the Preprofessional Advising Office, second floor South Hall, or telephone (916) 752-2672. Professional and peer staff are available to advise in the preparation for these careers and assist in the application procedure for entry into professional schools in these areas. An up-to-date library of catalogs of professional schools and reference books is maintained.

Referral Information

Although the Davis campus offers course work in preparation for admission to most of the schools listed above, the referral information which follows relates to preprofessional training in greatest demand at Davis.

Students are strongly urged to read this Catalog and the appropriate professional school announcement carefully before consulting faculty and staff about admission requirements. Communicate directly with personnel at the professional school to which you expect to apply if more detailed information is needed. A list of general reference books which may be of interest is presented at the conclusion of this section.

Business Administration

Preparation for study. Consult school announcement and Economics Department Office, Room 380, Academic Office Building III, Davis, phone 752-0741.

Forestry

Preparation for study. Consult this Catalog, pages 127-130 and school announcement.

Preforestry advisers. E. H. Stanford, Department of Agronomy and Range Science, Room 267, Hunt Hall, Davis, phone 752-1702 or 752-1703 and Jack Major, Botany Department, Room 245, Animal Science, phone 752-0621 or 752-0617.

Law

Preparation for study. Consult this catalog, page 164, school announcements, and the annual *Prelaw Handbook, Official Law School Guide*, prepared and published by The Association of American Law Schools and the Law School Admission Council.

Prelaw adviser for counseling about general law school admission requirements, exclusive of program planning: C. E. Jacobs, Department of Political Science, Room 271, Voorhies Hall, Davis, phone 752-2637 or 752-0966.

School of Law, Davis. Consult this Catalog, pages 164-167, *Announcement of the School of Law*, and Dean's Office, Room 1011, Martin Luther King, Jr. Hall, phone 752-0243.

Medicine

School of Medicine, Davis. Consult this Catalog, pages 168-171. For more detailed information contact the Office of Student Affairs, School of Medicine, Davis, phone 752-3171.

Veterinary Medicine

Preparation for study. Consult this Catalog, pages 172-174 and Dean's Office, College of Agricultural and Environmental Sciences, Room 228, Mrak Hall, Davis, phone 752-0107, or 752-0108.

School of Veterinary Medicine, Davis. Consult this Catalog, pages 172-175, School announcement, and Office of the Assistant Dean-Student Services, Room 1024, Haring Hall, Davis, phone 752-1383.

Allied Health Sciences

Consult Margaret McGimpsey or Susan Meunier, Office of Allied Health Sciences, School of Medicine, Davis (phone 752-0230), regarding curricula and schools for all health fields other than human and veterinary medicine. Preparatory course work only is offered at UC Davis, so the actual professional training for all fields must be completed elsewhere. Degree work is offered at Davis for the fields of Medical Technology and Dietetics and Nutrition; however, post-graduate internships are not available on the campus. Allied health fields include:

Clinical Psychology	Occupational Therapy
Dental Hygiene	Optometry
Dentistry	Pharmacy
Health Care Administration	Physical Therapy
Health Education	Physician Assisting
Medical Illustration	Rehabilitation Counseling
Medical Librarianship	Social Work
Medical Technology	Speech Therapy and Audiology
Nursing	

Admission Requirements

Suggested Curricula. As specific school requirements vary, students should contact either the schools directly or the Office of Allied Health Sciences for more detailed information. Elective units for all programs must include course work in the social sciences and humanities; Community Health 101 (listed under Medicine in this catalog) and a foreign language are recommended. Further, students are advised that professional school admission committees generally prefer students to have participated in health care and community activities.

Dental Hygiene. Two years of preparation with transfer necessary into a two-year professional curriculum. The Dental Hygiene Aptitude Test is required. English 1, 3.

Chemistry 1A, 1B, 8A, 8B.

Biological sciences (one year with laboratory). Recommended: Bacteriology 2, 3; Zoology 100, 105, or 106.

Psychology: two courses.

Recommended: Nutrition 10.

Dentistry. Students complete three to four years of preprofessional course work prior to admission to the four-year dental curriculum. Students must take the Dental Admission Test in April or October, one year prior to projected date of admission.

English 1, 3.

Chemistry 1A, 1B, 1C, and eight units of organic chemistry.

Physics 2A, 2B, 2C, 3A, 3B, 3C.

Biological sciences (one year with laboratory). Recommended: Zoology 100, Anatomy 100, or Zoology 105 or 106.

Psychology: two courses.

Recommended: Mathematics 13 or 16; Genetics 100A-100B or 115.

Health Care Administration. A public administration or business management orientation is recommended for the baccalaureate and master's degree work. Recommended:

Mathematics 13.

Upper division courses in Applied Behavioral Sciences (e.g., course 151).

Economics (accounting and macro- and micro-economic theory).

Community Health (listed under Medicine).

Political Science (e.g., courses 180, 181, 182, 183, 187).

Sociology (e.g., courses 154, 180).

Medical Technology. Students should complete a Bachelor of Science degree in any one of the natural sciences, with course work to include:

Chemistry 1A, 1B, 1C, 8A, 8B, and Chemistry 5 or Biochemistry 101.

Biological sciences: 27 units, including instruction in hematology (Clinical Pathology 101), immunology (Veterinary Microbiology 126), and medical microbiology (Veterinary Microbiology 127).

Physics 2A, 2C. Recommended: Physics 3A, 3C.

A postgraduate twelve-month internship is required.

Nursing. Two years of preparation with transfer necessary into a two- or three-year nursing curriculum.

*English 1, 3.

*Chemistry 1A, 1B.

Chemistry 8A, 8B.

*Physiology 2-2L or 101-101L.

*Human Anatomy 102, 102L (listed under Medicine).

Bacteriology 2, 3.

Nutrition 10.

*Psychology 1A or 10 (or 1C).

*Sociology 1 or 3.

Recommended: Anthropology 2; Human Development courses.

Occupational Therapy. Basic professional training is available at both undergraduate and graduate levels. Applicants are expected to be proficient in some art or crafts activities.

Chemistry 1A, 1B.

Physiology 2-2L or 101-101L.

Human Anatomy 102, 102L (listed under Medicine).

Psychology: one course.

Sociology: one course.

Recommended: Human Development 131 or Psychology 112.

Optometry. Two years of preparation with transfer necessary into a four-year Doctor of Optometry degree curriculum.

English 1, 3.

Chemistry 1A, 1B, 8A, 8B.

Physics 2A, 2B, 2C, 3A, 3B, 3C.

* Required by U.C.S.F. campus. Note that Psychology 1C is not acceptable at U.C.S.F.

Mathematics 11 or 16A.

Biological sciences: one year with laboratory.

Bacteriology 2.

Psychology: two courses.

Recommended: Mathematics 16B, 16C.

Pharmacy. Pharmacy requires six years of preparation prior to licensure, including one to two years of preprofessional course work. Many states include in this six years a twelve-month internship.

English 1, 3.

Chemistry 1A, 1B, 1C.

Chemistry 8A-8B or 128-129.

Chemistry 5.

Physics 2A, 2B, 2C, 3A, 3B, 3C.

Mathematics 16A, 16B, 16C.

Biological sciences: one year with laboratory. (U.C.S.F. campus requires vertebrate and invertebrate zoology.)

Economics: one course.

Recommended: Bacteriology 2, 3.

Physical Therapy. Basic professional training is available at both undergraduate and graduate levels.

English 1, 3.

Chemistry 1A, 1B. Recommended: Chemistry 8A.

Physics 2A, 3A. Physics 2B, 2C, 3B, 3C strongly recommended.

Physiology 2-2L or 101-101L.

Anatomy 102, 102L.

Psychology: two courses. Recommended: Psychology 168.

Recommended: Physical Education 103, 104A; Human Development courses.

Physician Assisting. The majority of programs require that applicants have one or two years of experience in direct patient care, usually as a medical corpsman or practical nurse. For most students, nursing in the extended role offers a more reasonable alternative.

Reference Books

The following books are available in the Reference Room of the University Library, the Health Sciences Library, or the Office of Allied Health Sciences.

American Universities and Colleges, edited by the American Council on Education.

Admission Requirements of American Dental Schools, published by the American Association of Dental Schools.

Admission Requirements of American Dental Hygiene Schools, published by the American Dental Hygienists' Association.

Medical School Admission Requirements U.S. and Canada, published annually by the Association of American Medical Colleges.

Graduate Division

Graduate study and research are administered by the Graduate Council, a standing committee of the Davis Division of the Academic Senate, and by the Dean of the Graduate Division. A Universitywide Coordinating Committee on Graduate Affairs determines general policies and establishes common procedures.

Advanced Degrees

On the Davis campus the following advanced degrees are offered: Master of Arts, Master of Arts in Teaching, Master of Fine Arts, Master of Science, Master of Education (in Agricultural Education), Master of Engineering, Master of Health Services, Master of Preventive Veterinary Medicine, Candidate in Philosophy, Juris Doctor, Doctor of Engineering, Doctor of Medicine, Doctor of Philosophy, and Doctor of Veterinary Medicine.

Majors for graduate study and the advanced degrees offered in each are shown below:

Agricultural Chemistry (M.S., Ph.D.)	English (M.A., Ph.D.)
Agricultural Economics (M.S., Ph.D.)	Entomology (M.S., Ph.D.)
Agricultural Education (M.Ed.)	Family Nurse Practice (M.H.S.)
Agricultural Science and Management (M.S.)	Food Science (M.S.)
Agronomy (M.S.)	French (M.A., Ph.D.)
Anatomy (M.S., Ph.D.)	Genetics (M.S., Ph.D.)
Animal Science (M.S.)	Geography (M.A., Ph.D.)
Anthropology (M.A., Ph.D.)	Geology (M.S., Ph.D.)
Art (M.F.A.)	German (M.A., Ph.D.)
Atmospheric Science (M.S., Ph.D.)	History (M.A., Ph.D.)
Avian Sciences (M.S.)	History of Art (M.A.)
Biochemistry (M.A., Ph.D.)	Horticulture (M.S.)
Biomedical Engineering (Ph.D.)	International Agricultural Development (M.S.)
Biophysics (Ph.D.)	Irrigation (M.S.)
Botany (M.S., Ph.D.)	Law (J.D.)—refer to School of Law
Chemistry (M.S., Ph.D.)	Linguistics (M.A.)
Child Development (M.S.)	Mathematics (M.A., Ph.D.)
Classics (M.A.)	Medicine (M.D.)—refer to School of Medicine
Comparative Pathology (M.S., Ph.D.)	Microbiology (M.A., Ph.D.)
Comparative Pharmacology and Toxicology (M.S., Ph.D.)	Music (M.A., M.A.T.)
Consumer Science (M.S.)	Nutrition (M.S., Ph.D.)
Dramatic Art (M.A., M.F.A., Ph.D.)	Philosophy (M.A., Ph.D.)
Ecology (M.S., Ph.D.)	Physical Education (M.A.)
Economics (M.A., Ph.D.)	Physics (M.A., Ph.D.)
Education (M.A.)	Physiology (M.S., Ph.D.)
Endocrinology (M.A., Ph.D.)	Plant Pathology (M.S., Ph.D.)
Engineering (M.Eng., D.Eng., M.S., Ph.D.)	Plant Physiology (M.S., Ph.D.)
	Political Science (M.A., Ph.D.)

Preventive Veterinary Medicine (M.P.V.M.)—refer to School of Veterinary Medicine	Sociology (M.A., Ph.D.)
Psychology (M.A., Ph.D.)	Soil Science (M.S., Ph.D.)
Range Management (M.S.)	Spanish (M.A., Ph.D.)
Rhetoric (M.A.)	Vegetable Crops (M.S.)
Russian (M.A.)	Veterinary Medicine (D.V.M.)—refer to School of Veterinary Medicine
	Zoology (M.A., Ph.D.)

This list changes frequently as graduate work expands into new areas of study. Prospective students seeking further information should consult the Graduate Division. General requirements for degrees are published in the *Announcement of the Graduate Division*. The specific requirements are available from the office of the department concerned.

Programs sponsored by a graduate group, containing faculty drawn from more than one department, are listed below. If a student is interested in one of these areas he should write to the Chairman of the Graduate Group for more information.

- Agricultural Chemistry—Donald G. Crosby, Ph.D., Chairman, 109 Environmental Toxicology
- Agricultural Science and Management—Dillon S. Brown, Ph.D., Chairman, 1059 Wickson
- Anatomy—Raymond D. Barnes, Ph.D., Chairman, 1043 Haring Hall
- Atmospheric Science—John J. Carroll, III, Ph.D., Chairman, 2052 Bainer Hall
- Avian Sciences—Daniel W. Peterson, Ph.D., Chairman, 209 Asmundson Hall
- Biochemistry—Roy H. Doi, Ph.D., Chairman, 239B Briggs Hall
- Biomedical Engineering—G. Worden Waring, Ph.D., Chairman, Temporary Building 169
- Biophysics—Richard S. Criddle, Ph.D., Chairman, 555 Hutchison Hall
- Botany—Herbert B. Currier, Ph.D., Chairman, 162 Robbins Hall
- Child Development—David B. Lynn, Ph.D., Chairman, 210 Walker Hall
- Comparative Pathology—Walter S. Tyler, D.V.M., Ph.D., Chairman, 1017 California Primate Research Center
- Consumer Science—Howard G. Schutz, Ph.D., Chairman, 160 Everson Hall
- Ecology—R. Merton Love, Ph.D., Chairman, 255 Hunt Hall
- Endocrinology—Thomas C. Lee, Ph.D., Temporary Building 139
- Engineering—Warren H. Giedt, Ph.D., Chairman, 2006 Bainer Hall
- Food Science—W. D. Brown, Ph.D., Chairman, Temporary Building 189
- Genetics—Robert W. Allard, Ph.D., Chairman, 201B Hutchison Hall
- Horticulture—James A. Cook, Ph.D., Chairman, 2009 Wickson Hall
- International Agricultural Development—Trimble R. Hedges, Ph.D., Chairman, 220 Voorhies Hall
- Linguistics—Wayne C. Harsh, Ph.D., Chairman, 111 Sproul Hall
- Microbiology—Robert E. Hungate, Ph.D., Chairman, 278 Hutchison Hall
- Nutrition—William C. Weir, Ph.D., Chairman, 162 Animal Science
- Pharmacology and Toxicology—Wendell W. Kilgore, Ph.D., Chairman, 111 Environmental Toxicology

Physiology—Edward A. Rhode, D.V.M., Dean's Office, School of Veterinary Medicine

Plant Physiology—Roger J. Romani, Ph.D., Chairman, 2039 Wickson Hall

Preventive Veterinary Medicine—Walter W. Saddler, D.V.M., M.P.H., Chairman, 2079 Haring Hall

Range Management—R. Merton Love, Ph.D., Chairman, 255 Hunt Hall

Soil Science—H. Michael Reisenauer, Ph.D., Chairman, 265 Hoagland Hall

Admission Standards

Students seeking admission to graduate status at the University of California must hold a bachelor's degree or its equivalent from an institution of acceptable standing. The program of preparation should be substantially equivalent in both the distribution of academic subject matter and in scholarship achievement to the requirements for a comparable degree at the University of California. Applications for admission are evaluated in terms of scholastic qualifications and formal preparation for the graduate field of study.

The Dean of the Graduate Division may deny an applicant admission if his scholastic record or his undergraduate program of study is judged inadequate as a foundation for advanced academic or professional study. This procedure applies to all applicants, whether they come from schools or colleges within the University of California or elsewhere. Departments may have special requirements for admission to graduate status, and some departments and schools require an additional application for admission to their advanced-degree program.

Application for Admission

Students seeking admission to the University of California, Davis, for graduate work may obtain application forms by writing to the Dean of the Graduate Division, University of California, Davis 95616. Applications must be on file no later than *June 1* for the fall quarter, *October 1* for the winter quarter, and *January 1* for the spring quarter, but early filing, preferably six to twelve months prior to the date of registration, is strongly recommended. The application must be accompanied by a money order or a bank draft for \$20 made payable to The Regents of the University of California. *This fee is not refunded under any circumstances.* In cases where complete records are filed later than the above dates, the student's registration may be delayed, thus making him liable for the late registration fee of \$10, or he may not even be allowed to register. If registration is delayed, the student must obtain a Permit to Attend Classes from the Office of the Registrar.

Official transcripts of record covering all college and university work completed to date, together with official evidence of degrees conferred, should accompany or immediately follow the application. A separate original and official record must be presented from each institution previously attended. Transcripts of students' records and all other official credentials are retained in the files of the Office of the Dean of the Graduate Division. In addition to having the records sent to this office, the student must have in his possession an of-

ficial record for his use in conference with departments and for other purposes here. The Graduate Division office copy may not be borrowed.

Students wishing to apply for the programs leading to the Standard Teaching Credential in Education and to the degrees of Juris Doctor, Doctor of Medicine, Doctor of Veterinary Medicine, and Master of Preventive Veterinary Medicine must file applications directly with the appropriate departments or professional schools.

Reentry

Persons formerly registered in a regular session as graduate students who wish to return must apply for reentry and pay the Reentry Application Fee of \$20 at least six weeks before the beginning of the quarter in which they wish to enroll. The Application for Reentry may be obtained from the Graduate Division. Transcripts of records covering all work undertaken since the student was last registered in graduate status at Davis must be presented along with the Reentry Application.

International Students

Applicants for admission to the Graduate Division on credentials from universities and colleges in foreign countries are advised to make their initial inquiry no later than six months before the date of intended enrollment to permit processing of their records.

Students whose undergraduate preparation has been in a language other than English should furnish positive evidence that their command of both spoken and written English will permit them to profit by the instruction offered. A score report from the Test of English as a Foreign Language (TOEFL), which is administered by the Educational Testing Service for the College Board, is recommended for meeting this requirement. This test is given at many testing centers abroad three times a year, and full information is available from the Educational Testing Service, Princeton, New Jersey 08540. A number of other tests given by authorized examiners abroad are also acceptable. These include the Michigan Test (English Language Institute Test, University of Michigan), the interview reports supervised by the directors of the Institute of International Education overseas office, and the American University Language Center (AULC) Test.

On arrival all international students take the special University examination in English. Those who do not pass are assigned to remedial courses. Even though the student has been admitted, his registration may be deferred until he acquires an adequate command of English.

Graduate Study Without an Advanced Degree Objective

A student who does not wish to become a candidate for a higher degree may be admitted to a specified field of study for course work only. Such a program, which requires the approval of the Dean, must have a definite scholarly or professional purpose. The scholastic requirements for admission are the same as for those who are candidates for degrees.

Program of Study

When the student reports to his department or group, he will be assigned to the appropriate adviser, who will plan with him his program of study. This will depend to some degree on the undergraduate training, and the student may be assigned to undergraduate courses to remove deficiencies.

Each student must satisfy the degree requirements as published in the *Announcement of the Graduate Division*. The program in an area of study, as established by the department or group and approved by the Graduate Council, often includes a core of required courses, but considerable flexibility is permitted to suit the individual student's needs. Undergraduates at Davis who plan to pursue graduate study should consult with their major adviser early in their senior year to guarantee adequate preparation.

Intercampus Exchange Program

A graduate student registered on any campus of the University may become an Intercampus Exchange Student with the approval of his graduate adviser, the chairman of the department or group in which he wishes to study on the host campus, and the Dean of the Graduate Division on both the home and the host campus. The Intercampus Exchange Student has library, infirmary, and other student privileges on the host campus but is considered as a graduate student in residence on his home campus. The grades obtained in courses on the host campus are transferred to his home campus and entered on his official record. Forms for application for the intercampus exchange may be obtained at the office of the Dean of the Graduate Division. In order to avoid the \$10 late fee penalty, these forms should be filed with the home campus Graduate Division six weeks prior to the beginning of the quarter in which the student wishes to take advantage of this program.

Fellowships, Assistantships, and Loans

Fellowships are awarded by the Fellowship Committee of the Graduate Council on the bases of scholarship and promise of outstanding academic and professional contribution. Applicants planning to enter in a fall quarter and wishing to be considered for a fellowship or graduate scholarship must file the combined application for Admission and Fellowship no later than January 15 of the year preceding the fall quarter to be attended. These applications are considered only once a year; therefore students entering subsequent to a fall quarter cannot be considered. Students continuing in graduate status at Davis must file an application for fellowship and graduate scholarship for continuing students with their major department or graduate group chairman on or before January 15. Applications for both new and continuing students may be obtained from the Graduate Admission/Fellowship Office, Room 252 Mrak Hall.

Teaching assistantships and research assistantships are available in many departments, and interested students should inquire at the office of the department in which they wish to study.

Information regarding Graduate Fellowships supported by various other federal agencies is available at the Graduate Division.

Application for loan funds for graduate students should be addressed to the Office of Financial Aid. (See page 47.)

Teacher Credential Program

Programs leading to a Standard Teaching Credential with specialization in elementary teaching and in secondary teaching are offered under the jurisdiction of the Graduate Division. Provisions for implementation of the Ryan Act on this campus are still under consideration. Questions concerning these changes should be directed to the two departments concerned.

The curricula for teacher education are offered by the Department of Education and the Department of Applied Behavioral Sciences, and interested students should obtain detailed information at either department. The courses in professional education required for the credential are specified in this catalog under departmental listings of courses of instruction (see pages 197 and 260). Subject-matter requirements for the teaching major and minor are specified with departmental offerings.

Admission to the program is by the Graduate Division. Eligibility requires a scholarship record of 2.75 or better in all upper division work undertaken. Application for the 1974-75 program should be made to Room 174, Academic Office Building III, for the Department of Education, and the Graduate Division for the Department of Applied Behavioral Sciences. Information on deadlines should be obtained from the two departments.

Since the requirements for the credential are set up both by the State Department of Education and by the University, all students who intend to work for the credential are urged to consult an adviser in one of the departments named above early in their undergraduate career (preferably by the end of their freshman year).

Curricula are offered which lead to the Standard Teaching Credential with a specialization in elementary teaching or in secondary teaching and to the secondary credentials required for teaching classes reimbursed under the National Vocation Acts. Two routes for obtaining each type of credential are available: a student-teaching program (the usual route) and an internship program (limited in enrollment). Information on the internship program should be obtained from the two departments.

The course offerings listed in this catalog are subject to change without notice

Courses of Instruction

EXPLANATORY NOTE

Academic Credit. Academic work at the University is measured by "units of credit," which determine the amount of time a student has formally devoted to a given subject. In conjunction with the letter grade conferred by the instructor, units of credit give the student and those interested in his career a reasonably accurate evaluation of his progress in various subjects. Units of credit make it possible for a student to assemble a course program for a given term that meets the minimum requirements for a course load while reflecting his special interests. Units of credit also make it possible for students to transfer from one campus or university to another without undue difficulty.

Relation of Units of Credit to Course Procedure. The time-honored rule adopted by most colleges and universities is the so-called "Carnegie unit," which assigns one unit of credit for three hours of work by the student per week. The standard distribution of this work is one hour of lecture or discussion presided over by the instructor and two hours of outside preparation by the student. In laboratory courses, two or three hours of work in the laboratory are assigned for one unit of credit. In most courses at the Davis campus the standard procedure prevails, so that a three-unit course meets for three hours a week, a four-unit course for four hours, and so on. Courses that are an exception to this pattern are authorized for increased credit on the stipulation that more demanding assignments are to be laid down by the instructor. Students should inquire of the instructor, at least by the first class meeting, what the course will involve in the way of outside reading, term papers, problem sets, field trips, and the like, for these are not always spelled out completely in the *General Catalog* (this applies to all courses but is particularly urgent in the case of 4 or 5 unit courses). In this way, the student will be able to plan his work more systematically.

Course Designations. Class hours are published each quarter in the *Class Schedule* and room numbers are given in the *Class Schedule and Room Directory*.

The quarter in which a course is given is shown as follows: I, Fall Quarter (September to December); II, Winter Quarter (January to March); III, Spring Quarter (April to June); IV, Summer Quarter (June to August) which is for students in the School of Medicine only; and Summer (extra session). When a course is listed to be offered in even-numbered years or odd-numbered years, the year involved would be that in which the quarter occurs (e.g., fall quarter 1973 would be an odd-numbered year and winter and spring quarters 1974 would be even-numbered years).

A course number followed by two or three letters from the first part of the alphabet (for example, Mathematics 131A-131B-131C) is continued through three successive quarters, ordinarily from September to June; occasionally, however, a course of two quarters may begin in the Winter Quarter. The first quarter course listed in this way is prerequisite to the second, and the second to the third. On the other hand, where A and B portions of a course are listed separately

(for example, Economics 102A and Economics 102B), the A course is not prerequisite to B unless it is specifically mentioned in the listing of the B course.

Prerequisites. Prerequisites for courses should be noted carefully: the responsibility for meeting these prerequisites rests mainly on the student. Certain classes are restricted to a limited number of students, and for these classes it is especially important that the student should have the prerequisite courses by the time the course begins. Otherwise he may find himself displaced by a student who does have the necessary prerequisites. If a student can demonstrate that his preparation is equivalent to that given by the prerequisites specified, these prerequisites may be waived for this student by consent of the instructor.

Level of Courses. Freshmen and sophomores are not encouraged to take upper division courses (i.e., those numbered 100–199).

Special Study Courses. The regulations of the Academic Senate limit to 5 the number of units of "Special Study" courses that a student may take in a given quarter. On the Davis campus, courses with the following numbers presently fall into this category: 98, 99, 194H, 198, and 199.

A student who finds that he shares with an instructor an academic interest that cannot be accommodated within the formal course structure may find it possible to arrange one of these independent study courses. A special study form may be obtained from the instructor who agrees to give such a course: these proposals must be approved by the Chairman of his department, and are subject to review by the appropriate committees of the Academic Senate. Courses numbered 98 ("Directed Group Study") and 99 ("Special Study for Undergraduates") are primarily for lower division students. Courses numbered 198 ("Directed Group Study") and 199 ("Special Study for Advanced Undergraduates") are open to students who are judged to have an adequate background in the subject proposed for special study (in Special Study courses, the subject matter proposed must fall within the instructor's professional competence). It is expected that the amount of effort proposed in Special Study courses will at least equal that required for a regular course of the corresponding unit value.

Some departments offer special Honors courses (194H). Students who are interested in such courses should consult the Chairman of the department concerned.

Independent Study Program. The Independent Study Program is intended to provide an opportunity for upper division students to design and pursue a full quarter (12–15 units) of individual study in an area of their special interest. Under the current system of numbering courses, a program qualifying as Independent Study will consist of one or more courses in the 190–199 series, adding up to a quarter's work. While the theme of such a program may be reasonably broad, a recognizable common thread should unite all the activities carried on by a student during an independent study quarter. Regularly offered formal courses will therefore be acceptable as a part of such a program only if they clearly fit its theme, and contribute something essential toward the realization of its objectives. Under no circumstances is the program to be considered merely a device to raise existing ceilings on variable-unit courses.

The procedure for enrolling in an Independent Study Program is as follows: 1) develop in general terms a plan of study; 2) locate a faculty sponsor or panel of sponsors with whose help and approval a detailed plan is developed; 3) complete a project proposal form, obtained from the dean in each college, and submit it to the Independent Study Committee either directly or through the dean's office. Deadlines will be two weeks prior to the final enrollment date in the quarter preceding the proposed independent study quarter (see page 6); 4) completion or other termination of the project is to be reported to the Independent Study Committee, which may request such documentation as was provided for in the project proposal.

For further information contact a member of the Independent Study Committee. The membership list may be obtained through the deans of the colleges.

Work-Learn Programs. Students may undertake a work-learn activity under courses in the College of Agricultural and Environmental Sciences (Work-Learn 192) and College of Engineering (Engineering 92 and 192). Other courses are found under departmental listings (see Education, Family Practice, Political Science, Psychology, and Rhetoric). Some 198 and 199 courses can be adapted to work-learn experiences by arrangement with a faculty member. For further information the student should consult his adviser or the Campus Work-Learn Center.

Tutorials. There are some opportunities for students to tutor in their major subject while currently enrolled as undergraduates. Information concerning these tutorial courses (numbered 197T or 197TC) may be obtained from the office of Departments that offer them.

"Faculty 48" courses offer an opportunity for a professor or lecturer to lead the exploration of a subject with a group of interested students. The subject matter may be broad in scope or relatively narrow and specialized: in either case it need not fall within the instructor's official field. These courses are authorized by the Davis Division Committee on Courses of Instruction for one time only; announcements of 48 courses do not, therefore, appear in the *Catalog* but are given in the *Class Schedule* for each term.

Graduate courses. Graduate courses (numbered 200-299) are open only to students who have adequate preparation; admission is subject to the approval of the instructor in charge.

Professional teacher-training courses in the Department of Education and courses in other departments that are specially intended for teachers or prospective teachers are numbered 300-399.

Professional courses in departments other than the Department of Education are numbered 400-499.

Extra-session courses. Extra-session courses (laboratory, field, or other individual work done out of session under the direction of a department of instruction) may be accepted upon the recommendation of the department in partial fulfillment of the residence requirement for the bachelor's degree.

University Extension courses. Simultaneous enrollment in resident courses and in extension courses is permitted only upon approval by the appropriate dean or study-list authority.

Concurrent courses. Where classroom space and the instructor's permission is available, enrollment may be granted to University Extension students in courses offered on the Davis campus for regularly admitted and registered students. Such work may be used for admission consideration and for degree recognition.

Summer Session courses. Regularly enrolled students or students planning to enroll for the fall quarter can receive credit toward their degrees in Summer Session courses.

Credit for summer session work at other schools. It is possible for students to gain credit for courses taken during the summer at other institutions, provided the courses parallel those given in the University of California. However, assurance that such credit will be accepted can be given only after the courses have been completed. Students should arrange to have the transcripts of their summer session grades sent to the Registrar for evaluation.

Flexibility. Opportunities for interdisciplinary programs tailored to the individual student's educational objectives are offered by the individual major in the College of Agricultural and Environmental Sciences (p. 72), the College of Engineering (p. 145) and the College of Letters and Science (p. 152).

SYMBOLS

The following numerical footnotes and their accompanying symbols are used throughout the courses section:

- ¹ Absent on leave, 1973-74.
- ² Absent on leave, fall quarter 1973.
- ³ Absent on leave, winter quarter 1974.
- ⁴ Absent on leave, spring quarter 1974.
- ⁵ In residence at President's Office, Berkeley campus.
- ⁶ In residence at Irvine campus.
- * Not to be given, 1973-74.
- † Not to be given, fall quarter 1973.
- ‡ Not to be given, winter quarter 1974.
- § Not to be given, spring quarter 1974.

AFRO-AMERICAN AND BLACK STUDIES

Albert J. McNeil, M.S., *Chairman of the Program*
Committee Office, 103 TB-115

Committee in Charge:

Charles C. Irby, M.A. (*Black Studies*)
Albert J. McNeil, M.S. (*Music*)
James J. Murphy, Ph.D. (*ex officio; Rhetoric*)
G. Thomas Sallee, Ph.D. (*Mathematics*)
Joe L. Singleton, M.A. (*Physical Education*)
Edward D. Turner, Ph.D. (*Psychology*)



The Afro-American and Black Studies Program provides opportunity for interested students to pursue a thorough study of Black people. In addition to the Black Studies courses, the Program includes course offerings from the departments of Anthropology, History, Political Science, and Sociology. However, courses relevant to the Program are also offered in Applied Behavioral Sciences, Dramatic Art, Economics, Music, Rhetoric, and Psychology. The Program allows and encourages flexibility in order to cater to the interests of the individual student. Each student, however, is required to select an *area of emphasis* to satisfy the requirements for a major leading to a Bachelor of Arts degree in Black Studies. This area of interest should be discussed with and approved by the Black Studies Committee. Interested students should contact the Black Studies office (telephone 752-1549) for adviser appointments.

Additional courses are being developed as part of a new proposed major in Afro-American Studies which will emphasize the tracing of Black culture through the transmigration of Black people from West Africa throughout the Western Hemisphere.

The Major Program

Lower Division Courses.—Required: Anthropology 1 or Biological Sciences 10 or Genetics 10; Anthropology 2 or Geography 2; History 4A, 4B, 4C; Music 28; Sociology 30A-30B-30C. Recommended: Applied Behavioral Sciences 47, Geography 11.

Upper Division Courses.—Required: 36 units of upper division courses to be approved by the Committee. At least 12 of these units must be from the student's area of emphasis. Upper division courses may be selected in consultation with the Committee, although the following courses may be recommended: Anthropology 102, 103B, 139A, 139B, 140, 148, 152, 153; Applied Be-

havioral Sciences 151A-151B-151C, 160; Asian American Studies 110; Black Studies 101; Economics 125A-125B; History 102M, 175A-175B, 176A-176B; Political Science 101, 146, 151, 152, 174, 178; Psychology 145, 147, 198; Sociology 118, 140, 143, 144.

Teaching Major.—Requirements for the teaching major are the same as for the major in Afro-American and Black Studies with the addition of course 10.

Teaching Minor.—A minimum of 30 units (including course 10) in the Afro-American and Black Studies curriculum.

Subject Representative: Mr. Turner.

Black Studies

Lower Division Courses

10. General Black Studies. (4) I, II.

Lecture—4 hours. Survey of the field of black studies. For students who do not plan to major in black studies. Mr. Irby

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Chairman in charge)

Upper Division Courses

101. Introduction to Black Studies. (4) I, II, III.

Lecture—4 hours. Prerequisite: Sociology 1 or Anthropology 2; History 27A-27B or History 17A-17B; Psychology 1C. Problems and methodology in Black Studies. Mr. Irby

102. The Ancestral Homeland. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 101. Basic ecology, population, social organization, and survival culture of West Africa before, during and after colonialism. Mr. Irby

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. Directed reading and discussion of selected problems in Afro-American and Black Studies. The Staff

AGRARIAN STUDIES

Major Adviser.—See *Class Schedule* listing.

Major Program.—See page 73.

Questions pertaining to the following courses

should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Course

2. Culture and Science in Agriculture. (3) II.

Lecture—3 hours. Introduction to agrarian studies, presenting relationships between agriculture and arts and sciences, natural and social, in evolution of man and his civilizations.

Mr. Romani

Upper Division Course

188. Special Topics in Agrarian Studies. (1) III.

Discussion—1 hour. Prerequisite: course 2 or consent of instructor; open to lower division students. Group study of special topics on the relationships between agriculture and the arts and sciences. May be repeated for credit.

Mr. Romani

AGRICULTURAL CHEMISTRY (A Graduate Group)

Donald G. Crosby, Ph.D., *Chairman of the Group*

Group Office, 109 Environmental Toxicology

Related Courses. See *Food Science and Technology 250A-250B, 250C, 251A-251B, 251C (Isolation, Characterization, Quantitation, and Identification of Trace Volatiles).*

Graduate Courses

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Course is designed to provide the individual student with an opportunity to organize, present orally, and defend a concept within a body of knowl-

edge of importance to the area of agricultural chemistry. The Staff (Mr. Crosby in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. The chemistry and biochemistry of foods, nutritional chemicals, pesticides, and other special topics as they apply to agricultural chemistry.

The Staff (Mr. Crosby in charge)

299. Research. (1-12) I, II, III, (Summer).

Arrangements should be made well in advance with a member of the Group in Agricultural Chemistry. The Staff (Mr. Crosby in charge)

AGRICULTURAL ECONOMICS

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 74 and 182.

Related Courses. See *Environmental Planning and Management 110 (Urban and Regional Planning); Environmental Studies 12 (Environmental Planning), 102 (Environmental Decision Making), 160 (Public Mechanisms for Controlling Land Use), 168 (Environmental Problems and Market Failure); Consumer Economics.*

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Note.—Each course (includes lower division, upper division, and graduate courses) is listed under one of the following groups:

- a) Production and Marketing Management
- b) Economic Theory
- c) Research Methods and Quantitative Analysis
- d) Economic Policy and Institutions
- e) Natural and Human Resource Development
- f) Individual and Directed Study Courses

a) PRODUCTION AND MARKETING MANAGEMENT

1. Economic Basis of the Agricultural Industry.

(4) II.

Lecture—4 hours. Agriculture and man; the

agricultural industry in U.S. and world economy; production and supply, marketing and demand; agricultural land, capital and labor markets; economic and social problems of agriculture in an urban and industrialized economy emphasizing California.

Mr. Snyder.

18. Business Law. (4) I.

Lecture—4 hours. Prerequisite: sophomore standing. Introduction to law; contracts, sales, and agency.

Mr. McGahan

49A, 49B, 49C. Field Practice. (½) I, II, III.

Three one-day field trips; written report. Prerequisite: consent of instructor; open to non-majors. Field trips will be organized to observe aspects of the production, processing, handling, and distribution of agricultural products. Co-operatives and private businesses will be visited. Prior preenrollment with department required. (P/NP grading only.)

I. Mr. Foytik;

II. Mr. Lianos; III. Mr. Hansen

112. Fundamentals of Business Organization. (4) I.

Lecture—4 hours. Principles and practices of business organization; goals; financial and personnel requirements; selection of form of organization—single ownership, partnership, corporation, and cooperative—to facilitate attainment of goals; taxation, industry structure; legal, political, and social problems. Sect. 1 _____;

Sect. 2 _____

NOTE: For key to footnote symbols, see page 191.

113. Fundamentals of Business Management. (4) II.

Lecture—4 hours. Recommended: course 112. Management principles and their application to all forms of business including cooperatives; the planning function; procurement, sales, finance, and personnel; case studies of agriculturally related businesses. Mr. Cothem

114. Production Management. (4) III.

Lecture—4 hours. Recommended: course 113. Principles and procedures for the efficient use of resources in processing and handling of agricultural products; plant layout; work scheduling; inventory control; coordination of production and sales; location. Mr. Foytik

117. Managerial Accounting. (4) III.

Lecture—4 hours. Prerequisite: Economics 11A–11B; course 112 recommended. Basic concepts of accounting as a managerial tool; procedures for financial reporting; systems and internal control; cost accounting; budgeting; interpretation of administrative reports. Mr. Johnson

130. Agricultural Marketing. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A or equivalent. The nature, function, organizational structure, and operation of agricultural markets; prices, costs, and margins; market information, regulation, and controls; cooperative marketing. Mr. Carman

140. Farm Management. (5) III.

Lecture—4 hours; laboratory—2 hours; field trip. Farm organization and resources; economic and technological principles in decision making; analytical techniques and management control; problems in organizing and managing the farm business. Mr. Reed

145. Farm and Rural Resources Appraisal. (4) I.

Lecture—3 hours; laboratory—3 hours; field trip. Principles of farm and ranch appraisal; land utilization in relation to problems of development and valuation. Real estate instruments and elements of real estate finance. Mr. Johnston

***160. Advanced Agricultural Marketing. (3) III.**

Lecture—3 hours. Recommended: course 155. The marketing firm in its economic context: market structures; pricing and price policies; empirical demand analysis; marketing cost and efficiency; public policies toward marketing. Mr. Carman

171. Investment and Capital Management. (3) II.

Lecture—3 hours. Prerequisite: Economics 11A–11B. Financial analysis at the firm level; methods of depreciation; influence of tax structure; evaluation of investment alternatives; sources of capital; determining the cost of capital; leverage effects; capital rationing; working capital management; financial models under risk and uncertainty. Mr. Carlson

257. Production Planning and Market Analysis. (3) III.

Lecture—3 hours. Quantitative analysis of production systems by statistical, economic, and engineering methods; sales analysis for the individual firm; problems of investment, location, scale of operations. Mr. Carlson

260. Administrative Organization and Policy Formation. (3) II.

Lecture—3 hours. Concepts and techniques of administration in the business firm; formulation and implementation of management goals; planning, procuring, organizing, and controlling physical factors and personnel. Mr. Logan

261. Case Problems in Management. (3) III.

Lecture—2 hours; laboratory—3 hours. Case problem analysis and discussion of management functions including business strategy, management evaluation, financing, marketing, and production, with emphasis on application of theory to problem definition and solution. Mr. Carlson

262. Field Research Problem. (3) (Extra Session—Summer)

Lecture—2 hours; laboratory—3 hours. Student will function as an individual or as a member of a team solving an economic planning or operating problem of a firm or governmental agency. Mr. Carlson

b) ECONOMIC THEORY**100A. Economic Analysis in Agriculture. (3) I.**

Lecture—3 hours. Prerequisite: Economics 1A, 1B; Mathematics 16A (may be taken concurrently). Theory of individual consumer and market demand; theory of production and supply of agricultural products, with particular reference to the individual firm; pricing, output determination, and employment of resources under pure competition. Mr. Rausser

100B. Economic Analysis in Agriculture. (3) II.

Lecture—3 hours. Prerequisite: course 100A. Pricing, output determination, and employment of resources under conditions of monopoly, oligopoly, and monopolistic competition. Mr. Logan

100C. Economic Analysis in Agriculture. (3) III.

Lecture—3 hours. Prerequisite: course 100B or equivalent. Theory of regional specialization, location, and trade for agricultural products; general economic equilibrium. Mr. King

200A. Microeconomic Theory. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A or consent of instructor. Theory of the firm under perfect competition; programming and dynamic models of the firm. (Same course as Economics 200A.) Mr. Rausser

200B. Microeconomic Theory. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A and Mathematics 16B or consent of instructor. Static and dynamic consumer behavior, imperfect competition, market and multi-market equilibrium, introduction to welfare economics and externalities. (Same course as Economics 200B.) Mr. Cornwall

200C. Microeconomic Theory. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 103 and 200B. Linear economic systems, the static Leontief system, competitive general equilibrium, welfare economics, comparative statics and risk. (Same course as Economics 200C.) Mr. Cornwall

c) RESEARCH METHODS AND QUANTITATIVE ANALYSIS**103. Theory of Economic Optimization. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B; mathematics 16A, 16B. Analytics of economic optimizing behavior for consumers and firms, using linear algebra, partial differentiation, quasi-concave functions, and the Kuhn-Tucker theorems. (Same course as Economics 103.) Mr. Lianos

106A. Quantitative Methods in Agricultural Economics. (3) II.

Lecture—3 hours. Prerequisite: Mathematics 13 or equivalent. Statistical methods for analyzing quantitative agricultural economics data: descriptive statistics, probability, hypothesis testing, statistical inference, and sampling. Mr. Paris

106B. Quantitative Methods in Agricultural Economics. (3) III.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 106A or equivalent. Statistical methods for analyzing quantitative agricultural economics data: linear and multiple correlation and regression analysis. Mr. Foytik

155. Quantitative Analysis for Business Decisions. (3) I.

Lecture—3 hours. Prerequisite: course 106A; Mathematics 16A. Introduction to selected topics in operations research, including mathematical programming, applied decision theory, game theory, and inventory models. Mr. Lianos

190A-190B. Senior Research Project. (2-2) I-II, II-III.

Lecture—1 hour; discussion—1 hour. Supervised individual research. The research report begun in 190A will be revised and completed

in 190B. (Deferred grading only, pending completion of the sequence.)

A: I. Mr. Fuller, II. Mr. Hedges;
B: II. Mr. Fuller, III. Mr. Hedges

210. Economic Methods. (4) III.

Lecture—4 hours. Prerequisite: Mathematics 130B and a course in linear algebra. Statistical models and their use in estimation of economic relationships; single and multiple equation systems. (Same course as Economics 240A.) Mr. Lianos

211. Advanced Econometrics: Theory. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 210; Mathematics 131A, 131B, 131C recommended. Multivariate analysis, specification analysis, simultaneous equation models, identification, estimating methods, small sample properties. (Same course as Economics 240B.) Mr. Wegge

212. Advanced Econometrics: Applications. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 210. Time series analysis and distributed lags, pooling of time series and cross-section data, Bayesian analysis, applications for prediction and policy. (Same course as Economics 240C.) Mr. Rausser

253. Linear Programming Analysis of Operational Problems. (3) II.

Lecture—3 hours. Linear programming methods with application to production, consumption, transportation, transshipment, and assignment problems; recursive and multiperiod programming, problems of aggregation and planning with limited information. Mr. Paris

254. Quantitative Analysis of Operational Problems. (3) III.

Lecture—3 hours. Nonlinear and dynamic programming methods with application to production, consumption, inventory, replacement market equilibrium, and competitive decision problems. Mr. Paris

255. Systems Analysis and Simulation. (3) III.

Lecture—3 hours. Dynamic model formulation and computer simulation of economic systems. Mr. Logan

256. Applied Econometrics. (3) II.

Lecture—3 hours. Application of statistical tools to economic and business analysis. Emphasis on regression analysis, problems of specification, and model development. Mr. King

280. Analysis of Research in Production Economics. (4) I.

Lecture—3 hours; discussion—1 hour. Current problems and methods of analysis in agri-

NOTE: For key to footnote symbols, see page 191.

cultural production economics research. Emphasizes both firm and industry. Mr. Carter

281. Economic Analysis of Demand and Trade. (3) II.

Lecture—3 hours. Models and methods of analysis of demand, interregional trade, and location in the agricultural economy. Mr. King

d) ECONOMIC POLICY AND INSTITUTIONS

120. Agricultural Policy. (3) III.

Lecture—3 hours. Analytical treatment of recent and current economic problems and governmental policies and programs affecting American agriculture. Mr. Siebert

125. Comparative Agriculture. (4) II.

Lecture—4 hours. Agriculture of the principal countries of the world, with special reference to the influence of food supply upon the development of man. Mr. Hedges

221. Agricultural Policy in Developed Countries.

(3) I.

Lecture—3 hours. Economic policy, its nature, formation and analysis; characteristics of agricultural sectors in developed countries; comparative analysis of policies relating to production, marketing, price, income, rural poverty, and resource adjustment; international trade policies for temperate zone agricultural commodities. Mr. Fuller

222. Agricultural Policy and Planning in Developing Countries. (3) III.

Lecture—3 hours. Agriculture in the structure of developing nations; its role in economic development; historical experience and theoretical models; agricultural and national planning; sectoral policies relating to prices, inputs, productivity, and marketing; international inputs into agricultural development; case studies. Mr. Dean

250. Institutional Setting for Agricultural Business. (3) I.

Lecture—3 hours. Study of economic and social influences of the institutional environment on agriculture-related industries; historical development and present structure of the American economy; governmental activities; financial aspects; labor problems. Mr. Sosnick

e) NATURAL AND HUMAN RESOURCE DEVELOPMENT

147. Natural Resource Economics. (4) I.

Lecture—3 hours; discussion—1 hour. Natural resource use problems with emphasis on past and current policies and institutions affecting resource use; determinants, principles, and patterns of natural resource use; property rights; conservation; private and public resource use problems; and public policy issues. Mr. Johnson

148. Economic Planning for Regional and Resource Development. (3) II.

Lecture—3 hours. Relation of resources to economic growth, including regional problems; planning economic development with particular emphasis on resource use in agriculture; selected resource development programs in the United States and certain foreign countries, including land reform experiences. Mr. Moore

150. Agricultural Labor. (3) I.

Lecture—2 hours; discussion—1 hour; field trip. Problems, attitudes, and characteristics of agricultural employers, employees, and labor contractors. Impact of mechanization; determinants of productivity; wage levels and structures; evolution and efficiency of the labor market; placement and supervision; off-season and in-season unemployment; organization and conflict; relevant legislation. Mr. Sosnick

151. Economics of Poverty. (3) III.

Lecture—3 hours. Prerequisite: economics 1A-1B or 2A-2B-2C or consent of instructor. Economic theories of mean distribution; causes of poverty; economic analysis of the political prospects of policies to minimize economic insecurity, maximize equality of opportunity, and established minimum income levels. Mr. Jolly

176. Economic Analysis in Resource Use. (3) III.

Lecture—3 hours. Prerequisite: Economics 1A, 1B; course 100B or equivalent recommended. An analytical treatment of resource use problems, including public policy issues; economic productivity and natural resources; determinants, principles, and patterns of natural resource use; resource conservation; land tenure problems and policies. Mr. Hansen

283. Analysis of Research in Natural Resource Economics. (3) III.

Lecture—3 hours. Scope and disciplinary context of natural resource economics. Recent problems affecting policy and use planning including efficiency and welfare criteria, technological externalities, public goods, extramarket goods, indivisibilities, and intertemporal problems; benefit cost analysis and public and private investment criteria. Mr. Johnston

f) INDIVIDUAL AND DIRECTED STUDY COURSES

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Carter in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Carter in charge)

199. Special Study for Advanced Undergraduates.
(1-5) I, II, III.

Prerequisite: junior or senior standing and consent of instructor. Limited to students with adequate preparation in Agricultural Economics.
The Staff (Mr. Carter in charge)

298. Directed Group Study. (1-5) I, II, III.

Advanced study in various subjects through special seminars on topics to be selected each year, informal group studies of special problems,

or group research on problems for analysis and experimentation.

The Staff (Mr. Carter in charge)

299. Individual Study. (1-12) I, II, III.

(S/U grading only.)

The Staff (Mr. Carter in charge)

299D. Special Study for Doctoral Dissertation.

(1-12) I, II, III.

(S/U grading only.)

The Staff (Mr. Carter in charge)

AGRICULTURAL EDUCATION

Major Advisers.—See *Class Schedule* listing.

Secondary Credentials—*Agriculture*: Mr. Baker, 204E Walker Hall.

Secondary Credentials—*Homemaking*: Mrs. Adams, 203B Walker Hall.

Junior College Credentials—*Agriculture*: Mr. Baker, 204E Walker Hall.

Major Program and Graduate Study.—See pages 75 and 182.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Upper Division Courses

160. Vocational Education. (3) III.

Lecture—3 hours. Philosophy and organization of vocational education, with particular reference to educational principles for agriculture, commerce, home economics, and industry.
Mr. Thompson

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Thompson in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Thompson in charge)

Graduate Courses

290. Seminar. (2) I, II, III.

Discussion—2 hours. Reports and discussions of topics of interest in the fields of agricultural education, home economics education, agricultural extension, and adult education. (S/U grading only.)
Mr. Thompson, Ms. Regan

299. Research. (1-12) I, II, III.

Research in agricultural education, home eco-

nomics education, vocational education, agricultural extension, or adult education.

The Staff (Mr. Thompson in charge)

Supervised Teaching Courses

320A. Introduction to Teaching. (1) I, II, III.

Lecture—1 hour. Observations and participation in some form of public school work.

Mr. Baker

320B. Instructional Materials and Procedures. (3) III.

Lecture—2 hours; laboratory—3 hours. Introduction to the materials and procedures used in teaching. Use of audio-visual, radio and other teaching aids. Preparation of teaching materials; collecting, organizing, processing, and evaluating community resources.

Mr. Baker

320C. Supervised Teaching. (1-12) I, II, III.

Field work—student teaching—36 hours. Prerequisite: course 320A; course 320E must be taken concurrently. Directed teaching for candidates for the credential in agriculture.

Mr. Baker

320E. Curriculum and Instruction Procedures.

(3) I, II, III.

Discussion—3 hours. Prerequisite: all students enrolled in course 320E must enroll in 320C concurrently. Planning and organizing an effective curriculum. Selection, organization, evaluation, and use of resource material for teaching.

Mr. Baker

323. Resource Development: Agricultural Education. (3) II.

Lecture—3 hours. Prerequisite: courses 320C and 320E. Selection and implementation of community resources in teaching.

Mr. Baker

AGRICULTURAL ENGINEERING—See Engineering: Agricultural, Agricultural Engineering Technology and Consumer Technology

NOTE: For key to footnote symbols, see page 191.

AGRICULTURAL ENGINEERING TECHNOLOGY

Courses listed here are in the College of Agricultural and Environmental Sciences and are intended primarily for students not majoring in Engineering. Questions pertaining to the following courses should be directed to the instructor, or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

For course offerings in the College of Engineering, see page 266. For the Bachelor of Science major program and graduate study for the College of Engineering, see pages 126 and 182.

Lower Division Courses**10. Machines, Systems, and Man in Agriculture.****(3) II.**

Lecture—2 hours; tutorial laboratory and field trips—3 hours. Role of engineering in agriculture with emphasis on current problems in food production and processing such as residue management, new machinery developments, and effects of mechanization on agricultural labor. Intended for students not majoring in Engineering. Mr. Burkhardt, Mr. Dobie

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. Primarily for lower division students. The Staff (Mr. Goss in charge)

99. Special Study for Lower Division Students.

(1-5) I, II, III. The Staff (Mr. Goss in charge)

Upper Division Courses**101. Orchard and Vineyard Machinery. (1) I.**

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. The relationship of orchard and vineyard machinery to fruit production and quality; functions and capabilities; interrelationships between cultural practices and machine operation. May be augmented by course 197. (P/NP grading only.) Mr. Fridley

102. Farm Tractors. (1) II.

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Principles of operation and construction of farm tractor chassis, transmissions, and hitches. Special emphasis on operator comfort, convenience, and safety. May be augmented by course 197. Mr. Burkhardt

103. Hydraulic Power and Controls. (1) II.

Lecture—1 hour. Recommended: courses 101 or 102 (may be taken concurrently) or 104. Principles of operation and construction of hydraulic systems. Pumps, motors, control valves, and auxiliary components. May be augmented by course 197. Mr. Studer

104. Field Machinery. (1) III.

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Performance, operation, and adjustment of machines for tilling, planting, cultivating, treating, and harvesting field crops. May be augmented by course 197. Mr. Kepner

105. Machinery Management. (1) III.

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Procedures for supervision of operation, repair, and maintenance. May be augmented by course 197. Mr. Chancellor

106. Vegetable and Small Fruit Machinery. (1) III.

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Interrelationships of machines, mechanization, and subsequent handling to the production of vegetables and small fruits, product quality, and acceptability by the industry. May be augmented by course 197. (P/NP grading only.) Mr. Kepner

111. Microclimatology. (3) I.

Lecture—3 hours. Prerequisite: upper division standing, or Geography 1 or 3, or Atmospheric Science 20, or consent of instructor. Daytime radiation intensities, nocturnal heat losses, climatic elements over different ground cover and terrain. Modification of microclimate by sheltering, frost-protection devices, and wind-breaks. Probabilities of temperatures, rainfall, and climatic hazards to agriculture (risk figures). Mr. Schultz

113. Animal Shelters, Environment, and Related Equipment. (1) III.

Lecture—2 hours (first five weeks of quarter). Prerequisite: Animal Science 2 or consent of instructor. Environmental considerations affecting the choice of animal shelter designs and materials; space, light, air, and temperature requirements; space arrangements; equipment. Mr. Morrison

114. Plant Shelters, Environment, and Related Equipment. (1) III.

Lecture—2 hours (last five weeks of quarter). Prerequisite: Plant Science 2, Botany 2, or consent of instructor. A study of shelters and equipment for providing a suitable environment for plant growth; temperature and humidity regulation; tillage and irrigation equipment for use in plant shelters. Mr. Morrison

121. Heat Transfer Processes. (1) I.

Lecture—1 hour. Prerequisite: Plant Science 2, Botany 2, or consent of instructor. Topics selected on the basis of current student needs from principles of radiation, convection, and conduction. Emphasis on applications with ex-

amples drawn from food processing, heating, refrigeration, cooling, and drying. May be augmented by course 197. Mr. Albright

122. Mixing and Related Processes. (1) I.

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Topics selected on the basis of current student needs from principles of grinding and other means of particles size reduction, size sorting, seed cleaning and grading, mixing of materials, selection and use of processing equipment. May be augmented by course 197. Mr. Henderson

123. Handling Agricultural Materials. (1) I.

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Concepts of materials handling. Emphasis on handling of free-flow granular materials, containerized materials, and perishable commodities. May be augmented by course 197. Mr. O'Brien

131. Air Pollution Problems in Relation to Agricultural Operations. (1) II.

Lecture—1 hour. Prerequisite: upper division standing; Physics 2B and Chemistry 1B recommended. Air pollution sources, burning of agricultural wastes, processing and field dusts, agricultural chemicals. Meteorological aspects, damages to agriculture, forest and ornamentals, transport of air pollutants. May be augmented by course 197. Mr. Akesson

132. Management of Agricultural Wastes. (2) III.

Lecture—2 hours. Prerequisite: upper division standing; Physics 2B and Chemistry 1B recommended. Current methods of disposing of animal, plant, pesticide, food processing, and forest products wastes. Waste problems in relation to air, soil, and water resources. May be augmented by course 197. Mr. Akesson

133. Aircraft and Ground Equipment for Crop Protection, Nutrition and Vector Control. (1) III.

Lecture—1 hour. Prerequisite: consent of in-

structor; Entomology 110, Plant Science 120, or Plant Pathology 120 recommended. Physical aspects of equipment and application techniques related to the effectiveness of agricultural chemicals and biological materials. Techniques for reducing hazards to people, crops, and wildlife. May be augmented by course 197. Mr. Yates

197. Laboratory. (1) I, II, III.

Prerequisite: consent of instructor. Directed laboratory exercises, field trips, or special projects. Multiple sections may be taken in combination with different AET lecture courses. Each section augments a specific course. Section offering dependent on a sufficient number of students enrolling.

The Staff (Mr. Goss in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Goss in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Mr. Goss in charge)

Graduate Courses

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Goss in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Goss in charge)

Professional Course

317. Problems in Teaching Farm Mechanics. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Physics 2B or 4B and consent of instructor. Demonstrations of and practice in the methods of teaching farm mechanics in secondary schools. School-shop planning including the selection, arrangement, and management of equipment. Curriculum planning, including the relation of teaching materials, references, and visual aids. Mr. O'Brien

AGRICULTURAL PRACTICES

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

49A. Field Equipment Operation. (1) I, III.

Laboratory—3 hours. Prerequisite: consent of instructor. Theory and operation of the major types of field equipment, wheel and track-type tractors used in agriculture, forestry, and natural resource management. Essentials of safe

equipment operation, the fundamentals of preventive maintenance, field adjustments and trouble shooting are presented. (P/NP grading only.) Mr. Hanna

49B. Field Equipment Maintenance. (1) II.

Laboratory—3 hours. Prerequisite: consent of instructor. Theory of operation and maintenance principles for internal combustion engines, power trains, hydraulic and pneumatic controls. Introduction to arc and acetylene welding, the care and use of basic hand and shop tools. (P/NP grading only.) Mr. Hanna

NOTE: For key to footnote symbols, see page 191.

AGRICULTURAL SCIENCE AND MANAGEMENT

Major Advisers.—See *Class Schedule* listing.
Major Program and Graduate Study.—See pages 76 and 182.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Upper Division Course

198. Directed Group Study. (1-5) I, II, III.

Discussion—1-5 hours. Prerequisite: senior standing. Selected topics relating to application

AGRONOMY

Related Undergraduate Majors and Graduate Study.—See pages 98, 99, and 182.

Related Courses. See *Plant Science and Range Management*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Upper Division Courses

100. Science and Technology of Field Crop Production. (3) III.

Lecture—3 hours; two Saturday morning field trips. Prerequisite: six units of plant science, botany and/or biology, or consent of instructor. Fundamentals of field crop production and solving agronomic problems using ecological, physiological, and genetic principles. Recommended for non-majors in agronomy.

Mr. Peterson

111. Cereal Crops of the World. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: 6 units of plant science, botany, and/or biology, or consent of instructor. Contribution of cereal crops to man's development; adaptation, production, utilization, and factors determining quality of wheat, oats, barley, rice, corn, and sorghum. Emphasis is on recent developments and scientific improvements.

Mr. Schaller

112. Forage Crop Ecology. (3) III.

Lecture—3 hours. Prerequisite: Botany 2 or consent of instructor. Forages as a world resource in food production. Ecological principles governing the adaptation, establishment, growth and management of perennial and annual forages, including pastures, rangelands and hay; aspects of forage quality which affect feeding value to livestock.

Mr. Raguse

112L. Forage Crops Ecology Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 112. Laboratory work in forage crop ecology to supplement course 112.

Mr. Raguse

of science and management techniques to problems of the agricultural industry.

The Staff (Mr. Carroll in charge)

Graduate Courses

290. Seminar. (1) I.

Seminar—1 hour.

The Staff (Mr. Carroll in charge)

298. Group Study. (1-5) I, II, III.

(S/U grading only.)

The Staff (Mr. Carroll in charge)

299. Research. (1-6) I, II, III.

The Staff (Mr. Carroll in charge)

113. Fiber, Oil, and Sugar Crops in a Changing World. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: 6 units of plant science, botany and/or biology, or consent of instructor. Industrial crops as world resources of food, feed, fiber, and consumer goods. The relationship of crops to their physical and biotic environment, technological changes, socioeconomic and political forces that shape crop production, and utilization practices.

Mr. Mikkelsen

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Knowles in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: 6 upper division units of agronomy.

The Staff (Mr. Knowles in charge)

Graduate Courses

205A-205B. Design, Analysis, and Interpretation of Experiments. (3-3) II-III.

Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing in Plant Science, Mathematics 13; an elementary knowledge of FORTRAN or ALGOL recommended. The planning and analysis of field and laboratory experiments with emphasis on the biological interpretation of results.

Mr. Qualset, Mr. Williams

210. Agricultural Research Planning and Management. (3) II.

Lecture—2 hours; discussion—2 hours; two full-day field trips. Prerequisite: graduate standing in any agricultural field of study and consent of instructor. An analysis of the problems of planning, managing, evaluating, and utilizing agricultural research to promote agricultural development.

Mr. Peterson

221. Advanced Plant Breeding. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Plant Science 113. Advanced topics

in plant breeding. Genetic diversity and centers of origin of cultivated plants, mating systems in plants, polyploidy, host-pathogen relationships, role of mutagens in plant breeding, and other topics of current interest. Mr. Stanford

222. Quantitative Genetics and Plant Improvement.
(4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Plant Science 113; Genetics 105; or consent of instructor. Genetic forces affecting populations. Formulation of breeding plans based on principles of population and quantitative genetics. Offered in even-numbered years.

Mr. R. W. Allard

***223. Selection Theory in Plant Breeding.** (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 222 or consent of instructors. Theory and application of selection to plant populations for improvement of quantitative characters. Statistical genetic analysis of quantitative character expression and methods for obtaining maximum efficiency in plant breeding schemes. Offered in odd-numbered years.

Mr. Jain, Mr. Qualset

230. Advanced Population Biology. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: Genetics 103; recommended—a basic course in ecology (Botany 117, Zoology 125, etc.). The dynamics of growth and evolution of populations. Genetic and ecological aspects of population regulation and integration. Natural selection within and among populations. Intra-

and interspecific competition. Community structure and diversity. Mr. Jain

231. Advanced Topics in the Ecology of Crop Plant Communities. (3) II.

Lecture—3 hours. Prerequisite: Plant Science 101 or consent of instructor. Analysis and quantitative description of the structure and dynamics of field crop communities in relation to interplant competition, population functions, environmental stresses and adaptation. Mr. Laude

232. Advanced Topics in the Physiology of Crop Plants. (3) I.

Lecture—3 hours. Prerequisite: Plant Science 102 or consent of instructor. Physiological aspects of vegetative and reproductive growth of field crop plants in relation to their field behavior. Mr. Huffaker

290. Seminar. (1) I.

The Staff (Mr. Knowles in charge)

298. Group Study. (1-3) I, II, III.

Directed study in the areas of plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of field crops or range and pasture plants.

The Staff (Mr. Knowles in charge)

299. Research. (1-9) I, II, III.

Original research involving plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of field crops or range and pasture plants.

The Staff (Mr. Knowles in charge)

AMERICAN STUDIES

Robert Merideth, Ph.D., *Chairman of the Program.*

Program Office, 822 Sproul Hall

Committee in Charge:

Jay E. Mechling, Ph.D. (*American Studies*)

Robert Merideth, Ph.D. (*American Studies*)

Jerry A. Moles, Ph.D. (*Anthropology*)

Morgan G. Sherwood, Ph.D. (*History*)

Brom Weber, Ph.D. (*English and American Studies*)

Robert A. Wiggins, Ph.D. (*English*)

Faculty:

Professor:

Brom Weber, Ph.D. (*English and American Studies*)

Associate Professor:

Robert Merideth, Ph.D.

Assistant Professors:

Jay E. Mechling, Ph.D.

^{2,3}David S. Wilson, Ph.D. (*English and American Studies*)



Major Advisers.—Mr. Merideth, Mr. Mechling.

American Studies, a major which leads to the Bachelor of Arts degree, involves the interdisciplinary study of American culture past and present, with attention to cross-cultural study so as to provide a basis for comparative analysis and evaluation. The major consists of a core of interdisciplinary courses which, taken in conjunction with an upper division "disciplinary" or "problem" or "cross-cultural" emphasis, as well as additional courses in both the methodology of cultural study and the data of American culture—from departments in the humanities and arts, the social sciences, and the natural and applied sciences—will enable the student to obtain a coherent understanding of the cultural

NOTE: For key to footnote symbols, see page 191.

heritage and problems of the United States. The program bridges disciplinary, departmental, and other specialized boundaries of inquiry and knowledge in order to develop a fully ecological view of the American and of the complex socio-biophysical environment to which he is obliged to adapt as an individual. The major prepares students for professional careers requiring a knowledge of American culture in teaching, industry, business, and government; for special training in such fields as Law, Library Science, Journalism, and Social Work; and for graduate study in American Studies and the disciplines in which students may complete the equivalents of departmental majors. Since each student's program is individually designed in accordance with the emphasis he elects, early consultation with an adviser in American Studies is strongly recommended for potential majors with regular advising conferences thereafter.

For admission to the Upper-Division Major.—Required: at least one course from the American Studies 1 sequence (1A, 1B, 1C, 1D) and American Studies 45; an understanding of theories of culture, of American history, and of social structure and processes such as would be expected with successful completion of Anthropology 2, History 17A–17B, Sociology 1, or appropriate equivalents. Recommended: courses chosen in consultation with an American Studies adviser as preparation for (a) the upper division emphasis (see below) and (b) upper division cross-cultural study, as well as (c) courses in the natural sciences, social sciences, and humanities which meet College distribution requirements and at the same time contribute clearly to the study of American culture (e.g., Biological Sciences 10, English 30A–30B–30C, Psychology 10). A listing of appropriate courses is available upon request in the American Studies office.

Upper-Division Major.—Required: 1. American Studies 110, 140A–140B–140C, 190A–190B–190C; 2. *One* from the following three emphases (student's plan to be approved in advance by an adviser): (a) 20 units of upper-division course work in a single department, concentrating on American culture (e.g., 20 units of courses in anthropology or literature or history or sociology); or (b) 20 units of course work focusing on a single cultural problem or theme (e.g., bureaucratization, urban studies, the arts, science and culture, religion and culture); or (c) 8 units of course work in a culture or subculture selected as the subject of cross-cultural study (see below) plus 12 units of further study in the data of American culture (see below). 3. *Two* from the following three options: (a) 12 units of cross-cultural study beyond American Studies 110 chosen in consultation with an American Studies adviser; (b) 12 units of supplementary theory and methods courses chosen from an annually revised list available in the American Studies office; (c) 16

units of courses in the data of American culture chosen from an annually revised list available in the American Studies office. Recommended: courses in the unused option from (3) above.

Teaching Major.—The major in American Studies provides a basis for obtaining teaching credentials in elementary and secondary schools; the student's program must be arranged for the purpose in consultation with the Chairman of the American Studies Program.

Lower Division Courses

1A. Technology, Science, and American Culture.

(4) I.

Lecture—2 hours; discussion—2 hours. Critical examination of American science and technology as cultural systems which define the natural world and man's relation to it; mutual influence and interaction of those systems and other cultural systems (arts, politics, social thought, religion, etc.). Mr. Mechling

1B. Religion in American Culture. (4) III.

Lecture—2 hours; discussion—2 hours. Critical examination of religion's role in American culture by exploring its ramifications in past and contemporary America, using written and other materials drawn from many fields and synthesizing the disparate cultural elements of the problem. Mr. Wilson

*1C. Race and Nationality in American Culture. (4)

III.

Lecture—2 hours; discussion—2 hours. Critical examination of the role of race and nationality in American culture by exploring their ramifications in past and contemporary America, using written and other materials drawn from many fields and synthesizing the disparate cultural elements of the problem. Mr. Wilson

1D. Tradition and Revolution in American Culture.

(4) I.

Lecture—3 hours; discussion—1 hour. Critical examination of characteristic patterns of tradition and revolution in American culture, past and present; emphasis on continuities and relationships in the arts, communities, ideologies, literature, politics, radical movements, religion, etc. Mr. Merideth

45. Introduction to American Studies. (4) I, III.

Lecture—2 hours; discussion—2 hours; evaluation of written reports and conferences with individual students. Prerequisite: at least one course from course 1 sequence; Anthropology 2 and Sociology 1 or their equivalents. The elements of American Studies, including the background and general nature of American Studies, and the methods and philosophies of the academic disciplines which deal with the United States. Mr. Merideth, Mr. Mechling

99. Individual Study for Undergraduates. (1-5)

I, II, III. The Staff (Chairman in charge)

Upper Division Courses

110. Introduction to Cross-Cultural Studies. (4) II.

Lecture—3 hours; short papers, tutorial conferences, archival exercises. Prerequisite: course 45. Similarities and differences between (1) American culture and foreign cultures, and (2) comparable elements in American culture (subcultures, value systems, etc.); theories, research methods and problems, representative models and importance of cross-cultural comparison and contrast; historical and nonhistorical approaches.

Mr. Weber

140A. Events and Institutions in American Culture.

(4) I.

Lecture—3 hours; reports and tutorial conferences. Prerequisite: course 45. Study of a selected, limited period in the history of American culture, focusing on events and institutions, multidisciplinary but integrated for the purpose of comprehending the period's character and meaning. Emphasis on quantitative theory and methods.

Mr. Mechling

140B. Value and Meaning in American Culture. (4) II.

Lecture—3 hours; reports and tutorial conferences. Prerequisite: course 45. Study of a selected, limited period in the history of American culture, approached thematically, multidisciplinary but integrated for the purpose of comprehending the period's character and meaning. Emphasis on qualitative theory and methods.

Mr. Wilson

140C. Problems in American Culture. (4) III.

Lecture—3 hours; reports and tutorial conferences. Prerequisite: courses 45, 140A, 140B. Multi- and inter-disciplinary analysis in depth of a selected problem in American culture. Em-

phasis on the selection and application of appropriate concepts, methods, and techniques.

Mr. Merideth

190A. Senior Proseminar. (4) I.

Seminar—3 hours; individual conferences and written report evaluations. Prerequisite: consent of Chairman of American Studies Program. Individual research on American Studies topics. (Deferred grading only, pending completion of sequence.) The Staff (Mr. Merideth in charge)

190B. Senior Proseminar. (4) II.

Seminar—3 hours; individual conferences and written report evaluations. Prerequisite: course 190A. Individual research on American Studies topics. (Deferred grading only, pending completion of sequence.)

The Staff (Mr. Merideth in charge)

190C. Senior Proseminar. (4) III.

Seminar—3 hours; individual conferences and written report evaluations. Prerequisite: course 190A-190B. Individual research on American Studies topics. (Deferred grading only, pending completion of sequence.)

The Staff (Mr. Merideth in charge)

197T. Tutoring in American Studies. (1-5) I, II, III.

Tutorial—1-5 hours. Prerequisite: consent of Chairman of American Studies Program. Tutoring in lower division American Studies courses, usually in small discussion groups. Periodic meetings with the instructor in charge; reports and readings. May be repeated for credit when the tutoring is for a different course. (P/NP grading only.)

198. Directed Group Study. (1-4) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Merideth in charge)

199. Special Study for Advanced Undergraduates.

(1-4) I, II, III.

Prerequisite: consent of instructor and Chairman of American Studies Program.

The Staff (Mr. Merideth in charge)

ANATOMY

Leslie J. Faulkin, Jr., Ph.D., *Chairman of the Department*

Department Office, 1072 Haring Hall

Professors:

Logan M. Julian, D.V.M., Ph.D.

Ralph L. Kitchell, D.V.M., Ph.D.

Walter S. Tyler, D.V.M., Ph.D.

Associate Professors:

Leslie J. Faulkin, Jr., Ph.D.

Benjamin L. Hart, D.V.M., Ph.D.

Assistant Professors:

Raymond D. Barnes, Ph.D.

Carleton L. Lohse, D.V.M., Ph.D.



Upper Division Courses

100. Systematic Anatomy. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Zoology 2. Lectures and dissections emphasizing the typical structure of the anatomical systems of the dog, rat, and monkey. Offered in odd-numbered years.

Mr. Julian

NOTE: For key to footnote symbols, see page 191.

170. Principles of Normal and Abnormal Animal Behavior. (3) III.

Lecture—3 hours. Prerequisite: course 150 and Physiological Sciences 140B or consent of instructor. Examination of normal behavioral patterns of domestic animals with emphasis on the historical, environmental, and organismic determinants of behavior. An analysis of factors contributing to abnormal behavior in domestic animals. Mr. Hart

180. Surgical Anatomy. (4) III.

Laboratory—12 hours. Prerequisite: second-year standing in the School of Veterinary Medicine. Topographical, radiological, and regional anatomy as applied to the clinical sciences.

198. Directed Group Study. (2-5) I, II, III.

Laboratory—6-15 hours. Prerequisite: consent of instructor.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Laboratory—3-15 hours. Prerequisite: consent of instructor.

The Staff (Chairman in charge)

Graduate Courses***200. Comparative Neuroanatomy. (3) III.**

Lecture—2 hours; laboratory—3 hours. Prerequisite: a course in human or veterinary neuroanatomy. A comparative-quantitative study of the central nervous systems of vertebrates, particularly mammals, with emphasis on function. Mr. Hart

201. Regional Anatomy. (4) II.

Laboratory—12 hours. Prerequisite: course 100 or equivalent. Detailed dissections comparing the regional anatomy of the sheep, cat, rabbit, chicken and man. Offered in even-numbered years.

202. Organology. (2) III.

Lecture—2 hours. Prerequisite: course 100 or equivalent and consent of instructor. Comparative development, growth patterns, and composition of selected organs: liver, kidney, lung, mammary gland, brain, and a skeletal muscle. Offered in odd-numbered years

The Staff (Mr. Julian in charge)

202L. Organology. (1) III.

Laboratory—3 hours. Prerequisite: course 202 (should be taken concurrently). Anatomical demonstration of principles of organology.

The Staff (Mr. Julian in charge)

203. Reproductive Biology of Laboratory Animals. (2) III.

Lecture—2 hours; optional discussion—1 hour. Prerequisite: course in mammalian systemic physiology. Scientific basis for manage-

ment of breeding colonies of mice, rats, rabbits, hamsters, guinea pigs, gerbils, cats, ferrets, macaques, squirrel monkeys, and didelphid marsupials. Anatomy, physiology, behavior, diseases, and environmental factors; solutions to practical problems and commonly used techniques (S/U grading only.) Mr. Barnes

204. Functional Comparative Anatomy of the Reproductive Systems. (3) I.

Lecture—3 hours. Gross, microscopic, and ultramicroscopic structure of the male and female reproductive systems in birds and mammals. Offered in odd-numbered years.

Mr. Barnes in charge

205. Ultramicroscopic Anatomy. (3) I.

Lecture—3 hours. Prerequisite: Zoology 107 or equivalent. The electron microscopic appearance of cells, tissues, and organs of animals emphasizing the structural basis for their physiological functions. Offered in even-numbered years.

Mr. Tyler, Mr. Faulkin

206. Morphology of Body Surfaces. (2) III.

Lecture—1 hour; discussion—1 hour. Information concerning the three-dimensional morphology of internal and external body surfaces, both normal and abnormal, as revealed by scanning electron microscopy of cells, tissues, organs, and replicas will be compared and correlated with that derived from other techniques. Offered in even-numbered years.

Mr. Tyler

207. Perspectives in Morphological Research. (3) III.

Lecture—2 hours; discussion—1 hour. Consideration of the principles and applications of modern morphological methods and their role in biomedical research. Examples of specific methods include stereology, computer analysis of images, scanning and transmission electron microscopy, histochemistry, autoradiography, rapid freezing, and vascular injections. Offered in odd-numbered years.

Mr. Tyler

210. Principles of Histochemistry. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Zoology 107, Biochemistry 101A. Principles of enzyme histochemistry of animal tissues applicable to light and electron microscopy. Offered in odd-numbered years. (S/U grading only.) Mr. Tyler

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)

Mr. Faulkin in charge

297. Advanced Group Study in Surgical Anatomy. (2-4) I, II, III.

Laboratory—6-12 hours. Prerequisite: course 180. Selected topics in topographical, radiological, or regional anatomy as they apply to the clinical sciences.

298. Group Study. (2-5) I, II, III.

Laboratory—6-15 hours. Prerequisite: consent of instructor.

The Staff (Chairman in charge)

ANESTHESIOLOGY—See Medicine

ANIMAL BIOCHEMISTRY—See Biochemistry

ANIMAL GENETICS—See Genetics

ANIMAL NUTRITION—See Nutrition

ANIMAL SCIENCE

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 76 and 182.

Related Courses. See *Food Science and Technology 120 (Muscle as Food)*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

1. Domestic Animals and Man. (3) I.

Lecture—2 hours; laboratory—2 hours. Domestication of animals and factors affecting their characteristics and distribution. Animal use by man for food, work, fiber, drugs, research and recreation; projected effects of population expansion and urbanization. Demonstrations of beef and dairy cattle, poultry, sheep, swine and horses. The Staff (Mr. Ronning in charge)

2. Introductory Animal Science. (3) III.

Lecture—2 hours; laboratory—2 hours. Recommended: course 1; Biological Sciences 1. Growth, reproduction, lactation, inheritance, nutrition, and disease control in domesticated animals; the application of sciences to animal production. The Staff (Mr. Weir in charge)

21. Livestock and Dairy Cattle Judging. (2) III.

Laboratory—6 hours. Prerequisite: courses 1 and 2. Conformation, finish and quality in relation to ideal type. Relationship of form to function. Change in body proportions with growth and maturity. Correlation between types in live meat animals and carcass quality. Mr. Mendel

31. Current Topics in Animal Science. (1) II.

Lecture-discussion—1 hour. Presentation and discussion of topics of current concern to the animal industry. Topics such as animal waste disposal, land utilization, livestock improvement programs, disease control programs, and importation problems will be considered. (P/NP grading only.) Mr. Ronning

299. Research. (2-12) I, II, III.

Laboratory—6-36 hours. Prerequisite: consent of instructor. (S/U grading only.)

The Staff (Chairman in charge)

49A-49B-49C. Animal Management Practices. (2-2-2) I-II-III.

Discussion—1 hour; laboratory—3 hours. The application of the principles of elementary biology; the art and science of management of beef and dairy cattle, horses, sheep, swine, and laboratory animals. (P/NP grading only.)

The Staff (Mr. Heitman in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. Problems in animal biology; nutrition, breeding, and physiology of livestock.

The Staff (Mr. Ronning in charge)

Upper Division Courses

111. Type Evaluation in Livestock and Dairy Cattle. (2) I.

Laboratory—6 hours. Prerequisite: course 21. Studies of recognized type evaluation in livestock and dairy cattle. Critical evaluation of the bases for the criteria used in establishing these standards. Mr. Carroll

114. Advanced Dairy Cattle Production. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 107; Nutrition 110 and course 124, or their equivalent recommended. Scientific principles from genetics, nutrition, physiology and related fields applied to conversion of animal feed to human food through dairy animals. Genetic, environmental, and managerial sources of variation in milk composition and yield; economic and energetic efficiency of milk production. Mr. Laben

115. Horse Production. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 100B; Nutrition 103 or 110; Physiology 110B. Feeding, breeding, and management of horses; application of the principles of basic animal sciences to problems of production of all classes of horses. Mr. Evans

NOTE: For key to footnote symbols, see page 191.

116. Meat Animal Production. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 107; Nutrition 103 or 110; Physiology 110B. Application of the sciences of nutrition, physiology, and genetics to the development of efficient management programs for beef, sheep, and swine production. Similarities and differences among these species affecting management practices. Methods of improving carcass and meat quality.

Mr. Bradford, Mr. Garrett

117. Physiological Aspects of Animal Production from Tropical and Arid Areas. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Nutrition 110; Physiology 110B. Comparative aspects of animal production from domesticated and wild species in tropical and arid environments, with emphasis upon the effects of the climatic and nutritional environment on basic physiological mechanisms as they relate to the efficiency of animal production.

Mr. Morris

118A. Range Livestock Production. (3) II.

Lecture—3 hours. Prerequisite: Nutrition 103 or 110; courses 1, 2, and Genetics 100B recommended. Not open for credit to Animal Science majors. The application of scientific knowledge to the improvement and production of beef cattle and sheep. Reproduction including artificial insemination; breeding plans; management; supplementary feeding; marketing.

Mr. Carroll

118B. Intensive Livestock Production. (3) III.

Lecture—3 hours. Prerequisite: Nutrition 103 or 110. Recommended: courses 1, 2 and 118A; Genetics 100B. Not open for credit to Animal Science majors. Principles and practices involved in feedlot, dairy, and swine operations. Growth and fattening; lactation; feeding practices; methods of evaluating body composition of meat animals; housing and equipment; waste disposal.

Messrs. Carroll, Heitman, Laben

123. Animal Growth. (4) II.

Lecture—2 hours; special reports and discussions—2 hours. Prerequisite: upper division course in physiology and Nutrition 110, or equivalent background knowledge. Basic and practical aspects of prenatal, postnatal and adult growth of animals focusing on nutritional, physiological, and genetic effects and interrelationships. An unconventional approach will integrate knowledge from the several disciplines on the major factors regulating and influencing growth.

Messrs. Garrett, Ashmore, Bradford

124. Lactation. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Physiology 110B and Nutrition 110, or equivalent background knowledge. Consideration of the biochemical, genetic, physiological, nutritional, and structural factors relating to mammary gland development, the initiation of

lactation, the composition of milk and lactational performance.

Mr. Baldwin, Mr. Laben

190. Proseminar in Animal Science. (1) I.

Seminar—1 hour. Prerequisite: senior standing in Animal Science or consent of instructor. Reports and discussions of recent advances in animal science.

Mr. Heitman

197T. Tutoring in Animal Science. (1-2) I, II, III.

Prerequisite: animal science or related major; advanced standing; consent of instructor. Tutoring of students in lower division animal science courses; weekly conference with instructors in charge of courses; written critiques of teaching procedures. May be repeated once for credit. (P/NP grading only.)

Mr. Ronning

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Selected topics relating to the animal sciences.

The Staff (Mr. Ronning in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. Problems in animal biology related to nutrition, breeding and physiology of large domestic livestock.

The Staff (Mr. Ronning in charge)

Graduate Courses**219. Muscle Growth and Development. (3) I.**

Lecture—2 hours; seminar—1 hour. Prerequisite: Biochemistry 101B, Zoology 100, 121A; or consent of instructor. Integration of growth and development of skeletal muscle: morphology, biochemistry, neural control mechanisms, circulatory and nutritional factors. Prenatal and neonatal differentiation of fiber types. Experimental and hereditary myopathies. Offered in odd-numbered years.

Mr. Ashmore

240. Statistical Inference in Animal Experimentation. (4) III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: Mathematics 13; knowledge of Fortran recommended. Development of hypothesis-testing techniques for specific application to problems involving large animal research and related areas. Particular emphasis on principles of inference and prediction. Laboratory exercises in statistical analysis utilizing computer techniques.

Mr. Gall

290. Seminar. (1) I, II, III.

Seminar—1 hour. Reports and discussions of topics of interest in genetics, nutrition, and physiology as they apply to animal science. (S/U grading only.)

The Staff (Mr. Ronning in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Lectures and discussions of advanced topics in the animal sciences.

The Staff (Mr. Ronning in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Ronning in charge)

ANTHROPOLOGY

Delbert L. True, Ph.D., *Chairman of the Department*
Department Office, 328 Young Hall

Professors:

Martin A. Baumhoff, Ph.D.
Daniel J. Crowley, Ph.D. (*Anthropology and Art*)
Jack D. Forbes, Ph.D. (*Anthropology and Applied Behavioral Sciences*)
David L. Olmsted, Ph.D.

Associate Professor:

Delbert L. True, Ph.D.

Assistant Professors:

Kenne H-K Chang, Ph.D.
Richard T. Curley, Ph.D.
William G. Davis, Ph.D.
Henry McHenry, Ph.D.
Jerry A. Moles, Ph.D.
Melvin K. Neville, Ph.D.
Henry J. Rutz, M.A. (*Acting*)
Carol F. Wall, Ph.D.



Departmental Major Advisers for Bachelor of Arts Degree.—Mr. Curley, Mr. Moles.

Departmental Major Adviser for Bachelor of Science Degree.—Mr. McHenry.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Anthropology 1, 2, 3, and Mathematics 13, Geography I or Environmental Studies 10.

Upper Division Courses.—Required: Anthropology 102, 103A, 109, 110; 111 or 112 or 120; 128; 4 units of physical anthropology; 4 units of ethnography; one additional archaeology course; and 8 additional units of courses selected from the following: any upper division anthropology course, Art 150, 151, Genetics 100A, 100B, 115.

Language Requirement.—18 units or the equivalent in one language.

Bachelor of Science Major Program

Lower Division Courses.—Required: Anthropology 1, 2, 3; Biological Sciences 1; Chemistry 1A–1B; Mathematics 13; Zoology 2; and either Chemistry 8A–8B or Mathematics 16A–16B. Recommended: Physics 2A–2B–2C; Psychology 1A–1B; Geology 1, 1L, 3, 3L.

Upper Division Courses.—A minimum of 44 units including three courses in physical anthropology and three additional courses in anthropology chosen in consultation with the adviser.

Of these units, 20 shall be chosen in consultation with the adviser from a list provided by the department and shall include Genetics 103, and either 115 or 100A–100B, and not less than one laboratory course in human or vertebrate anatomy.

Language Requirement.—18 units or the equivalent in one language.

Bachelor of Science List of Courses

Physical Anthropology.—Courses 150, 151, 152, 153, 154A, 154B, 155, 156.

Upper Division Courses outside the Department.—Anatomy 100; Biochemistry 101A, 101B; Epidemiology 103A, 103B, 103C; Genetics 100A, 100B, 103, 105, 115; Geology 106, 107, 140; Human Anatomy 102; Physiology 110A, 110B, 111A, 111B; Psychology 108, 112, 150, 180; Zoology 100, 106, 107, 125, 136, 147, 148, 155.

Graduate Study.—The department offers a program of study leading to the M.A. and Ph.D. degrees in anthropology. Further information regarding graduate study may be obtained at the department office and at the Graduate Division.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Required: 30 quarter units of anthropology.

Subject Representative: Mr. Curley.

Lower Division Courses

1. Physical Anthropology. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Introduction to human evolution. The processes and course of human evolution; man's place in nature and the study of primates; the biological variability of living man and the genetic background. Mr. Neville, Mr. McHenry

2. Cultural Anthropology. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Diversity of cultures considered from the aspects of language, economics, kinship, art, magic, and religion; culture change.

Messrs. Moles, Curley, Rutz

3. Introduction to Archaeology. (4) I, III.

Lecture—3 hours; discussion—1 hour. Development of archaeology as an anthropological study; objectives and methods of modern archaeology. Mr. True

4. Introduction to Linguistic Anthropology. (4) III.

Lecture—3 hours; discussion—1 hour. Lan-

NOTE: For key to footnote symbols, see page 191.

guage in its interrelationships with man's biology, his culture, and his society. Miss Wall

5. The Relevance of Human Biology. (4) I.

Seminar—4 hours. Prerequisite: consent of instructor. The interrelationship between biological and cultural adaptations to man's environment. Because of the competition for the limited space in this course and its varying focus and prerequisites, it is mandatory to contact instructor well before quarter's onset. (P/NP grading only.)

13. Quantitative Method in Anthropology. (4) II.

Lecture—3 hours; discussion—1 hour.
Mr. Baumhoff

20. The Native American Experience. (4) I, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: Native American Studies I or consent of instructor. An introduction to American Indian historical and socio-cultural development with emphasis upon the United States area and upon those processes, such as relations with non-Indians, which have contributed to the current condition of Indian people. (Same course as Native American Studies 20.)

Upper Division Courses

102. Ethnology. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introduction to varieties of explanation in anthropology; discussion of controversy surrounding relations between the designation of problem areas, choice of concepts, and selection of facts in the construction of anthropological theory. Mr. Rutz

103A. Archaeological Theory and Method. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1, 3, and 13. Theory and method of prehistoric archaeology. Mr. True

103B. Old World Archaeology. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 103A. Comparative prehistory and archaeology of the Eastern Hemisphere.

103C. New World Archaeology. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Comparative prehistory and archaeology of the Western Hemisphere.
Mr. Baumhoff

*104. Race and Sex: Race Mixture and Mixed Populations. (4) I.

Lecture—3 hours; discussion—1 hour. A study of the phenomena of race mixture (miscegenation), interracial marriage, and mixed (hybrid) human populations. Emphasis will be placed upon the social and cultural effects of race mixture and of the interaction of racism and sexual behavior. Mr. Forbes

105A. Indians of North America. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introductory survey of the Indians of North America: origins, languages, civilizations, and history. Mr. Forbes

*105B. Indians of South America. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introductory survey of the Indians of South America: origins, languages, civilizations, and history. Mr. Moles

106. Native Peoples of California and the Great Basin. (4) II.

Lecture—3 hours; discussion—1 hour. An introduction to the traditional and recent cultures of the American Indian peoples of the California-Great Basin area. Considerable emphasis will be placed upon the changes in those cultures taking place during the past 400 years. Mr. Forbes

108. Native Americans in Contemporary Society. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. An introduction to the socio-cultural development of American Indian populations in modern times with emphasis upon North America. Attention will be given to contemporary Indian affairs and problems as well as to the background for present-day conditions.

109. Phonetics. (4) I.

Lecture—3 hours; discussion—1 hour. Thorough grounding in articulatory phonetics with some attention to the fundamentals of acoustic phonetics. Miss Wall

110. Elementary Linguistic Analysis. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. An introduction to phonemic theory, morphophonemics, morphemics, and tactics. Mr. Olmsted

111. Intermediate Linguistic Analysis. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Continuation of course 110. Advanced work in phonemics, morphophonemics, morphemics, and tactics. Mr. Olmsted

112. Comparative Linguistics. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Linguistic prehistory, historical linguistics, and reconstruction. Mr. Olmsted

114. The Ethnography of Speaking. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; course 4 or Linguistics 35. The social and linguistic aspects of verbal behavior. Participants, situations, and functions of

communication. Speech communities, language and social stratification, bi- and multilingualism.

116. Introduction to Ethnographic Research. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 102. Guidelines for the proper conduct of ethnographic research; standards for evaluating ethnographic literature. Mr. Moles

***118. Ethnosemantics. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or equivalent. An examination of the uses of linguistic, cognitive psychological, and mathematical analyses in the study of meaning of folk classification systems. Emphasis will be placed upon the development of skills in the collection and analysis of field data. Mr. Moles

***119A. Culture and Personality. (4) II.**

Lecture 3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Methods and theories in the study of the relationships among culture, society, and personality. The development of culture and personality as a subdiscipline in anthropology.

***119B. Culture and Personality. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 119A. An examination of empirical investigations of preliterate and contemporary societies in relation to the techniques of culture and personality studies.

***120. Language and Culture. (4) II, III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; course 4 or Linguistics 35. Language and thought; classification of languages; linguistic aspects of culture; language, nation, and state. Mr. Moles

***121. Folklore. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or literary preparation acceptable to instructor. Theory and method in the study of folktales, myths, legends, proverbs, riddles, songs, and other forms of verbal tradition. Mr. Crowley

***122. Economic Anthropology. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Economic behavior in nonindustrial societies; its social and cultural setting, and its modern changes. Mr. Davis

123. Political Anthropology. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. A survey of functional, structural, organizational, and decision-making approaches to primitive, tribal, and peasant political organization. Some

attention will be given to political modernization within the setting of the colonial situation. Mr. Rutz

124. Comparative Religion. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Anthropological analysis of the origins, elements, forms, and symbolism of religion; functional interpretation with stress on ethnographic materials. Mr. Curley

128. Kinship and Social Organization. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Theoretical: discussion of theories of social organization with primary emphasis on typology and classification of family and kinship systems. Mr. Davis

139A. Peoples of Africa. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of West Africa and the Congo Basin with analyses of representative societies which illustrate problems of general theoretical concern. A major consideration will be the continuities and discontinuities between periods prior to European contact and the present. Mr. Curley

139B. Peoples of Africa. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of Eastern, Central, and Southern Africa with analyses of representative societies which illustrate problems of general theoretical concern. Major consideration will be continuities and discontinuities between periods prior to European contact and the present. Mr. Curley

***140. Peoples of Afroamerica. (4) I.**

Lecture—3 hours; discussion—1 hour. A study of the cultural implications of slavery and the contribution of Africans to the national cultures of the Americas. Mr. Crowley

***143. Peoples of India. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Development of Indian cultural traditions; social organization and social trends.

147A. Peoples of the Pacific. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Aboriginal cultures of Micronesia, Melanesia, and Polynesia in prehistoric and modern times. Primary emphasis will be given to comparative social organization. Mr. Rutz

***147B. Peoples of the Pacific. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. The effects of European colonization of the Pacific upon the cultures of Micronesia, Melanesia, and Polynesia. Mr. Rutz

NOTE: For key to footnote symbols, see page 191.

148. Ecological Anthropology. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of theories, methods, and applications of the ecological perspective to cultural and physical attributes of human populations.

Mr. Chang

150. Primate Evolution Laboratory. (3) III.

Lecture—1 hour; laboratory—5 hours. Prerequisite: course 155 or 151 (may be taken concurrently). Osteological, dental, and neuro-anatomical studies of living and fossil primates. Limited enrollment.

151. Primate Evolution. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; Zoology 2 recommended. The origin and relationships of the prosimians, monkeys, and apes.

152. Human Evolution and Fossil Man. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Nature and results of the evolutionary processes involved in the formation and differentiation of mankind.

Mr. McHenry

***153. Human Variation. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. The origin and meaning of differences among human populations. Racial differences, such as those in blood groups, physiology, morphology, dermatoglyphics, will be considered relative to the evolutionary factors involved.

154A. Primate Behavior and Ecology. (4) I, II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. The social behavior and ecology of the prosimians, monkeys, and apes, and their relevance to the evolution of human behavior and social groupings.

Mr. Neville

154B. Primate Behavior and Ecology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 154A, Mathematics 13 or equivalent knowledge of statistics, and consent of instructor. Intensive study of theoretical problems arising in connection with primate behavior and ecology. Certain primate species will be discussed in depth, and laboratory work will involve individual projects on primate groups or special problems.

Mr. Neville

155. Comparative Primate Anatomy. (4) II.

Lecture—2 hours; laboratory—4 hours. Prerequisite: Zoology 2. The functional anatomy of the locomotor, digestive, reproductive, and nervous systems of monkeys and apes. Emphasis on the anatomical evidence for their interrelationships.

Mr. McHenry

156. Human Osteology. (4) I.

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1 or equivalent. Introductory study of the human skeleton, including bone growth, pathology, radiology, microscopy, dentition, and variations in race, sex, and age.

Mr. McHenry

***162. Peasant Society and Culture. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Comparative study of peasant communities, utilizing historical and ethnographic sources; analysis of urban rural relations; problems of economic development and culture change.

Mr. Chang

***165. Culture Change. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Introduction to the analysis of socio-cultural stability and change; theories of innovation, diffusion, acculturation, and cultural evolution; problems of social planning.

Mr. Chang

***190. Cultures of China and Korea. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Ethnological and comparative treatments of two cultures with emphasis on the village level.

Mr. Chang

***191. Culture of Japan. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Development of Japanese cultural traditions; social structure and social trends.

Mr. Chang

***192. Peoples and Cultures of Southeast Asia.**

(4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or equivalent or consent of instructor. The development of major cultural traditions, the patterns of ecological relationships, and comparative social organization of ethnic and regional groups in Southeast Asia.

Mr. Davis

194H. Special Study for Honors Students. (1-5)

I, II, III.

Prerequisite: open only to majors of senior standing who qualify for honors program. Independent study of an anthropological problem involving the writing of an honors thesis. (P/NP grading only.)

The Staff (Mr. True in charge)

195. Field Course in Archaeological Method.

(3) III.

Laboratory—8 hours. Prerequisite: course 3. Lectures, museum preparation, and weekend excavations. May be repeated for credit with consent of instructor. Limited enrollment.

Mr. True

196. Archaeological Method. (3) II.

Laboratory—6 hours. Prerequisite: course 195 and consent of instructor. Museum preparation, advanced field investigation, and guidance in preparation of museum material for publication. May be repeated for credit with consent of instructor. Limited enrollment.

Mr. Baumhoff

197T. Tutoring in Anthropology. (1-5) I, II, III.

Tutorial—1-5 hours. Prerequisite: upper division standing with major in anthropology and consent of Department Chairman. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit.

The Staff (Mr. True in charge)

198. Directed Group Study. (1-5) I, II, III.

Discussion—3 hours. Prerequisite: consent of instructor. Directed reading and group discussion of selected anthropological problems.

The Staff (Mr. True in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Mr. True in charge)

Graduate Courses

201. History of Anthropological Theory. (4) I.

Lecture—2 hours; discussion—1 hour. The historical development of the various fields of anthropology with emphasis upon their interrelationships.

Mr. Baumhoff

202. History and Theory of Physical Anthropology. (4) II.

Seminar—3 hours. The history of thought in physical anthropology and an analysis of the major theoretical problems in the field. Suggested for all first-year graduate students lacking intensive preparation in biological anthropology.

Mr. Neville

209. Objectives and Methods for College Teaching of Anthropology. (2) I.

Discussion—2 hours; assignments and reports. Prerequisite: normally limited to teaching assistants in anthropology. Analysis of the elements of effective teaching, drawing upon the student's experience in the classroom situation.

Mr. Baumhoff

210. Aspects of Culture Structure. (4) I, II, III.

Seminar—3 hours. Analysis of various phases of culture, such as religion, economics, law, and folklore.

The Staff

216. Problems in Archaeological Method. (4) III.

Seminar—3 hours. Techniques for analyzing archaeological data; application to various prehistoric cultures.

Mr. True

***217. Andean Prehistory: Theory and Method. (4) II.**

Seminar—3 hours. Prerequisite: consent of instructor. Discussion and evaluation of prehistoric occupations in the Andean Region of South America. Emphasis upon Preceramic and early farming peoples.

Mr. True

***219. Culture and Personality. (4) II.**

Seminar—3 hours.

220. Field Course in Linguistics. (4) III.

Seminar—2 hours; laboratory—2 hours. Prerequisite: courses 110, 111. Techniques of eliciting, recording, and analyzing; work with a native speaker.

Mr. Olmsted

221. Rural Transformation in Post-Colonial Societies. (4) I.

Seminar—3 hours. Prerequisite: courses 223, 265, or consent of instructor. Problems of rural transformation arising out of political and economic interaction between national elites and rural regional and local populations under varying conditions of induced change in post-colonial societies. Attention will be given to the implications of this interaction for rapid economic growth. May be repeated for credit.

Mr. Rutz

223. Economic Anthropology. (4) III.

Seminar—3 hours. Prerequisite: course 122, or consent of instructor. Selected current methodological and theoretical problems in the analysis of nonindustrial economic systems.

Mr. Davis

224. Problems in Comparative Religion. (4) III.

Seminar—3 hours. Advanced study of current problems in the anthropological study of religion.

Mr. Curley

***225. Kinship and Social Structure. (4) II.**

Seminar—3 hours. Componential analysis of kinship systems and discussion of descent group and alliance theories.

Mr. Curley

***226. Evolution of Social Organization. (4) II.**

Seminar—3 hours. Diachronic and synchronic analyses of social organization.

***239. Problems in African Society and Culture. (4) I.**

Seminar—3 hours. Diachronic analyses of traditional institutions in sub-Saharan Africa.

Mr. Curley

240. Problems in Afroamerican Studies. (4) III.

Seminar—3 hours. Comparative studies of selected Black communities in the New World.

Mr. Crowley

***242. Problems in African Prehistory. (4) I.**

Seminar—3 hours.

Mr. Baumhoff

NOTE: For key to footnote symbols, see page 191.

***245. Ethnology of Northern and Central Asia. (4) II.**

Seminar—3 hours. Prerequisite: a reading knowledge of German, Russian, Chinese, or Japanese. Lectures on the culture aboriginally found north of the Caucasus-Korea line. Supervised study of the primary and secondary sources. Work with informants when available.
Mr. Olmsted

***247. Peoples and Cultures of Oceania. (4) II.**

Seminar—3 hours. _____

***248. Concepts and Problems in Ecological Anthropology. (4) I.**

Seminar—3 hours. Prerequisite: course 148 or equivalent or consent of instructor. Advanced study of theories, methods, and applications of the ecological perspective to cultural and physical attributes of human population. Mr. Chang

250A. Theory and Method of Anthropology. (4) I.

Seminar—3 hours. Measurement, research design, field methods, data analysis, and theory construction in anthropological research.
Mr. Moles, Mr. Baumhoff

250B. Theory and Method of Anthropology. (4) II.

Seminar—3 hours. Prerequisite: course 250A. The application of symbolic analysis to anthropological materials. Mr. Moles, Mr. Baumhoff

250C. Theory and Method of Anthropology. (4) III.

Seminar—3 hours. Prerequisite: course 250B. Continuation of course 250B.
Mr. Moles, Mr. Baumhoff

253. Concepts and Problems in Physical Anthropology. (4) II.

Seminar—3 hours.

Mr. McHenry

254. Primate Social Behavior. (4) III.

Seminar—3 hours. Prerequisite: course 154B or equivalent. Analysis of primate social behavior, with particular emphasis on field studies.
Mr. Neville

***265. Concepts and Problems in Applied Anthropology. (4) I.**

Seminar—3 hours. Prerequisite: course 165 or equivalent or consent of instructor. Advanced study in culture change; case studies of directed culture change; problems of planning and evaluation; uses of anthropological theory and data in professional fields such as agriculture, public health, administration, and international technical assistance.
Mr. Chang

***280. Ethnohistorical Theory and Method. (4) III.**

Seminar—3 hours. A discussion of the ethnohistorical method; the utilization of diverse types of data, especially documentary sources to reconstruct socio-cultural history. Particular attention devoted to the applied uses of ethnohistory in the solution of contemporary social problems.
Mr. Forbes

292. Seminar in Anthropological Linguistics. (4) III.

Seminar—3 hours.

Miss Wall

299. Research. (3-8) I, II, III.

The Staff (Chairman in charge)

APPLIED BEHAVIORAL SCIENCES

Major Advisers.—See *Class Schedule listing.*

Major Program.—See page 77.

Related Courses. See *Environmental Planning and Management I (Environmental Quality); Environmental Studies 10 (Introduction to Environmental Studies), 101 (Social Processes), 111 (Cultural Ecology).*

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses**17. Population Problems. (2) II, III.**

Lecture—2 hours. An assessment of relevant aspects of overpopulation to determine man's chance of survival.
Mr. Howard

18. Scientific Bias and Social Myth. (3) II, III.

Lecture—2 hours; discussion—1 hour. Assumptions and biases in different fields of knowledge, taboo topics, and the nature of evidence in the public and academic communities; fit between University education and issues of society.
II. Mr. Fujimoto, III. Ms. Regan

47. Orientation to Community Resources. (2) I, II, III.

Field trip—3 days; Seminar—three 2-hour sessions. (Given between quarters.) Prerequisite: consent of instructor. Field trip to educational, social, and welfare agencies in California. Observation and discussion with staff members of different agencies which serve the needs of families and children. Advance reservations required. P/NP grading only.)
Mr. Hawkes

99. Special Study for Undergraduates. (1-5) I, II, III.

The Staff (Mr. Thompson in charge)

Upper Division Courses**140. Research Methods in Applied Behavioral Sciences. (4) I.**

Lecture—4 hours. Prerequisite: Psychology 1A. Application of social sciences research methodology to multidisciplinary problems.
Ms. Regan, Mr. Thompson

141. Research Design and Analysis. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 13; course 140 or con-

sent of instructor. Survey of major types of research design in the Behavioral Sciences. Tests of statistical significance, analysis of variance, and related topics. Use of computer in data processing. Ms. Regan

150. Housing. (4) III.

Lecture—4 hours. Exploration of the shelter aspects of the family environment. Study of technological, social, economic, and aesthetic factors affecting the nature and organization of family and community housing.

151A. Community Research and Analysis. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Theories on the emergence and structure of contemporary communities. Ethnographic, power structure and comparative approaches to community studies. Ways to incorporate research into programs for community change and development. Lecture and field work. Mr. Fujimoto

151B. Community Development. (4) II.

Discussion—1 hour; seminar—3 hours. Prerequisite: course 151A or consent of instructor. Principles and strategies of building institutions so community people can effect change. Examination of styles of citizen participation and control and the various roles of change agents in working with communities for their own self-development. Seminar and field work. Mr. Forbes

151C. Field Experience in Community Development. (12) III.

Field experience. Prerequisite: course 151A, 151B, and consent of instructor. Field assignment-internship with community and grass roots groups, analysis of resources and alternatives for resolution of community development needs. Mr. Fujimoto, Mr. Forbes

160. The Disadvantaged: Issues and Innovations. (3) I, II.

Seminar—3 hours. Prerequisite: 10 units of psychology, sociology, and/or anthropology. Identification and characteristics of the "invisible" segments of society with emphasis on the socially and culturally disadvantaged. Barriers encountered by these individuals and avenues for change are explored. I. Mr. Forbes, II. Mr. Corbett

ART

Richard D. Cramer, M.F.A., *Chairman of the Department*
Department Office, 101 Art

Professors:

Richard D. Cramer, M.F.A. (*Acting Director, Laboratory for Research in the Fine Arts and Museology*)

161. The Continuing Learner. (3) II.

Lecture—3 hours. Prerequisite: Education 110 (may be taken concurrently). Principles of adult education emphasizing barriers to learning, the role of non-verbal communication, the importance of self-concept in teaching adults, and the educator's role in working with non-school populations.

162. Man, Work and Technology. (3) III.

Lecture—3 hours. Critical issues created for man by technology. Employment-unemployment and its effect upon man. Social responsibility of persons and institutions which implement changes in the labor market. Significance of quality in employer-employee relationships.

190. Proseminar in Applied Behavioral Sciences.

(1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. Discussion of selected critical issues in the applied behavioral sciences. Required of seniors in the Applied Behavioral Sciences major. May be repeated for credit. (P/NP grading only.) The Staff (Mr. Thompson in charge)

196. Senior Project in Applied Behavioral Sciences.

(1-5) I, II, III.

Prerequisite: major in Applied Behavioral Sciences and consent of instructor. Guided research leading to completion of senior thesis. May be repeated for credit.

The Staff (Mr. Thompson in charge)

197T. Tutoring in Applied Behavioral Sciences.

(1-5) I, II, III.

Prerequisite: consent of instructor. Leading of small voluntary discussion groups.

The Staff (Mr. Thompson in charge)

197TC. Community Tutoring in Applied Behavioral Sciences. (1-5) I, II, III.

Prerequisite: consent of instructor. Supervised tutoring in the community.

The Staff (Mr. Thompson in charge)

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Thompson in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Thompson in charge)

¹Daniel J. Crowley, Ph.D. (*Art and Anthropology*)

²Seymour Howard, Ph.D.

⁴Ralph M. Johnson, M.A.

Daniel Shapiro
Wayne Thiebaud, M.A.

Associate Professors:

Robert C. Arneson, M.F.A.
Roy R. DeForest, M.A.
Manuel J. Neri
Roland C. Petersen, M.A.
William T. Wiley, M.F.A.

Assistant Professors:

¹Sherwood A. Fehm, Jr., Ph.D.
William Henderson, M.F.A.
Harvey Himelfarb, M.A.
Lynn Matteson, M.A. (*Acting*)

Lecturers:

L. Price Amerson, M.A.
Joseph A. Baird, Ph.D.
Gerald Hoepfner, B.F.A.



Departmental Major Advisers.—See the *Class Schedule*.

Preparation for the Major:

Art Studio: *three courses from the following list: Art 2, 3, 4, 14, 16 (see prerequisites for upper division courses); 8 units chosen from courses 1A, 1B, 1C, 1D. Entering freshmen who have studied art in high school should apply for advanced standing by submitting examples of their work for faculty review. Lower division students at Davis and transfer students will be required to keep a continuing portfolio of their work which is subject to faculty perusal at such times as when the student is declaring the major, enrolling in overflow courses, requesting independent study courses, etc.

Art History: courses 1A, 1B, 1C, 1D; one course in drawing, graphics, or painting; and one course in sculpture or ceramics.

The Major Program

Art Studio: *six courses from Group A courses under three different artists; one course from Group B; and two courses from Group C. The Department reserves the right to retain student work, at its discretion.

Art History: two Group C courses within each of two periods (e.g., 154A, 154B, and 178B, 178C); five courses chosen from Group C. Students planning to do graduate work in the History of Art should develop their knowledge of foreign languages (especially German) as early as possible.

* Students interested in drawing and painting should take courses 2, 3, 4; course 14 is recommended.

Students interested in sculpture, should take courses 2, 3, 14; course 4 is recommended.

Students preparing for graduate work in any of the environmental design professions should take courses 2, 14, 16, 121A, 121B, 121C, 149, 168, 184.

Transfer Students.—Before enrolling in Art courses at Davis, ask your faculty adviser to evaluate transfer courses in art.

Graduate Study.—The Department of Art offers programs of study and research leading to the M.F.A. degree in the practice of art and the M.A. degree in the history of art. Detailed information regarding graduate study may be obtained from the *Announcement of the Graduate Division*.

Teaching Major.—The A.B. degree with a major in the practice of art or in the history of art. Depending on the credential, certain other courses are required. For information see the subject representative.

Teaching Minor.—30 units in Art. These must be selected in consultation with the subject representative.

Subject Representative: Department Chairman.

Lower Division Courses

1A. Ancient Art. (4) I.

Lecture—4 hours. Art of the pagan Mediterranean world from the prehistoric caves to the fall of the Roman Empire. Mr. Howard

1B. Medieval and Renaissance Art. (4) II.

Lecture—4 hours. Christian, Barbarian, Moslem, and Classical traditions in European Art from the fourth through the sixteenth centuries. Mr. Fehm

1C. Baroque and Modern Art. (4) III.

Lecture—4 hours. Major styles and masters of the Western world after the Counter Reformation. Mr. Matteson

1D. Oriental Art. (4) III.

Lecture—4 hours. The art of India, South East Asia, China, and Japan. Mr. Crowley

2. Elementary Form and Color. (4) I, II, III.

Laboratory—12 hours. Form in composition using black and white media. Introduction to color in composition. The Staff

3. Intermediate Form and Color. (4) I, II, III.

Laboratory—12 hours. Prerequisite: course 2. Color and form in composition. The Staff

4. Introductory Figure Painting. (4) I, II, III.

Laboratory—12 hours. Prerequisite: course 2. Form in composition, with the human figure as subject. The Staff

10. Introduction to Art: History and Appreciation. (3) I.

Lecture—3 hours. The understanding and appreciation of painting, sculpture, architecture, and industrial art. Illustrated lectures. Intended for students not specializing in art.

11. Introduction to Art: Practice. (3) I, II, III.

Lecture—1 hour; laboratory—4 hours; 2 hours to be arranged. Individual explorations in various media. Intended for students not specializing in Art. Not open for credit to students who have had Art 2, 14, or 16. The Staff

14. Elementary Sculpture. (4) I, II, III.

Laboratory—12 hours. Form in space using clay and plaster. The Staff

16. Descriptive Drawing and Rendering. (4) I, II, III.

Lecture—1 hour; laboratory—6 hours. Methods of objective drawing and of space description; rendering in various media. _____

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Restricted to lower division students.

The Staff (Mr. Cramer in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Cramer in charge)

Upper Division Courses**Group A: Practice of Art****101. Painting: Materials and Carriers. (4) I.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 3. Experimentation in media and their supports. Mr. Hoepfner

102. Advanced Drawing and Painting. (4) I, II, III.

Laboratory—8 hours; 1 hour to be arranged. Prerequisite: courses 3, 4. Drawing and painting in various media including oil and polymers. May be repeated for credit. The Staff

104. Advanced Form and Figure Composition.

(4) I, II, III.

Laboratory—8 hours, 1 hour to be arranged. Prerequisite: course 4. Problems of light, color and space that involve the human figure and its environment. May be repeated for credit. The Staff

110. Photography. (4) I, II, III.

Laboratory—9 hours. Prerequisite: course 3 or 128A. Photography as a creative medium using the view camera and the miniature camera. Mr. Himelfarb

112A. Ceramics. (4) I, II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 2 or 14. Ceramics; introduction to ceramic forms and processes.

Mr. Arneson

112B. Ceramics. (4) I, II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 112A. Ceramics; introduction to ceramic color and glaze. Mr. Arneson

115. Film-making. (4) I, II, III.

Lecture—1 hour; laboratory—6 hours; film-making projects. Prerequisite: at least a junior standing. Film-making as a creative medium using 8 and 16 mm. cameras and sound track. Mr. Henderson

121A. Architectural Design. (4) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: two quarters in art practice or design; or consent of instructor. Studio projects in architectural design. Mr. Cramer

121B. Architectural Design. (4) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 121A. Studio projects in architectural design. Mr. Cramer

***121C. Architectural Design. (4) III.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 121B. Studio projects in architectural design. Mr. Cramer

128A. Graphic Arts. (4) I, II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: 2 courses in art practice. Beginning practice and theory of printmaking; practice in traditional and experimental methods in relief and silk-screen printmaking, related to discussion of aesthetics of graphic form. _____

128B. Graphic Arts. (4) I, II, III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 128A. Practice and theory of traditional and experimental methods of intaglio printmaking: etching, engraving, aquatint, and innovational techniques and materials. _____

128C. Graphic Arts. (4) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 128A. Practice and theory of traditional and experimental methods of lithographic printmaking. _____

141. Sculpture: Materials and Methods. (4) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 14. Influences of material and technique on sculptural forms: clay, wood, metal, plastics. _____

142. Figure Sculpture. (4) I.

Lecture—1 hour; laboratory—6 hours; 1 hour to be arranged. Prerequisite: course 141; course 4 recommended. The human figure in sculpture. May be repeated for credit. Mr. Neri

143. Casting Techniques and Theories of Cast Sculpture. (4) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 14. Sculpture in various casting techniques and media. May be repeated for credit. _____

NOTE: For key to footnote symbols, see page 191.

***144. Advanced Sculpture. (4) III.**

Laboratory—8 hours; 1 hour to be arranged.
Prerequisite: course 141. Advanced sculptural projects in various media. The Staff

146. Ceramic Sculpture. (4) III.

Laboratory—8 hours; 1 hour to be arranged.
Prerequisite: course 112B. Clay as material for sculpture in round and relief. May be repeated for credit. Mr. Arneson

*Group B: Theory and Criticism***148. Theory and Criticism: Painting and Sculpture. (4) II.**

Lecture—3 hours; term paper required. Prerequisite: course 2 or 14, and one art lecture course. Study of forms and symbols in historic and contemporary masterpieces. Mr. Thiebaud

***149. Theory and Criticism: Architecture. (4) III.**

Lecture—3 hours; seminar paper. Prerequisite: course 2 or 14; one art lecture course. Aesthetic theories of design styles, historic and contemporary. Mr. Cramer

*Group C: History of Art****150. Arts of Subsaharan Africa. (4) I.**

Lecture—3 hours; term paper or gallery studies and review. Traditional arts and crafts of subsaharan Africa; particular attention to the relationships between sculpture and culture in West and Central Africa. Mr. Crowley

151. Arts of the Indians of the Americas. (4) I.

Lecture—3 hours; term paper or gallery studies and review. Development of art in North America, emphasizing ancient Mexico. South American relationships and parallels. Recent and contemporary Indian arts and crafts from Alaska to Chile. Mr. Crowley

***152. Arts of Oceania and Prehistoric Europe. (4) III.**

Lecture—3 hours; term paper. Traditional arts of aboriginal Australia, Melanesia, Polynesia, and Micronesia, as seen in their cultural contexts. Prehistoric art of Europe and the Near East. Mr. Crowley

154A. Archaic Greek Art. (4) I.

Lecture—3 hours; term paper or gallery studies and review. The art of Greece from the Protogeometric through Archaic periods. Mr. Howard

154B. Classical Greek Art. (4) II.

Lecture—3 hours; term paper or gallery studies and review. Greek art of the Gold and Silver Ages. Mr. Howard

154C. Hellenistic Art. (4) III.

Lecture—3 hours; term paper or gallery studies and review. Greek Art from Alexander to Julius Caesar. Mr. Howard

***155. Roman Art. (4) I.**

Lecture—3 hours; term paper or gallery studies and review. The art of republican and Imperial Rome. Mr. Howard

162. History of Printmaking. (4) II.

Lecture—3 hours; term paper or gallery studies and review. The development of graphic media in the Western World from the fifteenth century to the present. Mr. Amerson

***168. History of Urban Form. (4) I.**

Lecture—3 hours; term paper or gallery studies and review. The evolution of cities. Physical forms of town planning in the past as a guide to modern developments. Emphasis on major civic centers; Rome, Paris, London, New York, etc. Relation of European and American town planning. Mr. Baird

***176A. Art of the Middle Ages: Early Christian through Romanesque. (4) II.**

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture in Christian Europe from the founding of Constantinople through the twelfth century. Mr. Fehm

176B. Art of the Middle Ages: Gothic. (4) II.

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture in Christian Europe from the twelfth through the fifteenth centuries. Mr. Fehm

177A. Northern European Art. (4) I.

Lecture—3 hours; term paper or gallery studies and review. Painting and sculpture of the fifteenth century in Austria, Germany, France and the Lowlands, including such artists as Jan van Eyck and Hieronymus Bosch.

177B. Northern European Art. (4) II.

Lecture—3 hours; term paper or gallery studies and review. Painting and sculpture of the sixteenth century in Germany, France and the Lowlands, including such artists as Albrecht Dürer and Pieter Bruegel.

178A. Italian Renaissance Art. (4) I.

Lecture—3 hours; term paper or gallery studies and review. Late medieval painting and sculpture. Origins of the Renaissance. Mr. Fehm

178B. Italian Renaissance Painting. (4) II.

Lecture—3 hours; term paper or gallery studies and review. Painting in Italy in the fifteenth century. Mr. Amerson

178C. Italian Renaissance Painting. (4) III.

Lecture—3 hours; term paper or gallery studies and review. Painting in Italy in the sixteenth century. Mr. Amerson

***178D. Italian Renaissance Architecture. (4) I.**

Lecture—3 hours; term paper or gallery studies and review. Architecture in Italy from the thirteenth through the sixteenth centuries.

Mr. Fehm

178E. Italian Renaissance Sculpture. (4) I.

Lecture—3 hours; term paper or gallery studies and review. Sculpture in Italy with emphasis on the fifteenth and sixteenth centuries.

Mr. Amerson

179A. Baroque Art. (4) I.

Lecture—3 hours; term paper or gallery studies and review. Western European architecture, sculpture and the art of the garden from the late sixteenth through the early eighteenth centuries.

Mr. Baird

179B. Baroque Art. (4) II.

Lecture—3 hours. Painting in Western Europe in the seventeenth century: especially the Dutch, Flemish, French, and Italian painters.

183A. Painting from Goya to Manet. (4) I.

Lecture—3 hours; term paper or gallery studies and review. Developments of the late eighteenth and first half of the nineteenth century, with emphasis on France and England. (Neo-Classicism, Romanticism, Realism, etc.)

Mr. Matteson

183B. Painting from Manet to 1900. (4) II.

Lecture—3 hours; term paper or gallery studies and review. Later nineteenth century developments. Emphasis on France (Impressionism, Post-Impressionism, etc.). Mr. Matteson

183C. Painting in the Twentieth Century. (4) III.

Lecture—3 hours; term paper or gallery studies and review. Modern and contemporary developments. Emphasis on Europe and America (Cubism, Surrealism, etc.). Mr. Matteson

***183D. Modern Sculpture. (4) III.**

Lecture—3 hours; term paper or gallery studies and review. Sculpture from Neo-Classicism to the present.

Mr. Howard

184. Architecture in the Twentieth Century. (4) III.

Lecture—3 hours. The forms and substyles of modern architecture, with emphasis on the development of organicism in the works of Frank Lloyd Wright and of the international style in the work of Le Corbusier and Mies van der Rohe.

Mr. Cramer

***188A. Art of Latin America. (4) I.**

Lecture—3 hours; term paper or gallery studies and review. Architecture, sculpture and painting in Mexico from 1530 to the present. The American Southwest, the colonial art of

Peru, and eighteenth century to modern architecture in Brazil. European backgrounds and creative originality in the New World. Mr. Baird

***188B. Architecture of the United States. (4) III.**

Lecture—3 hours; term paper or gallery studies and review. American building, with emphasis on early colonial, Georgian, nineteenth and twentieth century developments. Particular attention to Northern California in the latter part of the course.

Mr. Baird

188C. Painting of the United States. (4) III.

Lecture—3 hours; term paper or gallery studies and review. American pictorial development from 1650 to the present, with emphasis on twentieth-century developments. Mr. Fehm

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Cramer in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Cramer in charge)

Graduate Courses**201. Experiments in Art and Visual Communication.**

(4) I.

Lecture—3 hours. Original work produced for class discussion and criticism. May be repeated for credit.

The Staff

***202. Sculpture in Selected Media. (4) II.**

Lecture—3 hours. Original work produced for class discussion and criticism. May be repeated for credit.

The Staff

***250. Principles of Art Historical Research. (4) I.**

Seminar—3 hours. Major historic bibliographical sources and reference materials. Use of national and international facilities for research, including intercampus potential of U.C. and other libraries of California. Techniques of research in specialized fields. Methods of illustration for published papers and books; forms of printing. Required of M.A. candidates in History of Art.

The Staff

***251. Seminar in Primitive Art. (4) I.**

Seminar—3 hours. Selected areas of special study in the arts of Africa, Oceania, and Pre-historic Europe; in certain years, study of the Indians of the Americas, pre-Conquest to contemporary.

Mr. Crowley

254. Seminar in Ancient Art: Greece. (4) II.

Seminar—3 hours. Selected areas of special study in Greek art from Helladic to later Hellenistic.

Mr. Howard

NOTE: For key to footnote symbols, see page 191.

***255. Seminar in Ancient Art: Rome. (4) II.**

Seminar—3 hours. Selected areas of special study in Roman art from Republican to late Imperial. Mr. Howard

276. Seminar in Medieval Art. (4) I.

Seminar—3 hours. Selected areas of special study in medieval art from Early Christian to late Gothic. Mr. Fehm

277. Seminar in Northern Renaissance Art. (4) III.

Seminar—3 hours. Selected areas of special study in Netherlandish and German art of the fifteenth and sixteenth centuries.

278. Seminar in Italian Renaissance Art. (4) II.

Seminar—3 hours. Selected areas of special study in Italian art from trecento to cinquecento. Mr. Amerson

***279. Seminar in Baroque Art. (4) III.**

Seminar—3 hours. Selected areas of special study in Baroque art from late sixteenth to late eighteenth centuries. Mr. Baird

283. Seminar in Modern European Art. (4) II.

Seminar—3 hours. Selected areas of special study in art since 1800 in Europe. Mr. Matteson

288. Seminar in American Art. (4) III.

Seminar—3 hours. Selected areas of special study in art in the United States from colonial times to the present. Mr. Baird

290. Seminar. (4) I, II, III.

Seminar—3 hours. Original works produced for group discussion and criticism; associated topics of a contemporary and historical nature. May be repeated for credit.

The Staff (Graduate Adviser in charge)

291. Seminar: Critical Evaluation. (1) I, II, III.

Seminar—1 hour. May be repeated for credit. (S/U grading only.)

The Staff (Graduate Adviser in charge)

292. Seminar: Comprehensive Qualifying.

(1) I, II, III.

Seminar—1 hour. A further critical evaluation of the student's work to determine his eligibility to begin the Comprehensive Project. May be repeated for credit. (S/U grading only.)

The Staff (Graduate Adviser in charge)

299. Individual Study. (1-6) I, II, III.

The Staff (Graduate Adviser in charge)

299D. Comprehensive Project. (9) I, II, III.

An original body of work accompanied by a catalog summarizing the student's aesthetic position. May be repeated for credit. (S/U grading only.) The Staff (Graduate Adviser in charge)

Professional Courses***300. Practice and Principles of Art Education.**

(3) I, II, III.

Lecture—2 hours; laboratory—4 hours. Prerequisite: senior or graduate standing; or consent of instructor. Art education and practice of techniques used in elementary and secondary schools.

***401. Museum Training: Curatorial Principles. (4) I.**

Seminar—3 hours. Study of private and public collections. Museum personalities. Appraisal of works of art; ethics of appraisal. Auction and sales: methods and catalogues. Registration. Technical problems of the museum. Connoisseurship. Collateral reading. Visits to museums. Seminar with assigned papers. Mr. Baird

402. Museum Training: Exhibition Methods. (4) III.

Seminar—3 hours. History of exhibition methods in private and public collections. Comparisons of different types of museums and their exhibition problems. Lighting and techniques of display with emphasis on actual design. Experimentation with unusual presentation forms. Seminar and exhibition. Mr. Baird

403. Museum Training: Historic Materials and Techniques. (4) II.

Seminar—3 hours. Examination of works of art with emphasis on materials and methods of construction: wall paintings, panel paintings, paintings on cloth, drawings, ceramics, metals, etc. Experimentation in constructing works of art from historical writings. Collateral reading. Visits to museums. Mr. Hoepfner

404. Museum Training: Problems of Conservation. (4) III.

Seminar—3 hours. Examination of works of art with emphasis on physical condition. Typical problems in preservation and restoration. Ethics and aesthetics of museum conservation. Demonstrations of scientific methods. Collateral reading. Visits to museums. Seminar and assigned papers. Mr. Hoepfner

ASIAN AMERICAN STUDIES

Related Courses. For other Asian languages, see course offerings in *Oriental Languages*.

Questions pertaining to the following courses should be directed to the instructor or to the

Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall. Concentration in Asian American Studies is available through an Applied Behavioral Sciences major.

Lower Division Courses

1C-2C-3C. Elementary Standard Cantonese.

(4-4-4) I-II-III.

Lecture—3 hours; laboratory—2 hours. (Same course as Oriental Languages 1C-2C-3C.) Mr. Leung

4C-5C-6C. Intermediate Standard Cantonese.

(3-3-3) I-II-III.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 3C or Oriental Languages 3C. Continuation of course 1C-2C-3C. (Same course as Oriental Languages 4C-5C-6C.) Mr. Leung

20. Asian Calligraphy. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: knowledge of Cantonese, Mandarin or Japanese helpful. Introduction to Asian calligraphy stressing the technique of writing. Mr. Leung

33. The Asian Experience in America. (3) I, II, III.

Lecture—2 hours; discussion—1 hour. General consideration of Asians in America, past and present. The Staff (Mr. Yoshioka in charge)

Upper Division Courses

100. Asian American Communities. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 33 or consent of instructor. Political and social status, occupation, income, education, health, housing, and civic culture of various Asian American communities in the United States; segregation in interrelations between geographical groups, relations between

rich and poor, patronism, exploitation; mobility within each ethnic group. Mr. Kagiwada

110. Asian Americans: A Case Study in Inter-Ethnic Relations. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 33 or consent of instructor. A study of prejudices, intermarriages, economical and political interaction between Asian American ethnic groups, of Asian Americans with other non-Asian ethnic groups, and with the larger society. Mr. Kagiwada

111. Alienation and the Asian American. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 33 or consent of instructor. An examination of self-awareness, alienation, and life perspective of Asians in America. Emphasis will be placed on the problems of identity formation of Asian Americans. Mr. Yoshioka

***140. Speech Patterns of Asian Americans. (4) II.**

Lecture—4 hours. A general introduction to bilingualism as a social issue; survey of bilingual communities, problems of bilingual speakers, linguistic effects of bilingualism, particularly the effects of Asian languages in the speech patterns of Asian Americans. Offered in even-numbered years.

300. Asian American Curriculum Development. (4)

(Extra Session—Summer).

Seminar—4 hours. Planning and organizing an effective curriculum in ethnic studies. Selection, organization, evaluation, and use of resource material for teaching. Mr. Kagiwada

ASTRONOMY—See Physics

ATMOSPHERIC SCIENCE

Major Advisers.—See *Class Schedule* listing. Major Program.—See page 78.

Related Courses. See *Agricultural Engineering Technology 111 (Microclimatology)*; *Environmental Toxicology 110 (Air Pollutants)*; *Water Science 202 (Evapotranspiration)*; *Geography 3 (Climate and Weather)*; *Civil Engineering 149 (Air Pollution Control)*, 242 (*Air Quality*).

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

20. Introduction to Meteorology. (3) I.

Lecture—3 hours. Prerequisite: an introductory course in calculus. Basic concepts of modern meteorology: weather and weather elements, atmospheric circulations, clouds, precipitation, radiation, instruments and observations, meteorological satellites. Mr. Coulson

20L. Introduction to Meteorology Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: course 20 (preferably taken concurrently). Introduction to meteorological instruments and observations; weather station visits; weather maps and charts; special films on weather modification, air pollution, and atmospheric circulation; physical experiments illustrating atmospheric phenomena. Mr. Coulson

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. (P/NP grading only.)

The Staff (Mr. Goss in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Mr. Goss in charge)

NOTE: For key to footnote symbols, see page 191.

Upper Division Courses

110A. Weather Analysis and Forecasting. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 20 or equivalent; course 121A (may be taken concurrently). Theory and practice of three-dimensional scalar and vector analysis as applied to atmospheric circulations. Physics, structure, and evolution of large-scale weather systems. Techniques of drawing weather maps.

110B. Weather Analysis and Forecasting. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 110A. Application of dynamic theory to atmospheric weather systems. Graphical integration techniques applied to weather maps. Beginning of numerical forecasting techniques. Mr. Carroll

110C. Weather Analysis and Forecasting. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 110B. Numerical forecasting techniques applied to the general circulation of the atmosphere. The World Weather Watch and its requirements. Use and limitations of satellite data. Long-range forecasting. Mr. Carroll

120. Atmospheric Thermodynamics and Statics. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 22C, Physics 4B, Atmospheric Science 20 (may be taken concurrently). The atmosphere at rest: atmospheric composition and structure, thermodynamics of atmospheric gases, thermal properties of dry and moist air, hydrostatic equilibrium and stability criteria, and thermodynamic diagrams in meteorology. Mr. Goddard

121A. Atmospheric Dynamics. (3) II.

Lecture—3 hours. Prerequisite: course 120. The atmosphere in motion: the equations of motion for rotating atmospheres; pressure and density fields and their relations to atmospheric circulations; wave motion in the atmosphere; vorticity. The physical basis of modern numerical methods in meteorology. Mr. Myrup

121B. Atmospheric Dynamics. (3) III.

Lecture—3 hours. Prerequisite: course 121A. The dynamics of fluid motion in geophysical and laboratory systems: Rossby waves; Helmholtz waves; the effect of turbulence; boundary layers; the Ekman layer. The dynamics of convective motion: the Rayleigh problem; penetrative convection; convective plumes; cumulus models. Mr. Myrup

***122. Atmospheric Radiation. (3) II.**

Lecture—3 hours. Prerequisite: Mathematics 22C, Physics 4C. Basic laws of radiation; properties of solar radiation; absorption, reflection and scattering in the atmosphere; planetary albedo; absorption and emission by atmospheric gases and aerosols; atmospheric energy budget. Offered in odd-numbered years. Mr. Coulson

123. Micrometeorology. (3) III.

Lecture—3 hours. Prerequisite: Mathematics 16B or equivalent. Properties of the atmosphere near the earth's surface: frictional effects, mass and energy transfers across the surface-atmosphere interface, and the effect of these in modifying the localized environment. Mr. Goddard

124. Meteorological Instruments and Observations. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 20 or equivalent. Modern meteorological instruments and their use in meteorological observations and measurements. Both standard and micrometeorological instruments are included. Mr. Goddard

131. Air Pollution Meteorology. (3) I.

Lecture—3 hours. Prerequisite: Physics 2C, Mathematics 16B, Chemistry 1B, or consent of instructor. Comprehensive overview of the relationship of meteorology to air pollution. Topics include: types and sources of pollutants; photochemistry, diffusion and transport, monitoring and air quality standards; inadvertent weather modification; and air pollution climatology. Mr. Carroll

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: three upper division units in Atmospheric Science.

The Staff (Mr. Goss in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: three upper division units in Atmospheric Science and at least an overall B average. The Staff (Mr. Goss in charge)

Graduate Courses

215. Atmospheric Processes. (3) I.

Lecture—3 hours. Prerequisite: graduate standing in atmospheric science or consent of instructor. Dynamics of the general circulation of the atmosphere, structure of weather systems, atmospheric energy budgets, mass momentum and radiative transfers, observational network and methods of measurement. Intended for students with Physical Science backgrounds other than meteorology. Mr. Coulson

221. Advanced Atmospheric Dynamics. (3) II.

Lecture—3 hours. Prerequisite: course 110C, Mathematics 22B. Dynamics of sub-synoptic scale atmospheric flows with emphasis on the effect of vertical density gradients on shear flow stability, wake generation and gravity waves; circulations in response to local horizontal density gradients; cumulus cloud dynamics and local severe weather. Mr. Carroll

222. Radiation in Planetary Atmospheres. (3) III.

Lecture—3 hours. Prerequisite: course 122 or equivalent. Theory and observations of radi-

ation in planetary atmospheres. Absorption, transmission, scattering by atmospheric gases, aerosols, and clouds; gaseous emission; effects of surface reflection; radiative energy budget of the atmosphere and of the planet as a whole; methods of measurement. Mr. Coulson

223. Advanced Micrometeorology. (3) I.

Lecture—3 hours. Prerequisite: course 123 and 121B or equivalent. Turbulent transfer of momentum, heat and moisture in the atmospheric boundary layer. Stability parameters. Air/sea interaction. Numerical boundary layer models. Micrometeorology of plant canopies and cities. Microclimate modification. Turbulent diffusion in the atmospheric boundary layer.

Mr. Myrup

***230. Atmospheric Turbulence. (3) II.**

Lecture—3 hours. Prerequisite: course 223 or equivalent. Dynamics and energetics of turbulent motion: transition to turbulence, energy dissipation, kinetic energy and thermal variance equations, convective and mechanical turbu-

lence, integral methods. Statistical methods: probability density function, moments, spectral analysis. The Kolmogoroff theory: spectrum, structure function and diffusion predictions.

Mr. Myrup

240. Physical Climatology. (3) II.

Lecture—3 hours. Prerequisite: course 123 or equivalent. Causes of climatic phenomena including the heat and water balance of the earth-atmosphere system and application of the physical principles involved to general climatology, agrometeorology and hydrology. Offered in even-numbered years.

Mr. Goddard

298. Group Study. (1-5) I, II, III.

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

The Staff (Mr. Coulson in charge)

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

The Staff (Mr. Coulson in charge)

AVIAN MEDICINE—See Epidemiology and Preventive Medicine

AVIAN SCIENCES

Related Undergraduate Major and Graduate Study.—See pages 79 and 182.

Related Courses. See Food Science and Technology 121 (Birds and Their Eggs as Food).

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

10. Poultry Production. (4) II.

Lecture—4 hours. A survey of principles and practices involved in poultry production. Designed for students not specializing in avian sciences.

Mr. Ogasawara

11. Laboratory in Poultry Production. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 10 (may be taken concurrently) or consent of instructor. Laboratory studies in poultry biology; techniques and economics of poultry production. Mr. Ogasawara

***12. Survey of Poultry and Allied Industries. (3) III.**

Lecture—2 hours; conference—1 hour. A survey of industries concerned with poultry products in the U.S.A. and various regions of the world: hatchery industry, feed industry, egg and meat production, poultry products, specialized enterprises. Offered in odd-numbered years.

Mr. Peterson

13. Birds, Man, and the Environment. (2) III.

Lecture—2 hours. Birds in the world of man:

folklore, art, literature, uniqueness, domestication, recreation, game birds, zoos, falconry, endangered species, public health, in research, as food sources. The Staff (Mr. Grau in charge)

13L. Birds, Man, and the Environment: Laboratory.

(1) III.

Laboratory—3 hours. Demonstrations and field trips for students enrolled concurrently in course 13.

The Staff (Mr. Grau in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. Problems in avian biology; nutrition, breeding, and physiology of poultry and their products.

The Staff (Mr. Grau in charge)

Upper Division Courses

102. Fertility and Hatchability in Birds. (3) III.

Lecture—2 hours; two field trips. Prerequisite: Biological Sciences 1 and Chemistry 8A. Reproduction in domestic and wild bird species. The influences on genetic, environmental and behavioral factors on embryonic development; special emphasis on the effects of diet, drugs, and pesticides.

Mrs. Abbott

149. Environmental Management of Poultry. (1) III.

Lecture—1 hour. Prerequisite: Physiology 149 (may be taken concurrently). Application of physiological principles to environmental management of poultry.

Mr. W. O. Wilson

NOTE: For key to footnote symbols, see page 191.

150. Comparative Nutrition of Avian Species. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1 and Chemistry 8A or consent of instructor. Comparison of digestive tracts, food habits, effects of nutrients on growth, sexual maturity, egg production, fertility and hatchability of eggs of wild and domestic species of birds. Effects of pesticides and other non-nutrient substances on their life cycles.

Mr. Vohra

190. Proseminar in Avian Science. (1) I, II, III.

Seminar—1 hour. Prerequisite: senior standing in avian sciences or consent of instructor.

Mr. Grau

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Grau in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. Problems in avian biology related to nutrition, breeding, and physiology of poultry and their products.

The Staff (Mr. Grau in charge)

Graduate Courses***202L. Laboratory in Avian Experimental Embryology and Teratology. (3) III.**

Laboratory—9 hours. Prerequisite: consent of instructor. The causes of abnormal morphogenesis in avian embryos including genetic, chemical, and physical-environmental factors; the application of transplantation, organ culture, and other experimental techniques. Offered in odd-numbered years.

Mrs. Abbott

290. Seminar. (1) I, II, III.

Seminar—1 hour. Reports and discussions of recent advances and selected topics of current interest in avian genetics, physiology, nutrition, and poultry technology.

The Staff (Mr. Grau in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Grau in charge)

299. Research. (1-12) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Grau in charge)

BACTERIOLOGY

Herman J. Phaff, Ph.D., *Chairman of the Department*

Department Office, 156 Hutchison Hall

Professors:

Robert E. Hungate, Ph.D. (*Emeritus*)

John L. Ingraham, Ph.D.

Allen G. Marr, Ph.D.

Martin W. Miller, Ph.D. (*Food Science and Technology*)

Herman J. Phaff, Ph.D. (*Bacteriology and Food Science and Technology*)

Mortimer P. Starr, Ph.D.

Associate Professors:

David Pratt, Ph.D.

Donald M. Reynolds, Ph.D.

Assistant Professor:

Mark L. Wheelis, Ph.D.

Lecturer:

Wiltraud P. Segel, Ph.D.

◇ ◇ ◇

Major Adviser.—Ms. Segel.

The Major Programs

The undergraduate major programs provide a balance of studies in the biology of bacteria and other microorganisms together with appropriate courses in mathematics and physical science, and may be elected by students registered in either the College of Letters and Science or College of Agricultural and Environmental Sciences. Both the Bachelor of Arts program and

the Bachelor of Science program are suitable for students who plan to do graduate work in a biological science or who wish a professional career in bacteriology.

Either major is appropriate for students contemplating a career in Medical Technology. Such students are advised to take Veterinary Microbiology 127 and 128 and a year laboratory course in physics in addition to the courses required for a major in bacteriology.

Bachelor of Arts Major Program

Lower Division Courses.—Bacteriology 3; Biological Sciences 1; Botany 2 or Zoology 2; Chemistry 1A-1B-1C, 5, 8A-8B; Mathematics 16A-16B and either 13, 16C, or 36A-36B; Physics 2A-2B-2C.

Upper Division Courses.—Bacteriology 105A, 105B, 105AL, 130A-130B, and either 105BL or 130L; Biochemistry 101A-101B-101L; Genetics 100A-100B; and one course from the following: Bacteriology 150, Biological Sciences 162, Botany 114, 118, 119, or Zoology 110; and two additional units in bacteriology which may include Veterinary Microbiology 127.

Bachelor of Science Major Program

Lower Division Courses.—Bacteriology 3; Biological Sciences 1; Chemistry 1A-1B-1C, 5; Mathematics 13, 21A-21B; Physics 2A-2B-2C and 3A-3B-3C. Recommended: elementary course in French or German.

Upper Division Courses.—Bacteriology 105A, 105B, 105AL, 130A–130B, and either 105BL or 130L; Biochemistry 101A–101B–101L; three quarters of physical chemistry; Chemistry 128A, 128B, 128C, 129A; Genetics 100A–100B; Genetics 102 or Biological Sciences 162.

Honors and Honors Program (see page 157).

Graduate Study (see page 182).—The Graduate Group in Microbiology offers programs of study and research leading to the M.A. and Ph.D. degrees in general microbiology, including bacteriology. The offerings of the Department of Bacteriology are augmented by courses and faculty of the Departments of Biochemistry and Biophysics, Botany, Food Science and Technology, Genetics, Viticulture and Enology, and the Schools of Veterinary Medicine and of Medicine. For detailed information regarding graduate study in microbiology, address the Chairman, Graduate Group in Microbiology, Department of Bacteriology.

Teaching Major.—Requirements for the principal teaching major are the same as those for the departmental major.

Teaching Minor.—30 units selected from the A.B. or B.S. Bacteriology major programs, as approved by the Department Subject Representative.

Subject Representative: Mr. Phaff

Related Courses. Botany 114, 118, 119; Epidemiology and Preventive Medicine 150; Food Science and Technology 104, 104L, 105, 106, 106L; Genetics 102; Veterinary Microbiology 126, 127, 128, 270; Viticulture and Enology 217; Zoology 110.

For other courses related to Bacteriology see the course offerings in the Departments of Food Science and Technology, Veterinary Microbiology, Medical Microbiology, Epidemiology and Preventive Medicine, Botany, Plant Pathology, and Biological Sciences.

Lower Division Courses

2. General Bacteriology. (4) I, II, III.

Lecture-demonstration—3 hours; discussion—1 hour. Prerequisite: Biological Sciences I. The biology of bacteria with some of its applications.

I. Ms. Segel; II. Mr. Wheelis;
III. Mr. Reynolds

3. Bacteriological Laboratory Techniques.

(1) I, II, III.

Laboratory—3 hours. Prerequisite: Biological Sciences I. Designed to acquaint the student with the basic techniques of bacteriology, with the major responsibility for organizing and accomplishing the work resting with the student. (P/NP grading only.) Ms. Segel

98. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students.

The Staff (Mr. Phaff in charge)

Upper Division Courses

NOTE: Although enrollment in upper division Bacteriology laboratory courses is not required for all curricula, the nature of bacteria is such that only a limited knowledge of bacteriology can be obtained without laboratory experience. Therefore, upper division laboratory courses are strongly recommended.

101. Microbiology and Society. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and consent of instructor; introductory courses in biology and chemistry recommended. Microbes and microbiology, with particular attention to human welfare and experience. Nature and classification of microbes. Ways in which microbes aid, harm, and otherwise affect man, including environmental, literary, historical, intellectual, aesthetic, ethical, legal, economic, and political aspects. Limited enrollment. Mr. Starr

105A. Bacterial Diversity. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences I, Chemistry 8B or 128A and 129A. An integrated consideration of aerobic bacteria as organisms; their morphology, systematics, ecology, metabolism, and economic importance. Mr. Starr

105AL. Bacterial Diversity Laboratory. (3) I.

Laboratory—6 hours; research report. Prerequisite: course 3; concurrent enrollment in course 105A. Designed to give the student laboratory experience with selected organisms considered in course 105A. Mr. Starr

105B. Bacterial Diversity. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 105A. Continuation of course 105A but dealing with the anaerobic bacteria, including comparisons of fermentation patterns and their significance to the organism.

105BL. Bacterial Diversity Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 105AL; concurrent enrollment in course 105B. Designed to give the student laboratory experience with selected organisms considered in course 105B.

130A–130B. Physiology and Genetics of Bacteria.

(3–3) II–III.

Lecture—3 hours. Prerequisite: Biochemistry 101B (may be taken concurrently), Genetics 100A, Mathematics 16A or 21A. An integrated

NOTE: For key to footnote symbols, see page 191.

consideration of the physiology, genetics, and molecular biology of bacteria. Topics will include bacterial growth, mutant selection, genetic analysis, regulation of enzyme function and macromolecular synthesis, and episomes.

Mr. Ingraham, Mr. Wheelis, _____

130L. Bacterial Physiology Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: courses 3 and 130A. Physiology and genetics of bacteria and bacterial viruses. Messrs. _____,

Ingraham, Marr, Pratt, Wheelis

150. Protistology. (3) III.

Lecture—3 hours. Prerequisite: Biological Sciences 1. A survey of protozoa and yeasts, including selected physiological topics.

Mr. Phaff, _____

150L. Protistology Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: courses 3 and 150 (may be taken concurrently). Experiments on the taxonomy, physiology, and ecology of selected yeasts and protozoa.

Mr. Phaff, _____

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Phaff in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Phaff in charge)

Graduate Courses

205. Bacterial Diversity and Ecology. (3) I.

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 105B, 105BL. Intensive study of selected microorganisms and habitats in relation to diversification elements.

Mr. Starr

206. Bacterial Taxonomy. (2) I.

Lecture-discussion—2 hours. Prerequisite: course on the bacteria; courses 105A and 105B (or courses in plant and/or animal diversity) recommended. Principles and procedures of bacterial taxonomy.

Mr. Starr

207. Microbial Ecology. (2) I.

Lecture and discussion—2 hours. Prerequisite: consent of instructor. Analysis of microbial participation in various ecosystems with a view toward formulation of quantitatively descriptive models.

230. Bacterial Physiology. (2) III.

Lecture—2 hours. Prerequisite: course 130B, Biochemistry 101B. Selected topics in bacterial physiology.

Mr. Ingraham, Mr. Marr

250. Yeasts and Related Organisms. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: consent of instructor. Morphology, development, classification, and distribution of yeasts; relation to other fungi; growth requirements; physiological activities.

Mr. Phaff, Mr. Miller

260. Bacterial Viruses. (2) III.

Lecture—2 hours. Prerequisite: consent of instructor. Selected topics on the structure, replication, and genetics of bacterial viruses.

Mr. Pratt

*280. Comparative Genetics of Prokaryotes. (2) II.

Lecture—2 hours. Recommended: knowledge of genetics of enteric bacteria. Systems of genetic exchange and genetic mapping techniques in various groups of prokaryotes, with special emphasis upon the actinomycetes and pseudomonads. Offered in odd-numbered years.

Mr. Wheelis

291. Seminar in General Microbiology. (1) III.

Seminar—1 hour. A review and discussion of the current literature and developments in the field of microbiology with presentations by individual students. (S/U grading only.)

The Staff (Mr. Phaff in charge)

292. Seminar in Bacterial Physiology. (1) I, II, III.

Seminar—1 hour. A review and discussion of the current literature and developments in bacterial physiology with presentations by individual students. (S/U grading only.)

Mr. Marr, Mr. Ingraham

293. Seminar in Bacterial Genetics. (1) I, II, III.

Seminar—1 hour. Review and discussion of the current literature and developments in bacterial genetics with presentations by individual students. (S/U grading only.)

294. Seminar in Bacterial Virology. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. Examination of current topics in the structure, replication, and genetics of bacterial viruses. (S/U grading only.)

Mr. Pratt

295. Seminar in Microbial Ecology. (1) I, III.

Seminar—1 hour. Prerequisite: consent of instructor. A review and discussion of the current literature in the ecology of protists and bacteria with presentations by individual students. (S/U grading only.)

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. (S/U grading only.)

The Staff (Mr. Phaff in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Mr. Phaff in charge)

BEHAVIORAL BIOLOGY—See Medicine
BIOCHEMISTRY (A Graduate Group)

Roy H. Doi, Ph.D., *Chairman of the Group*
 Group Office, 149 Briggs Hall

Graduate Study.—The Graduate Group in Biochemistry offers programs of study and research leading to the M.A. and Ph.D. degrees. For detailed information regarding graduate study in biochemistry address the chairman of the group.

BIOCHEMISTRY AND BIOPHYSICS

Major Advisers.—See *Class Schedule* listing.
Major Program and Graduate Study.—See pages 80 and 182.

Related Courses. See *Food Science and Technology 210 (Proteins: Functional Activities and Interactions), 250A–250B–250C, 251A–251B (Isolation, Characterization, Quantitation and Identification of Trace Volatiles).*

Questions pertaining to the following courses should be directed to the instructor or to the Division of Biological Sciences, 150 Mrak Hall.

Upper Division Courses

101A. General Biochemistry. (3) I, II, III.

Lecture—3 hours. Prerequisite: Chemistry 8B or 128B–129B. Recommended: introductory course in bacteriology, botany, or zoology. Introduction to the chemistry and metabolism of biologically important compounds; dynamic aspects of biochemistry with examples from animals, plants, and microorganisms.

Mr. Chaykin, Ms. Etzler, Mr. Segel

101B. General Biochemistry. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 101A. A continuation of 101A.

Messrs. Stumpf, Doi, Segel, Ms. Etzler

101L. General Biochemistry Laboratory. (5) I, III.

Lecture—2 hours; laboratory—9 hours. Prerequisite: course 101B (may be taken concurrently); Chemistry 5. Introduction to laboratory methods and procedures employed in studying biochemical processes. Designed for students who require experience in the use of biochemical techniques as laboratory tools.

Mr. Criddle, Mr. Toliver

102. Animal Biochemistry Laboratory. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Biochemistry 101B (may be taken concurrently). Laboratory procedures employed in the study of physiological and biochemical processes.

Mr. Baldwin

108. Biochemical Control Mechanisms. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry

Graduate Courses

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

The Staff (Mr. Doi in charge)

299. Research. (1–12) I, II, III.

The Staff (Mr. Doi in charge)

101B. The mechanisms by which metabolism is regulated in living cells. The role of variations in the intracellular levels of intermediates, activators, and inhibitors; enzyme induction and repression; and multiple forms of enzymes.

Mr. Dahmus, Mr. Hedrick

122. Plant Biochemistry. (3) II.

Lecture—3 hours. Prerequisite: Biochemistry 101B. The chemistry of important plant constituents and processes such as photosynthesis and respiration; carbohydrate, fat, and nitrogen metabolism.

Mr. Kosuge, Mr. Stumpf

123. An Introduction to Enzymology. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 101B. Principles of the physical, chemical and catalytic properties of enzymes and their utilization. Experimental determination and quantitative evaluation of influence of reaction conditions on activity are stressed. Specificity and mechanism of action illustrated by consideration of selected enzymes.

Mr. Whitaker

190. Undergraduate Seminar in Biochemistry. (1) I, II, III.

Seminar—1 hour. Prerequisite: courses 101A, 101B (may be taken concurrently). Discussion of the historical developments of modern biochemistry.

Messrs. Preiss, Toliver, Stumpf

198. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1–5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

Graduate Courses

201A–201B–201C. Advanced General Biochemistry. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 101B; Chemistry 110C or 107B, 108, 128C, 129C; or consent of instructor. Physical and chemical

NOTE: For key to footnote symbols, see page 191.

properties of amino acids, proteins, lipids, carbohydrates and nucleic acids; methods of isolating proteins; enzymes, including kinetics, co-factors, and type reactions; and the study of organized cell structures. The Staff

202A-202B. Advanced Biochemistry Laboratory.

(6-6) I-II.

Lecture—1 hour; laboratory—15 hours. Prerequisite: course 201A (may be taken concurrently); Chemistry 5. Laboratory methods and procedures used in biochemical research. Critical evaluation of experimental design and data is stressed. The Staff

*203. Carbohydrates. (3) III.

Lecture—3 hours. Prerequisite: course 201C or consent of instructor. The chemistry, metabolism, and biological functions of the various classes of carbohydrates and their polymers. Biosynthesis of simple and complex sugars and polysaccharides. Offered in odd-numbered years. Mr. Pielss

204. Nucleic Acids. (3) I.

Lecture—3 hours. Prerequisite: course 201C or consent of instructor. The physical and biological properties of nucleic acids; biosynthetic pathways; metabolism and structure of bases, nucleotides and their occurrence and distribution. The relation of structure and function of RNA and DNA to heredity, coding, and protein synthesis. Offered in odd-numbered years. Messrs. Bruening, Dahmus, Doi

205. Biochemical Mechanisms. (3) II.

Lecture—3 hours. Prerequisite: course 101B; Chemistry 110C, 131; or consent of instructor. Bond structures of biochemical interest. Application of modern organic and inorganic chemical principles to a study of the mechanisms of biochemical reactions. Mr. Ingraham

*206. Physical Biochemistry of Macromolecules.

(3) I.

Lecture—3 hours. Prerequisite: course 201C; Chemistry 110C; or consent of instructor. Application of modern physical concepts and experimental methods to the problems of large molecules of biological interest. Offered in even-numbered years. Mr. Criddle

207. Lipids. (3) III.

Lecture—3 hours. Prerequisite: course 201C or consent of instructor. A discussion of the chemistry, metabolism and experimental methodology unique to fatty acids, triglycerides, phospholipids, plasmalogens, sphingolipids, carotenoids and steroids. Offered in even-numbered years. Mr. Stumpf

210. Protein Biochemistry. (3) II.

Lecture—3 hours. Prerequisite: course 201C. Chemical, physical, and biological properties of

amino acids, peptides, and proteins. The biological aspects include protein function, biosynthetic and biodegradative pathways, and nutritional requirements for amino acids. Mr. Geschwind

212. Chemical Modifications of Proteins. (2) III.

Lecture—2 hours. Prerequisite: course 101B; Chemistry 128A-128B-128C and 129A-129B-129C or 128A-128B-128C-129A. Chemical approaches for studying proteins, emphasizing the use of chemical modifications as a tool in the study of active sites, particularly of enzymes, and relating of the structure of proteins to their functions. Mr. Feeny

213. Principles of Comparative Biochemistry. (3) I.

Lecture—3 hours. Prerequisite: course 201C or consent of instructor. An advanced treatment of comparative biochemistry. Comparisons of living systems, their structures and functions on a molecular basis, biochemical unity and diversity; protein structures and organized enzyme systems. Comparison of biochemical processes related to photobiology, metabolism, and excretion. Offered in odd-numbered years. (Same course as Biological Chemistry 213.) Mr. Benisek, Mr. Feeny

215. Kinetics of Biological Systems. (2) III.

Lecture—2 hours. Prerequisite: course 201B; Fortran IV (may be taken concurrently). The kinetic behavior of multivariable biological systems; mathematical methods and analysis of typical data with accent on computer use; in particular, the kinetics of multivariant catalysts, pre-steady state systems, perturbed systems, and reactions in a metabolic sequence. Offered in even-numbered years. Mr. Ingraham

225. Science, the Scientist, and Society. (2) II.

Discussion—2 hours. Prerequisite: two years of graduate work and consent of instructor. Readings and discussions on the attitudes and values of scientists toward themselves, science, and society. Scientists and ethics, responsibilities, prejudices; the organization, teaching, and publication of science; basic versus applied research; science and art creativity, societal control of science; antisience. Mr. Hedrick

*230. Biochemical Aspects of Endocrinology. (3) III.

Lecture—3 hours. Prerequisite: course 101B; Physiology 110B. The chemistry and function of animal hormones, with special reference to the isolation and structure of those of vertebrate origin. Assay, mechanism of action, biosynthesis, and metabolism of hormones. Biochemical lesions in congenital and other endocrinopathies. Offered in odd-numbered years. Mr. Geschwind

240. Selected Topics in Biochemistry. (2) II.

Lecture—2 hours. Prerequisite: course 201C or consent of instructor. (S/U grading only.) The Staff (Mr. Criddle in charge)

250. Biochemical Literature. (1) I, II, III.

Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Critical reading and evaluation of the current biochemical literature. Selected papers will be presented and discussed in detail. (S/U grading only.)

Mr. Ingraham, Mr. Toliver

270. Advanced Research Conference. (1) I, II, III.

Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Presentation and critical discussions of the research activities of various

members of the local biochemical community; primarily designed for graduate students. (S/U grading only.) Mr. Preiss, Mr. Ingraham

291. Current Progress in Biochemistry. (1) I, II, III.

Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Seminars presented by guest lecturers on the subject of their own research activities. (S/U grading only.) The Staff

299. Research. (1)–(2) I, II, III.

The Staff (Mr. Preiss in charge)

BIOLOGICAL CHEMISTRY—See Medicine

BIOLOGICAL SCIENCES⁸

S. R. Snow, Ph.D., *Associate Dean of Biological Sciences*

Division Office, 150 Mrak Hall

Major Advisers.—Assignments made in Division Office.

The Major Programs

The major programs in Biological Sciences provide an opportunity for broader study of biology than is possible with most departmental majors. The programs are suitable preparation for a wide variety of careers in professional areas such as medicine, nursing, dentistry, veterinary medicine, medical technology, and many other allied health sciences fields, for teaching, for work with various governmental agencies and private companies, and as preparation for advanced degrees and careers in research. Students interested in careers in one of the health science areas involving considerable personal interactions will be best served by the Bachelor of Arts plan; for those contemplating careers in areas where the emphasis is more laboratory-oriented, the Bachelor of Science plan will be more suitable. The B.S. degree can be attained by students registered either in the College of Letters and Science or in the College of Agricultural and Environmental Sciences; study leading to the A.B. degree is offered only in Letters and Science. Students following the major in Agricultural and Environmental Sciences should fulfill the same breadth requirements as students in Letters and Science. See page 148.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Bacteriology 2 and 3; Biological Sciences 1; Botany 2; Chemistry 1A–1B, 8A–8B; Zoology 2; 6 units of mathematics. Recommended: Chemistry 1C; Physics 2A–2B–2C.

Upper Division Courses.—Required: A total of 36 upper division units in biological sciences

including Genetics 100A–100B, and at least one course or course sequence from each of the following groups, including one course each in plant biology and animal biology:

a) Organismal Biology.—Bacteriology 105A, 150; Biological Sciences 162; Botany 105, 108, 114, 118, 119; Entomology 101, 103; Wildlife and Fisheries Biology 135, 135L; Zoology 100, 105, 106, 110, 112, 133A, 133B, 136, 137.

b) Population Biology and Ecology.—Anthropology 154A; Botany 117, 141; Entomology 104; Environmental Studies 100; Genetics 105; Water Science 120; Wildlife and Fisheries Biology 135, 151; Zoology 114,⁹ 116, 125.

c) Evolutionary Biology.—Anthropology 151; Botany 116, 140 (same course as Geology 140); Genetics 103; Geology 107, 140; Zoology 148.

d) Physiology.—Physiology 101, 110A–110B; Bacteriology 130A–130B; Botany 111A–111B; Entomology 102; Zoology 114,⁹ 142. (Bachelor of Arts majors may satisfy the Physiology group requirement with Biochemistry 101A–101B.)

e) Cell Biology.—Physiology 100A–100B, 103; Botany 130; Zoology 121A–121B.

Bachelor of Science Major Program

Lower Division Courses.—Required: Bacteriology 2 and 3; Biological Sciences 1; Botany 2; Chemistry 1A–1B–1C or 4A–4B–4C, and 8A–8B or 128A–128B–128C–129A; Mathematics 13 or 131A and 16A–16B–16C; Physics 2A–2B–2C; Zoology 2. Recommended: Chemistry 5; Physics 3A–3B–3C.

Upper Division Courses.—Required: A total of 45 upper division units in biological sciences including Biochemistry 101A–101B or Physiological Sciences 101A–101B, and Genetics 100A–100B; and one course or course sequence from each of the following groups including one

NOTE: For key to footnote symbols, see page 191.

⁸ Intercollege division.

⁹ May be used to satisfy one group only.

course each in animal biology, microbiology, and plant biology:

(Same as *a* through *e* under Bachelor of Arts major program above.)

Teaching Major.—A degree in Biological Sciences satisfies the requirement for a teaching major in the life sciences for both elementary and secondary teaching credentials, except that for the elementary credential Entomology 1 or 10 must be included.

Teaching Minor.—A minimum of 30 units of biology, including the undergraduate core: Biological Sciences 1, Botany 2, Zoology 2, and Bacteriology 2.

Subject Representative: Mr. Murphy (Botany)

Lower Division Courses

1. Principles of Biology. (5) I, II, III.

Lecture-discussion—4 hours; Laboratory—3 hours. Prerequisite: Chemistry 1B or a passing score on a qualifying examination in Chemistry. An interdisciplinary course designed for majors in the biological sciences. The emphasis is on the unity of basic biological principles as related to cell structure and function, reproduction, genetics, evolution, and ecology.

- I. Mr. Murphy, Mr. Thornton (Botany)
- II. Mr. Pratt, ——— (Bacteriology)
- III. Mr. Crowe (Zoology)

10. General Biology. (4) II, III.

Lecture—3 hours; discussion—1 hour. Not open for credit to those who have had course 1. Consideration of the main features and principles of biology, with emphasis on biological processes and special reference to evolution, heredity, and the bearing of biology on human life. Designed for students not specializing in biology.

- II. Mr. Ketellapper (Botany)
- III. ——— (Zoology)

BIOMEDICAL ENGINEERING (A Graduate Group)

Robert El. Smith, Ph.D., *Chairman of the Group*

Group Office, TB-139

Graduate Study.—The Graduate Group in Biomedical Engineering offers a program of study and research leading to the Ph.D. degree. For detailed information regarding graduate study in biomedical engineering address the chairman of the group.

BOTANY

———, *Chairman of the Department*

Department Office, 143 Robbins Hall

98. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. The Staff

Upper Division Courses

162. General Virology. (3) II.

Lecture—3 hours. Prerequisite: course 1; Genetics 100A and Biochemistry 101B recommended. An integrated presentation of the nature of animal, bacterial and plant viruses, including their structure, replication, and genetics. Messrs. Bruening, Pratt, Shalla

189. Integration of Biological Concepts. (3) III.

Lecture—2 hours; discussion—1 hour. Prerequisite: twenty upper division units in biology. A detailed examination in depth of the coherence of biology through a study of several unifying themes, for example, evolution.

197T. Tutoring in Biological Sciences. (1–5) I, II, III.

Prerequisite: upper division standing with major in a biological science. Assisting in courses under the direction of the faculty. The Staff

198. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor. The Staff

Graduate Course

210. Effective Teaching of College Biology. (3) III.

Lecture—1 hour; discussion—1 hour; assignments and reports. The teaching function of an academic career; objectives, nature, and evaluation of effective teaching; preparation of curricula, courses, lectures, discussions, and examinations; innovative programs. Undergraduate enrollment limited. (S/U grading only.)

Mr. Hildebrand

Graduate Courses

290. Seminar. (2) I, II, III.

Seminar—2 hours. Special topics in biomedical research and applications. Includes such topics as instrumentation, simulation and modeling, physiological and computer applications, artificial organs and assistive devices. (S/U grading only.) The Staff (Mr. Stoll in charge)

298. Group Study. (1–5) I, II, III.

The Staff (Chairman in charge)

Professors:

- Fredrick T. Addicott, Ph.D.
 Floyd M. Ashton, Ph.D.
^{2,3}Daniel I. Axelrod, Ph.D.
¹Paul A. Castelfranco, Ph.D.
 Alden S. Crafts, Ph.D., LL.D. (*Emeritus*)
^{3,4}Herbert B. Currier, Ph.D.
^{2,3}Ernest M. Gifford, Jr., Ph.D.
 Hendrik J. Ketellapper, Ph.D.
 Jack Major, Ph.D.
 C. Ralph Stocking, Ph.D.
 John M. Tucker, Ph.D.
^{2,3}Grady L. Webster, Ph.D.
 T. Elliot Weier, Ph.D. (*Emeritus*)
 Kenneth Wells, Ph.D.

Associate Professors:

- Michael G. Barbour, Ph.D.
 Bruce A. Bonner, Ph.D.
 Donald W. Kyhos, Ph.D.
 Norma J. Lang, Ph.D.

Assistant Professors:

- Richard H. Falk, Ph.D.
 Terence M. Murphy, Ph.D.
 Robert F. Norris, Ph.D.
 Thomas L. Rost, Ph.D.
 Robert M. Thornton, Ph.D.

Lecturers:

- David E. Bayer, Ph.D.
 Oliver A. Leonard, Ph.D.



Departmental Major Advisers.—Mr. Falk, Mr. Wells

The Major Programs

The Bachelor of Science major program should be elected by those students who plan advanced study in botany, who wish to obtain general secondary teaching credentials, or who wish training for a position requiring a detailed knowledge of plants. Students who wish a less intensive program in botany, but one that acquaints the students with plant life and its importance, should elect the Bachelor of Arts major program.

The Bachelor of Science program may be elected by students registered either in the College of Letters and Science or in the College of Agricultural and Environmental Sciences.

Bachelor of Science Major Program

Lower Division Courses.—Required: Bacteriology 2, 3; Biological Sciences 1; Botany 2; Zoology 2; Chemistry 1A, 1B, 1C, 8A, 8B; Physics 2A, 2B, 2C; Mathematics 13. German, French or Russian is the recommended language. Recommended: Chemistry 5; Mathematics 16A,

16B, 16C, especially for those students whose major interests are ecological, biochemical or physiological.

Upper Division Courses.—Required: Biochemistry 101A, 101B; Botany 105, 108, 111A, 111B, 116; Genetics 100A, 100B; in addition, students whose interests are morphological or taxonomic are required to take Botany 118 and 119, students whose interests are ecological are required to take Botany 114 and 117, students whose interests are biochemical or physiological are required to take Botany 114 and 5 additional upper division units in botany or related natural science courses. Students who have completed Bacteriology 105A, 105AL, and 105B are not required to take Bacteriology 2 and 3.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Biological Sciences 1; Botany 2; Chemistry 1A, 1B, 8A, 8B; Zoology 2. Recommended: Bacteriology 2, 3; Chemistry 1C; Mathematics 13.

Upper Division Courses.—Required: Botany 105, 108, 111A, 111B, 116; Genetics 100A, 100B; 10 additional units in botany or related natural science courses. Recommended: Botany 114 or 118, 119.

Honors and Honors Program (see page 157).—Students on the honors list may elect to substitute a maximum 5 units of 194H for 5 upper division units of the regular major; however, recommendations for high honors and highest honors at graduation are not dependent on the completion of 194H.

Teaching Major.—The requirements for the teaching major are the same as for the departmental major for degree (A.B. or B.S.).

Teaching Minor.—Botany 2; and a minimum of 23 units in botany or closely related subjects. Students must consult with subject representative.

Subject Representative: Mr. Wells

Graduate Study.—Graduate programs leading to M.S. and Ph.D. degrees are offered in cytology, plant physiology, anatomy, morphology, taxonomy, ecology, mycology, phycology, and allied areas. The resources of the department are augmented by appropriate courses in related departments.

Lower Division Courses**2. General Botany. (5) I, II, III.**

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1. Structure, physiology, and taxonomy of plants, with special emphasis on seed plants.

I. Mr. Bonner; II. Mr. Barbour; III. Mr. Kyhos

***90. Freshman Seminar in Plant Biology. (2) I, II, III.**

Seminar—2 hours. Prerequisite: consent of instructor. Selected topics on questions of cur-

NOTE: For key to footnote symbols, see page 191.

rent interest chosen to illustrate the nature and achievements of research in plant biology. (P/NP grading only.) The Staff

91. Current Issues in Plant Biology. (2) II.

Seminar—2 hours. Prerequisite: consent of instructor. Basic concepts and methods of plant biology. Fundamental problems, recent trends in research, relationships with other fields of study. Topics to be announced quarterly. May be repeated for credit. (P/NP grading only.) Mr. Bayer, Mr. Barbour

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. The Staff (Chairman in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. The Staff (Chairman in charge)

Upper Division Courses

101. Survey of Biotic Communities of California. (3) III.

Lecture—2 hours; weekend field trips—8 to 10 days. Prerequisite: upper division standing, consent of instructor; course 2 recommended. The structure of selected plant communities and the relationship of their component species to the environment. Mr. Barbour

105. Plant Anatomy. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Structure and growth of meristems; development and structure of cells, tissues and tissue systems; comparative anatomy of stem, root, and leaf. Mr. Rost

107. Weed Control. (4) III.

Lecture—2 hours; laboratory—6 hours; 2 field trips. Prerequisite: course 2; Chemistry 8B. Introduction to the physiological and chemical principles underlying control of weeds; principles of preventive, cultural, and biological weed control; identification of common weeds. Mr. Norris

108. Systematic Botany of Flowering Plants. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Laboratory and field studies of the characters and relationships of the principal families and orders of flowering plants. Principles of taxonomy. Practice in identification of species by means of keys. Mr. Tucker

111A. Introduction to Plant Physiology. (3) I, II.

Lecture—3 hours. Prerequisite: course 2; Chemistry 8B (may be taken concurrently). The fundamental activities of plants; the plant cell as a functioning unit. The processes of absorption, movement and utilization of water and minerals. Water loss, translocation, photosynthesis. Mr. Stocking

111B. Introduction to Plant Physiology. (3) II, III.

Lecture—3 hours. Prerequisite: course 111A; Biochemistry 101A recommended. Continuation of course 111A. Respiration; metabolism. The dynamics and control of growth and development. II. Mr. Thornton; III. Mr. Murphy

111L. Introductory Plant Physiology Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 111. Experiments designed to illustrate basic principles considered in course 111. Mr. Stocking, Mr. Thornton

114. Biology of Fungi and Algae. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Not open for credit to students having received credit for courses 118 or 119. An introduction to the morphology, taxonomy, evolution, and physiology of the fungi and the algae. Miss Lang, Mr. Wells

*115. Mosses and Liverworts. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 2. Morphology, taxonomy, and ecology of mosses and liverworts. Field trips.

116. Vascular Plants: Structure and Evolution. (5) II.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2; course 105 recommended. Structure, reproduction and evolution of the major groups of living and extinct vascular plants; special emphasis given to seed plants.

117. Plant Ecology. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 111B. Study of individual plants, species, and vegetation in relation to environment and of modification of the environment by vegetation. Mr. Major

118. Phycology. (5) II.

Lecture—3 hours; laboratory—6 hours; field trip. Prerequisite: course 2. Morphology, physiology, genetics, evolution, distribution, cultivation, and economic importance of algae. Miss Lang

119. Introductory Mycology. (5) I.

Lecture—3 hours; laboratory—6 hours; field trip. Prerequisite: course 2 or Bacteriology 2. Introduction to structure, ontogeny, and taxonomy of selected species of the major taxa of *Myxomycota* and *Eumycota*. Mr. Wells

130. General Cytology. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or Zoology 2; Genetics 100B or Biochemistry 101A. An analysis of the structure and ultrastructure of cells; the relationship between structure and function at cellular and subcellular levels. Consideration of cell particulars, membranes, endoplasmic reticulum, mito-

chondria, plastids, the Golgi region and their relation to both the metabolic nucleus and the dividing nucleus. Should not be taken by Biological Sciences majors to satisfy the Biological Sciences requirement in Plant Biology. Mr. Falk

130L. General Cytology Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: course 130 (may be taken concurrently). Introduction to the laboratory methods of cytology; introduction to the interpretation of electron micrographs. Mr. Falk

140. Paleobotany. (5) III.

Lecture—2 hours; laboratory—6 hours; two all-day field trips, one 3-day field trip. Prerequisite: senior standing. Guiding principles underlying an analysis of successive floral assemblages in Cenozoic and Cretaceous rocks. Development of modern vegetation with emphasis on centers of origin and radiation, rates of evolution, and community evolution. (Same course as Geology 140.) Mr. Axelrod

141. Plant Geography. (3) III.....

Lecture—3 hours. Prerequisite: course 108 or 116, course 117 recommended; or consent of instructor. Analysis of the distribution patterns of the vascular plant groups, and consideration of the factors which account for the present diversity of flora and vegetation. Mr. Webster

*142. Evolution of Plant Ecosystems. (4) I.

Lecture—2 hours; five or more all-day field trips. Prerequisite: upper division standing; Botany 117 or 140 or 141 strongly recommended. Development of mixed mesophytic forest, conifer-hardwood forest, taiga, mediterranean and desert ecosystems. (Same course as Geology 142.) Mr. Axelrod

155. Plant Microtechnique. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 105 or 116. Introduction to practical laboratory methods in preparing plant materials for microscopic examination; special emphasis on paraffin and chromosome smear techniques; introduction to techniques of tissue culture and photomicrography. Mr. Gifford

180. Biological Evaluation of Herbicides. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 107 and 111A–111B (may be taken concurrently). Principles dealing with the physical, chemical, and physiological aspects of herbicides. Laboratory, greenhouse and field studies illustrating these principles in herbicide evaluation; emphasis upon biological assays and upon the interpretation of biological data. Mr. Bayer

190. Proseminar in Plant Biology. (2) II.

Prerequisite: upper division standing. Integration of concepts in plant biology. Selected topics include current research trends, relations with other disciplines, and topics of current interest in the theory, philosophy, history, and sociology of science. Topics to be announced quarterly. May be repeated for credit. (P/NP grading only.) Mr. Wells

*194H. Special Study for Honors Students. (1–5)

I, II, III.

Prerequisite: open only to majors of senior standing on honors list. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis.

The Staff (Chairman in charge)

198. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

201A. Ecological Theory. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: a course in ecology, e.g., Environmental Studies 100, and graduate standing. Course will focus on the ecologic community as a unit. The major generalizations, concerning the structure and functioning of the community will be examined together with the generalizations relating both structure and function to the abiotic environment and its fluctuations. (Same course as Ecology, Geology, and Zoology 201A.) Messrs. Salt, Major, Valentine

201B. Analysis of a Selected Ecosystem. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing; course 201A or consent of instructor. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a particular ecosystem. Recent advances in theory, technique, and basic information are emphasized. Lectures will be given by specialists from several fields. May be repeated for credit. (Same course as Ecology, Geology, and Zoology 201B.) The Staff (Mr. Goddard in charge)

201C. The Changing Biosphere. (3) III.

Lecture—2 hours; 1 assigned problem. Prerequisite: graduate standing; courses 201A, 201B; or consent of instructor. Course deals with changing gas balance and weather in the biosphere and effects on plants and animals, the effects of structural, chemical and physical

NOTE: For key to footnote symbols, see page 191.

changes of living systems, changes in species diversity, effects on human population increase, and related topics. (Same course as Ecology, Geology, and Zoology 201C.)

The Staff (Mr. Richerson in charge)

205A. Advanced Plant Physiology. (3) I.

Lecture—3 hours. Prerequisite: course 111B, Biochemistry 101A (may be taken concurrently). Cellular physiology, plant water relations, and translocation. Mr. Currier

205B. Advanced Plant Physiology. (3) II.

Lecture—3 hours. Prerequisite: course 111B, Biochemistry 101B (may be taken concurrently). Mineral nutrition, photosynthesis, respiration, and general plant metabolism. Mr. Murphy

205C. Advanced Plant Physiology. (3) III.

Lecture—3 hours. Prerequisite: course 111B, Biochemistry 101A; courses 205A and 205B, Biochemistry 101B recommended. Internal and environmental regulation of plant growth and development. Mr. Bonner

206A. Advanced Plant Physiology Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: course 205A (may be taken concurrently). Laboratory procedures in advanced plant physiology. Experiments designed to follow subject-matter sequence of course 205A. Mr. Currier

206B. Advanced Plant Physiology Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 205B (may be taken concurrently), Chemistry 5. Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205B. Mr. Murphy

206C. Advanced Plant Physiology Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 205C (may be taken concurrently). Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205C. Mr. Bonner

*210. Cell Physiology-Protoplasmatics. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Selected plant physiological topics treated on the cellular level: water relations, plasmolytic phenomena, cytoplasmic movements, transport mechanisms, vital staining, responses of cells to high and low temperatures, wound reactions, effects of poisons. Microscopic techniques are stressed. Mr. Currier

211. Plant Cell Metabolism. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: consent of instructor. Plant cell physiology, dealing particularly with the roles of plastids, mitochondria, microsomes, and nuclei in cellular metabolism. Isolation and study of

these particulates, using centrifugation, gasometric, chromatographic, and spectroscopic methods. Mr. Stocking

212. Physiology of Herbicidal Action. (3) I.

Lecture—3 hours. Prerequisite: courses 107, 205A, 205B, 205C. Study of the fundamental processes involved in the physiological action of herbicides. Detailed consideration of the fate of herbicides in plants. Mr. Ashton

215. Light and Plant Growth. (3) II.

Lecture—3 hours. Prerequisite: courses 205A, 205B, 205C; Physics 2B. Mechanisms and phenomena involved in the control of plant growth by light. Photoperiodism, photomorphogenesis, phototropism, and certain aspects of photosynthesis. Mr. Bonner

*216. Advanced Morphology of Vascular Plants.

(3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 116. Evolution of form, structure, and reproduction of fossil and extant types through Cycadophytes. Mr. Gifford

217. Concept and Measurement of the Plant Community. (3) I.

Seminar-discussion—3 hours; term paper. Prerequisite: course 117 and a course in statistics. Major subject areas are: 1) historical concepts of the plant community and of hierarchical groupings of communities, and 2) a review of sampling and analytical methods employed in the description or measurement of plant communities. Mr. Barbour

*218. Experimental Phycology. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 118. Special problems in development, physiology, and genetics using algae as experimental organisms. Topics to be investigated will be selected according to the interests of individual students. Miss Lang

220. Plant Morphogenesis. (3) III.

Lecture—3 hours. Prerequisite: course 105 or 116; course 155 recommended. Survey of recent advances in the study of growth and the development of form, with special reference to higher plants, and some emphasis on experimental approaches. Mr. Rost

220L. Plant Morphogenesis Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 220 (may be taken concurrently) and consent of instructor. Procedures, principally experimental, used to study the development of plant form. Mr. Rost

221. Selected Topics in Plant Physiology. (2) I, II, III.

Lecture—2 hours. Evaluation of the most recent research in plant physiology. Lectures

and discussions by specialists in the areas of their research interests. May be repeated for credit. (S/U grading only.)

I. Mr. Addicott; II. Mr. Norris; III. ———

231. Biological Electron Microscopy. (3) II.

Lecture—1 hour; laboratory—8 hours. Prerequisite: consent of instructor. An introduction to biological electron microscopy. Areas to be covered are: electron optics, electron-specimen interactions, vacuum systems, specimen preparation, and microscope operation. Mr. Falk

*255. Principles of Plant Taxonomy. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 108; Genetics 103 recommended. Principles of plant taxonomy; phylogenetic vs. phenetic classification; examples of the way in which various disciplines—atomy, embryology, biochemistry, etc.—elucidate problems of taxonomic relationship, mainly of genera and higher categories. Mr. Tucker

*256A. Experimental Plant Taxonomy. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 108. Recommended: course 117; Genetics 103. Application of experimental techniques to the elucidation of taxonomic problems and evolutionary relationships in higher plants. Mr. Kyhos

*256B. Experimental Plant Taxonomy. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 256A. A continuation of course 256A. The study of variation in natural populations in relation to taxonomy; the application of population sample analysis, cytogenetics, transplant studies, etc., to the solution of taxonomic problems and the clarification of relationships. Mr. Kyhos

*257. Plant Autecology. (3) I.

Lecture—3 hours. Prerequisite: course 117, Mathematics 13. Evaluation of biotic and abiotic environmental factors in the distribution of plant species. Mr. Major

258. Plant Synecology. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 108, 117; Soil Science 120A recommended. Theories and techniques involved in the study of structure, composition, boundaries, ecology, and classification of vegetation, with particular emphasis on California plant communities. Mr. Major

*290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)
The Staff (Chairman in charge)

291. Seminar in Plant Morphology. (1) I, II.

Seminar—1 hour. (S/U grading only.)
I. Mr. Kyhos; II. Mr. Rost

292. Seminar in Plant Physiology. (1) I, III.

Seminar—1 hour. (S/U grading only.)
I. Mr. Thornton; III. Mr. Addicott

293. Seminar in Weed Science. (1) II.

Seminar—1 hour. (S/U grading only.)
Mr. Leonard

294. Seminar in Cytology and Cytobiochemistry.

(1) III.

Seminar—1 hour. Survey of current research developments in the fields of cytology and biochemistry with special reference to plants. Discussion of the fine structure of cells in relation to biochemical function. (S/U grading only.)
Mr. Falk

295. Seminar in Mycology. (1) I, III.

Seminar—1 hour. Review and evaluation of current literature and research in mycology. (Same course as Plant Pathology 295; S/U grading only.) I. Mr. Butler; III. Mr. Wells

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-9) I, II, III.

The Staff (Chairman in charge)

CANTONESE—See Oriental Languages

CHEMISTRY

Raymond M. Keefer, Ph.D., *Chairman of the Department*

Department Office, 108 Chemistry Building

Professors:

Thomas L. Allen, Ph.D.
Lawrence J. Andrews, Ph.D.
*Albert T. Bottini, Ph.D.
Robert K. Brinton, Ph.D.
Raymond M. Keefer, Ph.D.

Richard E. Kepner, Ph.D.
Charles P. Nash, Ph.D.
Edgar P. Painter, Ph.D.
Harold G. Reiber, Ph.D. (*Emeritus*)
Leo H. Sommer, Ph.D.
David H. Volman, Ph.D.
George S. Zweifel, Sc.D.

NOTE: For key to footnote symbols, see page 191.

Associate Professors:

¹Alan L. Balch, Ph.D.
 Edwin C. Friedrich, Ph.D.
 Hakon Hope, Cand. real
 W. Kenneth Musker, Ph.D.
 Peter A. Rock, Ph.D.
 John W. Root, Ph.D.
 James H. Swinehart, Ph.D.

Assistant Professors:

William H. Fink, Ph.D.
 Kenneth G. Hancock, Ph.D.
 Joel E. Keizer, Ph.D.
 Gerd N. LaMar, Ph.D.
 Claude F. Meares, Ph.D.
 R. Bryan Miller, Ph.D.
 Carl W. Schmid, Ph.D.
 Dino S. Tinti, Ph.D.



Major Subject Advisers.—Mr. Fink, Mr. Hancock, Mr. Keizer, Mr. Kepner, Mr. Painter, Mr. Tinti.

The Major Programs

Students who are interested in chemistry as a profession should elect the program leading to the Bachelor of Science degree. Students desiring a less intensive program in chemistry should elect the program leading to the Bachelor of Arts degree. Students who plan to pursue graduate work in Chemistry or related fields are strongly advised to obtain a reading knowledge of German or Russian. High school students should note that the preparation for either degree is simplified if their high school programs include chemistry and four years of mathematics.

Candidates for the bachelors' degree in chemistry will receive upper division credit for those lower division chemistry courses accepted in lieu of upper division courses required for the major.

Bachelor of Science Major Program

Lower Division Courses.—Required: Chemistry 1A, 1B, 1C, 5 or 4A, 4B, 4C; Physics 4A, 4B, 4C, 4D, 4E; Mathematics 11, 21A, 21B, 21C, 22B, and either 22A or 22C.

Upper Division Courses.—Required: Chemistry 110A, 110B, 110C, 111A, 111B, 124, 128A, 128B, 128C, 129A, 129B, 129C, and 8 units of any additional courses in chemistry (one of which must include laboratory work) except Chemistry 107A or 107B.

Bachelor of Arts Major Program

Lower Division Courses.—Required: Chemistry 1A, 1B, 1C, 5 or 4A, 4B, 4C; Physics 2A, 2B, 2C, 3A, 3B, 3C; Mathematics 11, 21A, 21B, 21C, or 16A, 16B, 16C.

Upper Division Courses.—Required: 36 units in chemistry, biochemistry, or physics, including

Chemistry 110A, 110B, 110C, 128A, 128B, 128C, 129A, and 129B.

Honors and Honors Program (see page 157).—The honors program comprises 6 units of course 194H.

Graduate Study.—The Department of Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees in chemistry. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Chemistry.

Teaching Major.—The teaching major is satisfied by either the A.B. or B.S. major in chemistry.

Teaching Minor.—Chemistry 1A, 1B, 1C, 5, 8A, 8B, 107A, 107B. With the approval of the subject representative some substitution may be permitted.

Subject Representative: Mr. Nash

Lower Division Courses**1A. General Chemistry. (5) I, II.**

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: high school chemistry; or high school physics and three years of high school mathematics (with an average grade of B or higher); or second-quarter standing. Fundamental principles of chemistry. Stoichiometry, properties and theory of gases, first law of thermodynamics, atomic and molecular structure, colligative properties of solutions.

The Staff
 (I. Mr. Keefer and Mr. Allen in charge;
 II. Mr. LaMar in charge)

1B. General Chemistry. (5) II, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 1A. Continuation of course 1A. Chemical equilibria, oxidation-reduction processes, electrochemistry, introduction to qualitative analysis.

The Staff (II. Mr. Brinton and Mr. Swinehart in charge; III. Mr. Allen in charge)

1C. General Chemistry. (5) I, III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 1B. Continuation of course 1B. Chemical kinetics, structures and reactions of complex ions and molecules, application of principles of chemistry to problems of qualitative analysis. The Staff (I. Mr. Musker in charge; III. Mr. Fink in charge)

4A. General Chemistry. (5) I.

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Mathematics 21A or 16A (may be taken concurrently); high school chemistry or consent of instructor. An introduction to atomic and molecular structure and binding, states of matter, thermochemistry and chemical equilibria. Courses 4A—4B—4C are equivalent to course sequence 1A—1B—1C—5.

The sequence 4A-4B-4C is accelerated for students majoring in the physical sciences or in engineering. Mr. Tinti

4B. General Chemistry. (5) II.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 4A. Continuation of course 4A. A quantitative treatment of chemical equilibria with applications to precipitation reactions, acid-base reactions, complexation reactions, and oxidation-reduction reactions. Elementary electrochemistry and chemical kinetics. The laboratory will emphasize quantitative techniques. Mr. Rock

4C. General Chemistry. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 4B. Continuation of course 4B. Topics in systematic inorganic chemistry, nuclear chemistry, introduction to organic chemistry and the functional group concept, biological applications. Laboratory will emphasize qualitative analysis and preparative techniques.

5. Quantitative Analysis. (4) I, II, III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1C with grade of C or higher. Not open to students who have credit for Chemistry 4B. An introduction to the principles and methods of quantitative chemical analysis, with emphasis on the application of equilibrium theory to analytical problems. I. Mr. Hope; III. Mr. Brinton

8A. Organic Chemistry, Brief Course. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 1B with a grade of C or higher. With course 8B an introduction to the nomenclature, structure, chemistry, and reaction mechanisms of organic compounds. Intended for students majoring in areas other than chemistry.

I. Mr. Sommer; II. ———; III. ———

8B. Organic Chemistry, Brief Course. (3) I, II, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 8A. Continuation of course 8A. The laboratory is concerned primarily with the study of the properties and chemistry of the common classes of organic compounds.

I. ———; II. Mr. Sommer; III. Mr. Hancock

10. Concepts of Chemistry. (4) I.

Lecture—3 hours; discussion—1 hour. Designed for the nonscience major. A survey of the important basic concepts and modern applications of chemistry. Not open to students who have credit for course 1A; students with credit for course 10 may take course 1A for full credit. Mr. Friedrich

Upper Division Courses

107A. Physical Chemistry for the Life Sciences.

(3) I.

Lecture—3 hours. Prerequisite: course 4C or 5 or consent of instructor; Mathematics 16C or 21C; one year college level physics. A basic course in physical chemistry intended for majors in life science areas. Introductory development of classical and statistical thermodynamics including equilibrium processes and solutions of nonelectrolytes. Kinetic theory of gases and liquids. Transport processes in liquids and solutions. Mr. Meares

107B. Physical Chemistry for the Life Sciences.

(3) II.

Lecture—3 hours. Prerequisite: course 107A or 110A. Continuation of course 107A. Electrochemistry and the thermodynamics of simple electrolyte solutions. Chemical rate processes. Introduction to spectroscopy, atomic and molecular structure, x-ray crystallography, radiation and nuclear chemistry, and to surface chemistry and colloidal systems. Considerations on bioirreversible processes. Mr. Meares

108. Physical Chemistry of Macromolecules. (3) III.

Lecture—3 hours. Prerequisite: course 107B or 110C. Physical properties and characterization of macromolecules with emphasis upon those of biological interest. Structural, thermodynamic, optical and transport properties of polymers in bulk and in solution. Physical characterization methods. Special topics on the properties of polyelectrolyte systems. Mr. Schmid

110A. Physical Chemistry. (3) I, III.

Lecture—3 hours. Prerequisite: course 5; Mathematics 11 and 21C or equivalent, or 16C; one year of college physics. Development of the principles of classical thermodynamics; emphasis on criteria for the existence and maintenance of equilibrium.

I. Mr. Brinton, Mr. Volman; III. Mr. Hope

110B. Physical Chemistry. (3) I, II.

Lecture—3 hours. Prerequisite: course 110A. Continuation of course 110A. Atomic and molecular structure and spectra; the relation between molecular and thermodynamic properties.

I. Mr. LaMar; II. Mr. Tinti

110C. Physical Chemistry. (3) II, III.

Lecture—3 hours. Prerequisite: course 110B. Continuation of course 110B with emphasis on solution thermodynamics, kinetic theory, and chemical kinetics. II. Mr. Keizer; III. Mr. Nash

111A. Physical Chemistry: Methods and Applications. (4) I, II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107B or 110C (may be taken

NOTE: For key to footnote symbols, see page 191.

concurrently). Lecture topics include statistical analysis and data processing, basic electronics, diffraction methods, and optical systems. Laboratory exercises will involve computer practice, thermodynamic measurements on nonelectrolyte systems, and structural properties of molecules.

I. Mr. Fink; II. Mr. Nash

111B. Physical Chemistry: Methods and Applications. (4) II, III.

Lecture—1 hour; laboratory—9 hours. Prerequisite: course 111A or consent of instructor. Lecture topics will include distribution equilibria and electroanalytical methods. Laboratory exercises will involve kinetics and mechanism, electrochemistry, distribution equilibria, chromatography, and elective projects.

II. Mr. Hope; III. Mr. Rock

121. Introduction to Molecular Structure and Spectra. (4) III.

Lecture—4 hours. Prerequisite: course 110C. Modern theoretical and experimental methods used to study problems of molecular structure and binding; emphasis on spectroscopic techniques.

Mr. LaMar

124. Inorganic Chemistry. (4) II.

Lecture—4 hours. Prerequisite: course 107B or 110B; 128B (any of which may be taken concurrently). Bonding, structure, and reactivity of inorganic compounds, including organometallic complexes and inorganic aspects of biological chemistry.

Mr. Musker

125. Methods of Inorganic Chemistry. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124. Discussion and application of the chemical and physical methods used to synthesize and characterize inorganic compounds and to study their reactivity.

Mr. Musker

126. Nuclear Chemistry. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 110B (may be taken concurrently with consent of instructor). Introduction to experimental and theoretical nuclear chemistry including nuclear properties, nuclear spectroscopy, radiation effects, radioactive decay, and nuclear reactions. Both the lectures and the laboratory stress applications of nuclear phenomena in chemistry.

Mr. Root

128A. Organic Chemistry. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 1C or 4C with a grade of C or higher; chemistry majors should enroll in course 129A concurrently. Introduction to the basic concepts of organic chemistry with emphasis on stereochemistry and the chemistry of hydrocarbons. Designed primarily for majors in chemistry. Only two units credit allowed students having had course 8B.

I. ———; II. Mr. Painter;
III. Mr. Zweifel

128B. Organic Chemistry. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 128A or consent of instructor; course 129A strongly recommended; chemistry majors should enroll in course 129B concurrently. Continuation of course 128A with emphasis on aromatic and aliphatic substitution reactions, elimination reactions, and the chemistry of carbonyl compounds. Introduction to the application of spectroscopic methods to organic chemistry.

I. Mr. Zweifel; II. Mr. Miller; III. Mr. Bottini

128C. Organic Chemistry. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 128B; chemistry majors should enroll in course 129C concurrently. Continuation of course 128B with emphasis on enolate condensations and the chemistry of amines, phenols, and sugars; selected biologically important compounds.

I. Mr. Kepner; II. Mr. Bottini; III. Mr. Sommer

129A. Organic Chemistry Laboratory. (2) I, II, III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1C or 4C with a grade of C or higher; 128A (may be taken concurrently). Introduction to laboratory techniques of organic chemistry. Emphasis is on methods used for separation and purification of organic compounds. Only one unit credit allowed students having had course 8B.

I. Mr. Miller; II. Mr. Kepner; III. ———

129B. Organic Chemistry Laboratory. (2) I, II, III.

Laboratory—6 hours. Prerequisite: courses 128B (may be taken concurrently), 129A. Continuation of course 129A. Emphasis is on methods used for synthesis and isolation of organic compounds.

I. Mr. Zweifel; II. ———; III. Mr. Bottini

129C. Organic Chemistry Laboratory. (2) I, II, III.

Laboratory—6 hours. Prerequisite: courses 128C (may be taken concurrently), 129B. Continuation of course 129B.

I. Mr. Kepner; II. Mr. Bottini; III. Mr. Sommer

130. Qualitative Organic Chemistry. (4) III.

Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 5, 128C, 129C. The application of physical and chemical techniques to the qualitative identification of organic compounds.

Mr. Friedrich

131. Advanced Organic Chemistry. (4) II.

Lecture—4 hours. Prerequisite: courses 107B or 110B, 128C. Application of current knowledge of reaction mechanisms and molecular structure to problems of organic synthesis.

Mr. Zweifel

150. Chemistry of Natural Products. (3) I.

Lecture—3 hours. Prerequisite: courses 107B or 110B, and 128C. Chemistry of carbohydrates and lipids: structure proof, stereochemistry, conformation, substitutions, and rearrangements of model systems.

Mr. Painter

194H. Undergraduate Research. (2-5) I, II, III.

Prerequisite: course 110C (may be taken concurrently) and honors status. Original research and a written report of the investigation. Unit value to be determined by instructor supervising the research.

The Staff (Mr. Keefer in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics, and physics.

The Staff (Mr. Keefer in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics, and physics. The Staff (Mr. Keefer in charge)

Graduate Courses**210A. Advanced Physical Chemistry: Thermodynamics. (4) I.**

Lecture—3 hours; either discussion—1 hour, or paper at discretion of instructor. Prerequisite: consent of instructor. Principles and applications of statistical mechanics: ensemble theory; statistical thermodynamics of gases, solids, liquids, and solutions; surface effects; chemical equilibrium. Thermodynamics of gravitational, electric, and magnetic fields. The Third Law. Applications to biophysical problems. Mr. Rock

210B. Advanced Physical Chemistry: Quantum Chemistry. (4) II.

Lecture—3 hours; either 1-hour discussion or paper at discretion of instructor. Prerequisite: consent of instructor. Principles of quantum chemistry and their applications to atomic and molecular structure and spectroscopy, and to chemical bonding. Mr. Fink

210C. Advanced Physical Chemistry: Kinetics. (4) III.

Lecture—3 hours; either 1-hour discussion or paper at discretion of instructor. Prerequisite: consent of instructor. Chemical kinetics in gases and liquids including the kinetic theory of gases, statistical theories of bimolecular and unimolecular reactions, introduction to trajectory methods, equilibrium structure of liquids, transport processes in fluids, photochemical processes, and relaxation kinetics. Mr. Keizer

219. Spectroscopy of Organic Compounds. (3) I.

Lecture—3 hours. Use of spectroscopy in organic chemistry for the identification of compounds and the investigation of stereochemical and reaction mechanism phenomena.

220. Organic Chemistry. (3) III.

Lecture—3 hours. Selected topics of current interest concerning the structures and syntheses of naturally occurring organic compounds, including both carbocyclic and heterocyclic systems. Offered in odd-numbered years.

Mr. Miller

221A-H. Organic Chemistry. (3) II.

Lecture—3 hours. Selected topics of current interest in organic chemistry. Topics will vary each time the course is offered, and in general will emphasize the research interests of the staff member giving the course. The Staff

223. Organometallic Compounds. (3) III.

Lecture—3 hours. Selected topics of current interest concerning the preparation of organometallic compounds and their utilization in organic synthesis. Offered in even-numbered years. Mr. Zweifel

224. Inorganic Chemistry. (3) I.

Lecture—3 hours. Prerequisite: course 124. Development of the modern theories related to the structural, optical, and magnetic properties of inorganic compounds and complexes. Offered in odd-numbered years. Mr. Swinehart

225. Inorganic Chemistry. (3) I.

Lecture—3 hours. Prerequisite: course 124. Application of kinetic and thermodynamic principles to the interpretation of inorganic systems. Offered in even-numbered years. Mr. Musker

230A-J. Special Topics in Physical Chemistry.

(3) I, II, III.

Lecture—3 hours. Prerequisite: consent of instructor. Series of advanced, research-oriented, special-topics courses in physical chemistry. Topics will vary each time the course is offered. The Staff

233. Physical Organic Chemistry. (3) I.

Lecture—3 hours. Modern concepts of substitution, elimination, and addition reactions, rearrangements, and stereochemistry.

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

Mr. Hancock, Mr. Keizer

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-12) I, II, III.

The laboratory is open to qualified graduate students who wish to pursue original investigation. Students wishing to enroll should communicate with the department well in advance of the quarter in which the work is to be undertaken. The Staff (Chairman in charge)

NOTE: For key to footnote symbols, see page 191.

CHICANO STUDIES—See Mexican-American (Chicano) Studies**CHINESE—See Oriental Languages****CLASSICS**

Department Office, 616 Sproul Hall

Professor:

Wesley E. Thompson, Ph.D.

Associate Professor:

Richard E. Grimm, Ph.D.

Assistant Professors:

Frederick H. van Doorninck, Jr., Ph.D.

David A. Traill, Ph.D.

**The Major Program—Greek**

Lower Division Courses.—Required: Greek 1, 2, and 3 or their equivalents. Recommended: Latin 1, 2, and 3.

Upper Division Courses.—Required: 36 units of upper division courses of which two may be chosen from department-approved courses in other fields. Students majoring in Greek must maintain at least a C average in upper division courses.

The Major Program—Latin

Lower Division Courses.—Required: Latin 1, 2, 3, or their equivalents.

Upper Division Courses.—Required: at least 36 units of upper division courses, including 121A–121B.

Graduate Study.—M.A. degree.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Requirements for the teaching minor in Latin: Latin 1, 2, 3, or their equivalents; at least 18 units of upper division work, including Latin 121A–121B. Recommended: History 111C.

Subject Representative: Mr. Grimm

Classics**Lower Division Courses*****4A. Classical Civilization. (3) III.**

Lecture—3 hours. An introduction to the literature, art, and institutions of classical Greece. Mr. Thompson

10. Greek and Roman Mythology. (3) I.

Lecture—3 hours. Origin and development of myths and legends, their place in the religion, literature, and art of Greece and Rome. Mr. Thompson

17A. Greek Archaeology. (3) I.

Lecture—3 hours. Greece, Crete, and the Aegean world during the Bronze Age with em-

phasis on the Minoan and Mycenaean civilizations. Consideration of certain aspects of Homeric civilization in light of the archaeological remains. Mr. van Doorninck

17B. Greek Archaeology. (3) II.

Lecture—3 hours. The archaeological monuments of Archaic and Classical Greece. Selections from Greek literature are related to the archaeological remains. Mr. van Doorninck

***17C. Roman Archaeology. (3) III.**

Lecture—3 hours. The development of Rome and its Empire as illustrated by the monuments. Mr. van Doorninck

40. Homer and the Tradition of Ancient Epic. (3) II.

Lecture—3 hours. Reading in translation of the *Iliad* and *Odyssey*. Homer's influence on Vergil. Lectures on the development of ancient epic. Offered in odd-numbered years. Mr. Traill

41. Greek Tragedy. (3) III.

Lecture—3 hours. Reading in translation of selected plays of Aeschylus, Sophocles, and Euripides. Lectures on the development and influence of Athenian tragedy. Mr. Grimm

Upper Division Courses***139B. Greek Literature in Translation. (3) II.**

Lecture—3 hours. Development of historical writing in Greece: Herodotus, Thucydides, and selections from the minor historians. Offered in even-numbered years. Mr. Thompson

***141. Greek and Roman Comedy. (4) II.**

Lecture—3 hours. Readings in Aristophanes, Menander, Plautus, and Terence; lectures on the development of ancient comedy. Offered in odd-numbered years. Mr. Grimm

***142. Greek and Roman Novel. (4) III.**

Lecture—3 hours. Examination of the ancient Greek romances and their development into the grotesque realism of Petronius' *Satyricon*, and the religious mysticism of Apuleius' *The Golden Ass*. Mr. Traill

***150. Athenian Political and Social Institutions. (3) II.**

Lecture—2 hours; discussion—1 hour. Politics and government, marriage and kinship, religious societies, and the demographic and economic basis of Athenian democracy. Offered in odd-numbered years. Mr. Thompson

161A-C. Varieties of Authorial Vision. (4) I, II, III.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Study of representative examples of imaginative literature from antiquity to the present. Content will alternate among the following segments: A. The Tragic Vision; B. The Comic Vision; C. The Tragicomic Vision. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, French, German, and Russian 161A-C). The Staff

***162A-F. The Theory and Practice of Literary Translation. (4) II.**

Lecture—2 hours; discussion—1 hour; term translation project. Prerequisite: competence in "source" language and consent of instructor. Theories and problems of rendering texts in foreign languages into English; imaginative equivalence and re-creative adaptation demonstrated in terms of various models; comparison of student translation projects. Content will alternate among the following segments: A. French to English; B. German to English; C. Greek/Latin to English; D. Italian to English; E. Russian to English; F. Spanish to English. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, French, German, and Russian 162A-F.) The Staff

***174. Ancient Greek Sanctuaries. (4) III.**

Lecture-discussion—4 hours. Prerequisite: course 17B or consent of instructor. The history, cults, and monuments of Olympia, Delphi, and other sanctuaries. Student reports on major monuments. Offered in even-numbered years. Mr. van Doorninck

***175. Topography and Monuments of Ancient Athens. (4) III.**

Lecture-discussion—4 hours. Prerequisite: course 17A-17B or consent of instructor. The history of Athens as an urban center from the Bronze Age through the late Roman period. Student reports on major monuments with emphasis placed on restoration, chronology, and on the relating of documentary to excavational evidence. Offered in odd-numbered years. Mr. van Doorninck

Graduate Courses**201. Introduction to Classical Philology. (4) I.**

Seminar—3 hours. Survey of major contemporary areas of classical scholarship with special attention devoted to current problems in literary and textual criticism. Mr. Thompson

202. Homer. (4) III.

Seminar—3 hours. Readings in the *Iliad* and *Odyssey*; the origins and transmission of the poems. Mr. van Doorninck

203. Vergil. (4) II.

Seminar—3 hours. Reading of selected books of the *Bucolics*, *Georgics*, and *Aeneid*. Emphasis will be placed on the study of Vergilean poetic language. Mr. Grimm

***204. Greek and Roman Comedy. (4) I.**

Seminar—3 hours. Historical and critical problems in Aristophanes or New Comedy. May be repeated for credit. Mr. Thompson

***205. Latin Lyric and Elegy. (4) II.**

Seminar—3 hours. Critical examination of the works of Catullus, Horace, or Propertius. May be repeated for credit. Mr. Traill

***206. Greek Historiography. (4) III.**

Seminar—3 hours. Development of historical writing in Greece. May be repeated for credit. Mr. Thompson

***207. Greek Drama. (4) II.**

Seminar—3 hours. Literary and philological analysis of the plays of Euripides, Sophocles, or Aeschylus. May be repeated for credit. Mr. Grimm

Greek

Departmental Major Adviser.—Mr. Thompson.

Lower Division Courses**1. Elementary Greek. (5) I.**

Lecture—4 hours. The Staff

2. Elementary Greek. (5) II.

Lecture—4 hours. Prerequisite: course 1. A continuation of course 1. The Staff

3. Elementary Greek. (5) III.

Lecture—4 hours. Prerequisite: course 2. A continuation of course 2. The Staff

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. Primarily for lower division students. The Staff

Upper Division Courses***100. Attic Orators. (4) I.**

Lecture—3 hours. Prerequisite: course 3. Mr. Thompson

101. Plato. (4) I.

Lecture—3 hours. Prerequisite: course 3. Mr. Thompson

***102. Euripides. (4) I.**

Lecture—3 hours. Prerequisite: course 101.

***103A. Homer: *Iliad*. (4) I.**

Recitation—3 hours; term paper. Prerequisite: course 3. Mr. van Doorninck

NOTE: For key to footnote symbols, see page 191.

***103B. Homer: Odyssey. (4) II.**

Recitation—3 hours; term paper. Prerequisite: course 3. Mr. van Doorninck

104. Menander. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 3. Mr. Thompson

***105. Demosthenes. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 3. Mr. Thompson

111. Sophocles. (4) III.

Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years. Mr. Grimm

***112. Aristophanes. (4) III.**

Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years. Mr. Grimm

***113. Thucydides. (4) I.**

Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years. Mr. Thompson

***114. Lyric Poetry. (4) II.**

Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years. Mr. Thompson

***115. Aeschylus. (4) II.**

Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years. Mr. Grimm

***116. Herodotus. (4) II.**

Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.

Mr. van Doorninck

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Thompson in charge)

Latin

Departmental Major Adviser.—Mr. Grimm.

Lower Division Courses**1. Elementary Latin (4) I.**

Lecture—4 hours. The Staff

2. Elementary Latin. (4) II.

Lecture—4 hours. Prerequisite: course 1. A continuation of course 1. The Staff

3. Elementary Latin. (4) III.

Lecture—4 hours. Prerequisite: course 2. A continuation of course 2. The Staff

***10. The Structure of Latin. (4) III.**

Lecture—4 hours. Prerequisite: not open to students who have received credit for any other course in Latin. Survey of the Latin language with special emphasis on the morphology and syntactical relationships of classical Latin. Mr. Thompson

Upper Division Courses**101. Livy. (4) III.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Mr. Thompson

***102. Roman Comedy. (5) I.**

Lecture—4 hours; term paper. Offered in even-numbered years. Mr. Thompson

103. Vergil: Aeneid. (4) I.

Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***104. Sallust. (4) I.**

Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years. Mr. Thompson

***105. Catullus. (4) II.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Mr. Grimm

***106. Horace: Odes and Epodes. (4) I.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Mr. Grimm

***108. Horace: Satires and Epistles. (4) II.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Mr. Grimm

***109. Roman Elegy. (4) III.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years. Mr. Grimm

***111A-111B-111C. Silver Age Latin. (4) I, II, III.**

Lecture—3 hours. Prerequisite: course 3. Selections from Tacitus, Pliny, Petronius, Juvenal, Martial, and other writers of the Silver Age. Offered in odd-numbered years. Mr. Traill

***112. Cicero: Political Writings. (4) I.**

Recitation—3 hours; term paper. Prerequisite: course 3. Mr. Thompson

***114. Cicero: Philosophical Works. (4) I.**

Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

115. Lucretius. (4) II.

Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years. Mr. Traill

***116. Vergil: Eclogues and Georgics. (4) III.**

Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***121A-121B. Latin Composition. (3-3) II, III.**

Lecture—3 hours. Prerequisite: junior standing. Offered in odd-numbered years. Mr. Grimm

199. Special Study for Advanced Undergraduates.

(2-5) I, II, III.

The Staff (Mr. Grimm in charge)

Graduate Course**299. Research. (2-5) I, II, III.**

The Staff (Chairman in charge)

CLINICAL PATHOLOGY

Jiro J. Kaneko, D.V.M., Ph.D., *Chairman of the Department*

Department Office, 1165 Haring Hall

Professors:

- Donald E. Jasper, D.V.M., Ph.D.
- Jiro J. Kaneko, D.V.M., Ph.D.
- Oscar W. Schalm, D.V.M., Ph.D.

Associate Professor:

¹Nemi C. Jain, M.V.Sc., Ph.D.

Assistant Professor:

Kerry S. Keeton, D.V.M., Ph.D.

Lecturers:

- Edward J. Carroll, Ph.D.
- Jerry P. Lewis, M.D. (*Clinical Pathology and Professor of Internal Medicine*)



Upper Division Courses

101. Comparative Hematology. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: Physiology 110B, Chemistry 5, introductory biochemistry or consent of instructors. Principles, methods and procedures of clinical hematology; comparative blood cellular morphology and function. Offered in even-numbered years. Messrs. Schalm, Jain, Kaneko

199. Special Study for Undergraduates. (1-4)

I, II, III. The Staff (Mr. Kaneko in charge)

Graduate Courses

201. Clinical Hematology. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: third-year standing in the School of Veterinary Medicine or consent of instructor. Hematological techniques and interpretation as applied to the study of disease in animals.

Mr. Schalm, Mr. Jain

202. Clinical Biochemistry. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Biochemical methods in the diagnosis of disease. Special emphasis on electrolyte balance, liver function, kidney function, urinalysis, osteological diseases, thyroid function, and disorders of carbohydrate, protein, and lipid metabolism.

Mr. Kaneko, Mr. Keeton

203. Biochemistry of Metabolic Diseases. (3) II.

Lecture—3 hours. Prerequisite: biochemistry and physiology or consent of instructor. The biochemistry of inborn and acquired errors of metabolism in animals and man. Offered in even-numbered years.

Mr. Kaneko, Mr. Freedland

204. Morphological Hematology. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: consent of instructor. Morphological and interpretive clinical hematology for graduate students. Offered in odd-numbered years. Mr. Schalm

***205. Physiology and Pathology of Leukocytes.**

(2) III.

Lecture—2 hours. Prerequisite: courses 101 or 201, Biochemistry 101A-101B, or consent of instructor. Metabolism, ultrastructure, kinetics, homeostasis, cytochemistry, and functions of different leukocytes; physiological, functional, histochemical and morphological changes in leukocytes in diseases; their role in inflammatory and immunologic processes. Offered in even-numbered years. Mr. Jain

206. Immunohematology. (2) II.

Lecture—2 hours. Prerequisite: course 101 or 201, Veterinary Microbiology 126; or consent of instructor. Immunologic aspects of hematology; blood cell antigens and antibodies; autoimmune hematology diseases; reactions to blood transfusions; transplantation mechanisms. Offered in odd-numbered years.

Messrs. Jain, Carroll, Lewis, MacKenzie

261. The Bovine Mammary Glands in Health and Disease. (2) II.

Lecture—2 hours; two 2-hour laboratory sessions. Prerequisite: consent of instructor. Ontogeny, embryology, anatomy and physiology of the mammary glands; relationship of mastitis and milk quality; infectious causes and the influence of environment, milking machines and management on mastitis; pathogenesis of mastitis; cellular and humoral defense mechanisms; mastitis diagnosis and control.

Mr. Jasper, Mr. Carroll

290. Seminar in Clinical Pathology. (1) I, II, III.

Seminar—1 hour.

The Staff (Mr. Kaneko in charge)

295A-295B-295C. Clinical Pathology Laboratory.

(1-1-1) I-II-III.

Discussion—7 hours total; laboratory—16 hours total. Prerequisite: fourth-year standing in School of Veterinary Medicine. Application of laboratory methods to the diagnosis of animal disease. (S/U grading only.) The Staff

298. Directed Group Study. (1-3) I, II, III. The Staff

299. Research in Clinical Pathology. (1-12) I, II, III. The Staff

NOTE: For key to footnote symbols, see page 191.

CLINICAL SCIENCES—See *Medicine, Radiological Sciences, Reproduction and Surgery*

COMPARATIVE LITERATURE

Roland W. Hoermann, Ph.D., *Chairman of the Program*
Program Office, 724 Sproul Hall

Committee in Charge:

- Ruby Cohn, Ph.D. (*Comparative Literature and Dramatic Art*)
Peter L. Hays, Ph.D. (*English*)
Roland W. Hoermann, Ph.D. (*German*)
Jurate Izokaitis, Ph.D. (*French*)
Daniel S. Keller, Ph.D. (*Spanish*)
David A. Traill, Ph.D. (*Classics*)
Valerie A. Tumins, Ph.D. (*Russian*)
Marian B. Ury, Ph.D. (*Oriental Languages*)

Faculty:

- Sidney Berger, Ph.D. (*English*)
Jean Marc Blanchard, Agrégé de Lettres (*French*)
Ruby Cohn, Ph.D. (*Comparative Literature and Dramatic Art*)
John F. Fetzer, Ph.D. (*German*)
Thomas A. Hanzo, Ph.D. (*English*)
Roland W. Hoermann, Ph.D. (*German*)
Michael J. Hoffman, Ph.D. (*English*)
Manfred Kusch, M.A. (*French*)
Marshall Lindsay, Ph.D. (*French*)
Richard G. Swift, M.A. (*Music*)



Major Advisers.—Mr. Grimm, Classics; Mr. Hays, Mr. Isaak, English; Mr. Kusch, French; Mr. Menges, German; Mr. Marelli, Italian; Mrs. Ury, Oriental Languages; Mr. Genereux, Russian; Mr. Jaén, Spanish.

Comparative Literature is the intercultural study of the literary arts in such a manner as to transcend national or linguistic boundaries. Its purpose is to examine—comparatively and contrastively—the humanistic components involved in such interrelated phenomena as literary styles, taste, and influences; the history, theory, and practice of literary criticism; the analogues and transformations in literary devices, themes, imagery, and genres; the historical flow of literary archetypes; and the role of folklore and myth in literature.

The specific goals of the undergraduate curriculum are: a) to develop the student's ability to read literature critically; b) to encourage scrutiny of literary masterpieces as manifestations of

craftsmanship and human imagination that are not isolated by time, place, or language; c) to aid the student in gaining a more integrated sense of general literary history than is offered by the study of a single literature; and d) to prepare the student in the original languages for methodological investigation of problems involving more than one literature.

The interdepartmental major in Comparative Literature consists of a minimum of 69 units of course work in literature departments, including a distribution between a first and second literature of concentration.

The Major Program

Lower Division Courses.—Required: a) Sufficient preparation in elementary and intermediate language courses to insure satisfactory performance in first and second literatures of concentration on the upper division level; b) one segment from Comparative Literature 40; c) Classics 10, 40, 41. Recommended: Art 10, Dramatic Art 15, 20; History 4A–4B–4C; Philosophy 6, 20A, 20B.

Upper Division Courses.—Required: a) First Literature of Concentration—six courses in the original language, including appropriate historical distribution; b) Second Literature of Concentration—three courses in the original language; c) two courses from among Comparative Literature 140, 141, 142; and d) three literature courses exclusive of first and second literatures of concentration (may include foreign literature in translation or additional Comparative Literature courses).

Teaching Major.—In addition to the normal requirements for the major, the teaching major presupposes completion of three courses in advanced (upper division) grammar, conversation, and composition in the foreign language corresponding to the student's foreign literature choice for his first or second literature of concentration.

Teaching Minor.—Minimum requirements include: a) 12 units in Comparative Literature courses; b) 12 units of upper division work in a single foreign literature in the original language, and three courses in advanced (upper division) grammar, conversation, and composition in the same foreign language; c) 12 units of upper division literary breadth outside the literature of "b."

Lower Division Courses

40A-H. Introduction to Comparative Literature. (4) I.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Introduction to the comparative study of literature: archetypes, analogues, and transformations in major epochs and works. Content will alternate among the following segments: 40A. Folklore, Legend and Myth; 40B. Lyric Verse; 40C. Epic Poetry; 40D. Tragedy; 40E. Comedy; 40F. The Novel; 40G. Tales and Short Stories; 40H. Satire and Didactic Forms. May be repeated for credit in different subject area. Mr. Berger

49. Freshman Seminar. (2) I.

Seminar—2 hours. Prerequisite: consent of instructor. Literary representations of the creative process and the artist problem; introduction to modes of literary judgment and criticism; the range and validity of the comparative study of literature. (P/NP grading only.) Mr. Hoermann

50. Intermediate Seminar: Myths and Motifs.**(2) II.**

Seminar—2 hours. Prerequisite: consent of instructor. Studies focusing on the emergence of similar myths and motifs in various literatures. (P/NP grading only.) Mr. Hays

51. Intermediate Seminar: Genres and Literary Judgment. (2) III.

Seminar—2 hours. Prerequisite: consent of instructor. Studies devoted to particular genres and the changes they have undergone. (P/NP grading only.) Mr. Lindsay

99. Special Study for Undergraduates. (1-5) I, II, III.

The Staff (Chairman in charge)

Upper Division Courses

140A-G. Themes and Structures in Literature. (4) II.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Interpretation of selected works according to recurring thematic, formal, and structural elements. Special emphasis on problems of meaning, consciousness, perception, and convention. Content will alternate among the following segments: A. Time and Space; B. The Picaresque Tradition; C. War and Revolution; D. The Hero and Anti-hero; E. The Artist Problem; F. Justice and Deception; G. Redemption and Scapegoatism. May be repeated for credit in different subject area. Mr. Kusch

141. Theories of Literature and the Techniques of Literary Criticism. (4) III.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: reading knowledge of one

foreign language or consent of instructor and completion of 8 units of upper-division literature course work. Exploration of literary theories with emphasis on specific objectives and possibilities of comparative literature. May be repeated for credit. Mr. Hanzo

***142. Critical Reading and Analysis. (4) I.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Close reading of selected texts; scrutiny of very limited amount of material, with attention to the problems of texts in translation.

The Staff (Chairman in charge)

159. Special Topics in Comparative Literature.*(4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Intensive study of selected subjects, such as "The Play within the Play," the lyrical novel, the roles of philosophy and psychology in literary analysis, or problems of literary attitude and judgments. The Staff (Chairman in charge)

Note: Interdepartmental "troika" courses (161-169) are also cross-listed in the offerings of the three specific departments which are represented on the teaching-panel staff in each case. Whenever possible, enrollment in such cross-listed courses shall reflect the "home" department of the student's academic major. Students majoring in Comparative Literature or in a non-literature area will register with the "Comparative Literature" designation below.

161A-C. Varieties of Authorial Vision. (4) I, II, III.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Study of representative examples of imaginative literature from antiquity to the present. Content will alternate among the following segments: A. The Tragic Vision; B. The Comic Vision; C. The Tragicomic Vision. May be repeated for credit in different subject area. (Same course as Classics, English, French, German, and Russian 161A-C.) The Staff

***162A-F. The Theory and Practice of Literary Translation. (4) II.**

Lecture—2 hours; discussion—1 hour; term translation project. Prerequisite: competence in "source" language and consent of instructor. Theories and problems of rendering texts in foreign languages into English; imaginative equivalence and re-creative adaptation demonstrated in terms of various models; comparison of student translation projects. Content will alternate among the following segments: A. French to English; B. German to English; C.

NOTE: For key to footnote symbols, see page 191.

Greek/Latin to English; D. Italian to English; E. Russian to English; F. Spanish to English. May be repeated for credit in different subject area. (Same course as Classics, English, French, German, and Russian 162A-F.) The Staff

163A-C. Intercultural Literary Colloquium: Literature and the Other Arts. (4) II.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. The encounter of literature with other art forms; structural and thematic elements of music and the fine arts reflected as subject matter or compositional principles in literature; contrast and similarity in the creative process of the several media. Content will alternate among the following segments: A. Music and the Artist-Hero; B. Pictorial Arts and Visual Media; C. Theater, Opera and Dramatic Forms. May be repeated for credit in different subject area. (Same course as English, French, German, and Russian 163A-C.) Messrs. Fetzer, Hoffman, Swift

***164A-C. Intercultural Literary Colloquium: The Great Periods of International Culture. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in the literary crosscurrents, accommodation and dominance that have characterized the literatures of a common Western culture. Content will alternate among the following segments: A. The Middle Ages; B. The Renaissance; C. Rationalism and the Enlightenment. May be repeated for credit in different subject area. (Same course as English, French, German, and Russian 164A-C.) The Staff

***165. Intercultural Literary Colloquium: Studies in Fantastic Reality. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. The literary experience of mystery, the fantastic, and the demonic in Western tradition, including works by such writers as Borges, Dostoevski, and Kafka. (Same course as English, French, German, and Russian 165.) The Staff

***166A. Modalities of Modern Literature: The Novel. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Intercultural literary colloquium on the transformations of self, nature, and community in novels by such writers as Dostoevski, Svevo, Kafka, Faulkner, and Robbe-Grillet. (Same course as English, French, German, and Russian 166A.) The Staff

***166B. Modalities of Modern Literature: The Drama. (4) III.**

Lecture—2 hours; discussion—1 hour; term

paper. Prerequisite: consent of instructor. Readings in representative authors such as Ibsen, Strindberg, Chekhov, Pirandello, and Brecht. Ms. Cohn

***167. Intercultural Literary Colloquium: Comparative Study of Major Authors. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Pivotal works of artists in the Western mainstream, such as Dante, Shakespeare, Cervantes, Goethe, Tolstoi, Proust, and Joyce. (Same course as English, French, German, and Russian 167.) The Staff

168A-E. Intercultural Literary Colloquium: Modern Literary Movements and Styles. (4) I.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in popular taste, messianic vision, and elitist polarities. Content will alternate among the following segments: A. Romanticism; B. Symbolist Poetry and Poetics; C. Naturalism and Expressionism; D. Utopianism and Authoritarian Structures; E. Quests of Mystery and Science Fiction. May be repeated for credit in different subject area. (Same course as English, French, German, and Russian 168A-E.) The Staff

***169A-D. Intercultural Literary Colloquium: The Avant Garde. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Literary innovation and rebellion in Western Culture since World War I. Content will alternate among the following segments: A. Dada and Surrealism; B. The Absurdist Tradition; C. The "New Novel"; D. Proletarian and Epic Theater. May be repeated for credit in different subject area. (Same course as Dramatic Art, English, French, German, and Russian 169A-D.) The Staff

197T. Tutoring in Comparative Literature. (2-4) I, II, III.

Discussion—2-4 hours. Prerequisite: upper division standing with declared major in Comparative Literature. Tutoring in undergraduate courses including leadership in small voluntary discussion groups affiliated with current courses offered by Comparative Literature (e.g., Freshman Seminar, course 49). May be repeated for credit up to 6 units. Mr. Hoermann

198. Directed Group Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff

CONSUMER ECONOMICS

Related Undergraduate Major.—See page 85.

Related Graduate Study.—See page 182.

Related Courses. See *Agricultural Economics*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Upper Division Courses

141. Consumers and the Market. (4) I, II.

Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. The structure of the market and the effects of its performance on consumers. Agencies aiding and protecting consumers, sources of information available to consumers. Ms. Parker

142. Consumer Economic Problems. (4) II, III.

Lecture—4 hours. Prerequisite: Economics 1B. The management of income and expenditures by the household. The use of consumer

credit, savings, investments, and insurance by households. Ms. Lane

198. Directed Group Study. (1–5) I, II, III.

The Staff (Mr. Carter in charge)

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff (Mr. Carter in charge)

Graduate Courses

247. Consumption and Standards of Living. (4) III.

Lecture—4 hours. Prerequisite: course 141. An analytical treatment of household consumption behavior. The effects of income, prices, and household characteristics on expenditures. Standards of income and consumption adequacy. Ms. Lane

290. Seminar. (1) I, II, III.

Seminar—1 hour.

Ms. Lane

299. Research. (1–12) I, II, III.

The Staff (Mr. Carter in charge)

CONSUMER SCIENCE

Major Advisers.—See *Class Schedule* listing.

Related Major Program and Graduate Study. See pages 83, 94, and 182.

Related Courses. See *Consumer Economics, Food Science and Technology, Foods, Nutrition, and Textiles and Clothing*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Upper Division Course

100. Consumer Behavior. (3) II.

Lecture—3 hours. Recommended: Preparation in areas of psychology or sociology and economics. Provides a set of behavioral concepts and theories useful in understanding consumer behavior on the part of the individual, business, and social organizations. Conceptual model to help guide and understand consumer research will be presented. Mr. Schutz

Graduate Courses

200. Consumer Research Methods. (3) I.

Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Topics will include consumer laboratory and field attitude research, consumer sampling, measurement techniques, scales, and methods of analysis.

Mr. Schutz

201A. Consumer Product Quality, Standards, and Labeling: Basic Principles. (2) I.

Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. An overview of consumer product quality, standards for consumer products, informative product labeling, and the relationships of quality, standards and labeling are presented. Mr. Needles

201B. Consumer Product Quality, Standards, and Labeling: Textile Products and Hard Goods. (2) II.

Lecture—2 hours. Recommended: course 201A and Textiles and Clothing 160. Consumer product quality and standards for textile products; shelter, transportation, appliances, and repair are given more limited coverage.

Mr. Zeronian

201C. Consumer Product Quality, Standards, and Labeling: Food and Nutrition Practices and Problems. (2) III.

Lecture—1 hour; discussion—1 hour. Recommended: course 201A and upper division courses in Foods (100A, 100B or equivalent) and Nutrition (102A, 102B or equivalent). Relation of consumer problems in nutrition and food use to regulations and practices involving quality, standards, and labeling of food products. Topics include food grades and standards;

NOTE: For key to footnote symbols, see page 191.

identity standards; labeling for regulation and for information; fortification and enrichment of foods; nutritional supplements and substitutes; food additives.
Mr. Hill in charge

202. Consumer Protection. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: knowledge equivalent to Consumer Economics 141, 142. Consumer protective agencies and programs; federal, state, and local government programs; private consumer protective agencies and programs; nonprofit agencies and programs; consumer legal remedies; consumer protective legislation and enforcement of consumer protective regulation and legislation.

290. Seminar in Consumer Science. (1) I, II, III.

Seminar—1 hour. Prerequisite: graduate standing. Selected topics related to the consumer, consumer problems, and consumer-oriented research will be presented. A broad spectrum of consumer topics will be presented over the three-quarter sequence.

The Staff (Mr. Schutz in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: graduate standing.

The Staff (Mr. Schutz in charge)

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing.

The Staff (Mr. Schutz in charge)

CONSUMER TECHNOLOGY

Questions pertaining to the following courses should be directed to the instructor or to the Office of College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

15. Experiments in Creative Woodworking. (1) I.

Laboratory—2 hours. Experimental comparison of techniques for creating objects and structures of wood. Physical principles and properties of woods as related to structural stability, selection and use of tools, and aesthetics in design; finishes to preserve, enhance, or create effects.

Mr. O'Brien

16. Experiments in Creative Metalworking. (1) III.

Laboratory—2 hours. Recommended: Chemistry 1A and Physics 2A. Experimental comparisons of techniques for creating objects and structures of metal. Physical principles; design considerations; effects of techniques on quality and appearance; bases for self-evaluation of skills. Selected operations of welding, cutting, forming, and finishing. (P/NP grading only.)

Mr. Garrett

17. Electrical Appliances and Systems. (1) III.

Lecture—1 hour. Characteristics and principles of selected electrical appliances and systems for lighting, heating, and power. Principles of electricity; loads, distribution, and control; safety; planning systems and selecting appliances. May be augmented by course 97. (P/NP grading only.)

Mr. Garrett

22. Characteristics of Land Vehicles. (1) I.

Lecture—1 hour. Prerequisite: Physics 2A or consent of instructor. Comparative study of the stability, control, flotation, comfort, and safety of automobiles, bicycles, motorcycles, trailers, trucks, and all-terrain vehicles. Bases for selec-

tion and for evaluation of operating techniques. May be augmented by course 97.

Mr. Chancellor

31. Using Computers for Records and Problems.

(1) I, II.

Discussion—laboratory—2 hours. Directed exercise in using computers and computing calculators for solving selected agricultural, management, and production problems. Batch and time sharing computing methods; programmable desk calculators.

Mr. Albright

97. Laboratory. (1) I, III.

Directed laboratory exercises, field trips, or special projects. Multiple sections may be taken in combination with different CT lecture courses. Each section augments a specific course. Section offering dependent on sufficient number of students.

The Staff (Mr. Goss in charge)

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. Restricted to lower division students. The Staff (Mr. Goss in charge)

99. Special Study for Lower Division Students.

(1-5) I, II, III.

The Staff (Mr. Goss in charge)

Upper Division Courses

100. Social Implications of Mechanization in Agriculture. (2) II.

Lecture—2 hours. Prerequisite: upper division standing or consent of instructor. Roles of rural manpower and mechanization in the production of food and fiber. Pressures for mechanization and social implications of the resulting developments. Technological considerations in developing machines. Human benefits and stresses resulting from increased levels of mechanization.

Mr. O'Brien

101. Engines for Automotive, Agricultural, Residential, and Recreational Use. (3) III.

Lecture—2 hours; laboratory—2 hours. Prerequisite: upper division standing or consent of instructor. Principles of engine construction, operation, performance, and utilization. Engine fuel resources and properties of fuels, lubricants, and engine exhaust. Fuel combustion, carburetion, and electrical systems. Mr. Burkhardt

103. Human Factors in Selection of Equipment and Tools. (1) I.

Discussion-laboratory—2 hours. Prerequisite: upper division standing or consent of instructor. Comparative analysis of the characteristics of equipment and tools as related to the dimensions and capabilities of users; the role of the user in tool operation; sensitivity to design features; determinations of value; safety considerations; selection of alternative models. (P/NP grading only.) Mr. Garrett

111. Home Design. (1) III.

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Study of factors to be considered in planning new or remodeled homes. Factors include size, layout, location, orientation, materials, traffic patterns, facilities, aesthetics, cost, and building codes and regulations. May be augmented by course 197. Mr. O'Brien

112. Low Cost Construction. (1) I.

Lecture—1 hour. Prerequisite: consent of instructor; Physics 2A and Economics 1A recom-

mended. Consideration of innovative construction methods; comparison of materials and methods, considering factors such as availability, workability, durability, strength, economy, and appearance. May be augmented by course 197. (P/NP grading only.) Mr. Parsons

113. Sanitation and Water Supply for Remote Locations. (1) III.

Lecture—1 hour. Prerequisite: upper division standing; Physics 2B and Chemistry 1B recommended. Sources of domestic water at remote locations; sanitation precautions; methods and equipment for sanitary disposal of domestic wastes. May be augmented by course 197. Mr. Akesson

196. Individual Projects. (1-2) I, II, III.

Prerequisite: consent of instructor. Directed exercise in planning and executing independent projects consistent with the student's abilities. Mr. Garrett, Mr. O'Brien

197. Laboratory. (1) I, III.

Laboratory—3 hours. Directed laboratory exercises, field trips, or special projects. Multiple sections may be taken in combination with different CT lecture courses. Each section augments a specific course. Section offering dependent on sufficient number of students enrolled. The Staff (Mr. Goss in charge)

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Goss in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III. The Staff (Mr. Goss in charge)

DESIGN

Major Advisers.—See *Class Schedule* listing.

Major Program.—See page 85.

Related Courses: See *Engineering 110 (Introduction to Engineering Principles)*; *Environmental Planning and Management 20 and 22 (Introduction to Landscape Design)*; *136 (Design of Recreation Environments)*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses**6A-6B-6C. Visual Communication Through Design.**

(4-4-4) I, II, III.

Lecture—3 hours; discussion—1 hour. Consideration of the social, cultural and physical needs of man influencing design: A. Environmental; B. Personal Expression; C. Communication Design. May be taken in any order. (P/NP grading only.) I. Mr. Gotelli; II. Ms. Rossbach; III. Ms. Butler

20A. Drawing. (4) I, III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Drawing for the designer as an aid to perception and communication of ideas, objects, and plans. I. Mr. Gotelli; III. Ms. Rossbach

20B. Media. (4) I.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Introduction to the tools, materials, and techniques used in the designer's studio. Ms. Butler

21. Drafting and Perspective. (4) I, II.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Recommended: course in drawing. Creation of three-dimensional designs on two-dimensional surfaces. Mr. Olsen

22. Lettering and Type Design. (4) I.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Understanding of the forms and spacing of the Latin alphabet: hand-letter-

NOTE: For key to footnote symbols, see page 191.

ing, constructed letters, basic type styles, type measures, and layout. Ms. Butler

23. Personal Adornment. (4) II.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Exploration of man's image altered through ornament and its relation to the human structure. Ms. Stabb

24. Non-loom Textiles. (4) I.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Contemporary approach to non-loom textile techniques: netting, plaiting, knotting, and basketry. Ms. Huckins

25. Reproduction Graphics. (4) III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Basic studio and photographic skills for the designer; continuous tone, line and halftone films, mechanical and four-color screen separations. Ms. Butler

26. Visual Presentation. (4) II.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Exploration of communication through display and exhibition design.

Mr. Gotelli

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Thompson in charge)

Upper Division Courses

130. Model Construction. (4) III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Recommended: preparation in drafting and perspective. Construction and presentation of working models from drawings of furniture, interiors, exteriors, and playground equipment. Mr. Olsen

131. Layered Textiles. (4) III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Recommended: background in drawing, personal adornment and non-loom textiles. Exploration of multi-pieced and multi-layered textiles: applique, patchwork, quilting, stump work. The individualized influences of materials and techniques on contemporary textiles. Ms. Rossbach

132. Loomed Textiles. (4) II.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Recommended: course in non-loom textiles. Influences of material and techniques of the woven form of tapestry weaving and frame loom weaving, natural dyeing, and simple loom construction. Ms. Huckins

133. Graphic Communication Design. (4) III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Recommended: course 22. Study and practice of layout skills in poster,

book, magazine, and TV design. Exploration of the social impact and application of communication media. Ms. Butler

134. Environmental Design. (4) II.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Recommended: courses 21, 130. Exploration of specific problems in interior form and exterior space such as: design for the disabled; and contemporary urban problems.

Mr. Olsen, Mr. Gotelli

*140A. History of Design. (3) I.

Lecture—3 hours. Prerequisite: Art 1A (may be taken concurrently). The history of Western design from Ancient Egypt and the Middle East through the Aegean and Classical civilizations to the waning of the Middle Ages.

*140B. History of Design. (3) II.

Lecture—3 hours. Prerequisite: Art 1B or consent of instructor. The history of Western design from the Renaissance through the Baroque, the Rococo and Neoclassicism of the eighteenth century, nineteenth century, industrialization to the emergence of modernism.

142A. World Textiles: Far East and Pacific. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Art 1A. Exploration through lectures and visual material of the textile arts of Japan, China, Korea, India, Indonesia, and the Pacific Islands with emphasis on the aesthetic and stylistic qualities of these cultures.

Ms. Rossbach

142B. World Textiles: Middle East, Europe, and United States. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Art 1A. Exploration through lectures and visual material of the textile arts of the Middle East, Europe, and the United States with emphasis on aesthetic and stylistic qualities. The influences of Eastern textiles on textiles of Europe and the United States. Ms. Rossbach

143. History of Costume Design. (3) II.

Lecture—3 hours. Prerequisite: Art 1A. The history of costume design from the earliest times to the present with emphasis on both aesthetic and functional aspects. Ms. Stabb

144. History of Interior Design. (3) III.

Lecture—3 hours. Prerequisite: one course in art history. The history of Western interior design from its beginnings in Ancient Egypt through the Classical, Medieval, and Renaissance worlds to modern times.

160A-160B-160C. Textile Design. (4-4-4) I-II-III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Recommended: courses 20A and 20B. Exploration of the design and apprec-

iation of hand printed textiles; emphasizes the unique qualities of the individual as producer.

Ms. Rossbach; Ms. Huckins

170A-170B-170C. Costume Design. (4) I-II-III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Recommended: courses 20A and 23. Studio projects in costume design; consideration of functional and aesthetic factors influencing the historic, contemporary, and projected image of man as expressed through costume.

Ms. Huckins; Ms. Stabb

180A-180B-180C. Interior Design. (4) I-II-III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Recommended: design. Analysis, organization, and solution of interior design problems involving the social, cultural,

economic, and aesthetic needs of man. Consideration of the interrelationship of interior design, architectural and landscape design.

I-III. Mr. Olsen; II. Mr. Gotelli

190. Proseminar. (2) I, II, III.

Seminar—2 hours. Prerequisite: design major or consent of instructor. (P/NP grading only.)

The Staff

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: upper division standing and consent of instructor.

The Staff (Mr. Thompson in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Thompson in charge)

DRAMATIC ART

Robert A. Fahrner, Ph.D., *Chairman of the Department*

Department Office, 222 Dramatic Art Building

Professors:

Ruby Cohn, Ph.D. (*Dramatic Art and Comparative Literature*)

Everard d'Harnoncourt, Ph. D.

Theodore J. Shank, Ph.D.

Daniel E. Snyder

Alan A. Stambusky, Ph.D.

Associate Professors:

Robert A. Fahrner, Ph.D.

Alfred Rossi, Ph.D.

Robert K. Sarlos, Ph.D.

Assistant Professors:

David Copelin, D.F.A.

Harry C. Johnson, M.A.

Lecturers:

Gene A. Chesley, M.A.

Jerry W. Helm

Phyllis J. Kress, M.F.A.



Major Adviser.—Mr. Shank.

Lower Division Courses.—Twenty-two quarter units in Dramatic Art including the following, 20 (Introduction to Dramatic Art); 21A, 21B (Fundamentals of Acting); 24 (Visual Aspects of Dramatic Art); and 25 (Technical Aspects of Dramatic Art).

Upper Division Courses.—Thirty-eight quarter units in Dramatic Art including the following: 124A, 124B (Principles of Theatrical Design); 127A (Principles of Directing); 156 (European Theatre and Drama: Greek to Renais-

sance); 157 (European Theatre and Drama: Renaissance to Romantic); 158 (European and American Theatre and Drama: Romantic to the Present); 160A (Principles of Playwriting); either 127B (Principles of Directing) or 160B (Principles of Playwriting); 190 (Senior Projects in Dramatic Art).

In exceptional cases, with the adviser's consent, the student may petition to substitute up to 8 units from other Dramatic Art courses for any of the above courses.

In addition each major student is required to participate in departmental dramatic productions.

Teaching Major.—The requirements for the teaching major are the same as for the undergraduate major.

Teaching Minor.—At least 30 quarter units, including Dramatic Art 20, 21A, 21B, and 24; and 127A and two courses from the sequence 156, 157, 158. Participation in departmental dramatic productions is recommended.

Subject Representative: Mr. Shank

Graduate Study.—The Department of Dramatic Art offers programs of study and research leading to the M.A., M.F.A. (Acting, Design, Directing, Playwriting, or any combination of these), and Ph.D. (Theatre Research) degrees. Detailed information may be obtained from the Graduate Adviser.

The University Theatre

Each year the Department of Dramatic Art presents a series of stage productions of outstanding dramas from various periods and countries. These productions are part of the academic

NOTE: For key to footnote symbols, see page 191.

program of the Department and serve an important purpose in the study of dramatic art. Participation is open to all students.

Artists in Residence Program

The Department of Dramatic Art periodically engages professional artists-in-residence to work with students in productions and in creative workshops.

Lower Division Courses

10. Introduction to Acting. (3) I, II, III.

Laboratory-discussion—4 hours. Fundamentals of movement, speech, theatre games, and improvisations. Selected reading and viewing of theatre productions. Intended for students not specializing in Dramatic Art. The Staff

15. The Art of the Cinema. (4) I, III.

Lecture—3 hours; laboratory—2 hours. The cinema as an art form; its relation to other arts; its evolution with emphasis on the significant modern contributions. Mr. d'Harnoncourt

20. Introduction to Dramatic Art. (4) I, III.

Lecture—3 hours; discussion—1 hour. Understanding and appreciation of both the distinctive and collaborative contributions of playwright, actors, director, and designer to the total work of dramatic art. Study of plays from the major periods of dramatic art in their cultural contexts. Mr. Fahrner, Mr. Copelin

21A. Fundamentals of Acting. (4) II.

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 20. Physical and psychological resources of the actor. Experience in individual and group contact and communication, theatre games, advanced improvisation, sound and movement dynamics. Viewing of theatre productions. Limited to those planning to major in Dramatic Art. The Staff

21B. Fundamentals of Acting. (4) III.

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 21A and consent of instructor. Theory and practice of acting with emphasis on character analysis, interpretation, and development. Acting in a student-directed project. Viewing of theatre productions. Limited to those planning to major in Dramatic Art. The Staff

24. Visual Aspects of Dramatic Art. (4) III.

Lecture—3 hours; laboratory—2 hours. Understanding and appreciation of the visual aspects of dramatic art: theatre architecture, scenery, lighting, costume, and makeup. Mr. Snyder

25. Technical Aspects of Dramatic Art. (2) I, II, III.

Lecture—1 hour; laboratory—2 hours. Understanding and appreciation of the technical principles of dramatic production: basic tools

and materials, principles of scene construction, scene painting, costume construction, stage rigging, lighting and sound equipment and control systems. Mr. Helm

27. Creative Collaboration in Playwriting and Directing. (4) II.

Workshop—6 hours. Prerequisite: courses 21A, 21B. Exercises in conceiving and developing theatre pieces with emphasis upon the creative collaboration of playwright and director. Mr. Copelin

30. Theatre Laboratory. (1–5) I, II, III.

Prerequisite: course 25 or consent of instructor. Projects in acting, production, scene design, costuming, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit up to a total of 8 units. The Staff

Upper Division Courses

111. Voice and Speech for the Actor. (1) I, II, III.

Laboratory—2 hours. Fundamentals of voice production and speech through exercises in relaxation, diaphragmatic breathing, breath control and phrasing, articulation, resonance, and tone placement. May be repeated five times for credit. Mr. Johnson

112. Stage Movement. (1) I, II, III.

Laboratory—2 hours. Fundamental work in developing physical aspects of acting techniques used in stage movements. Mr. Johnson

115. Advanced Study of Major Film Makers. (4) II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 15. Analysis of the contribution of some outstanding film creators. Study of diverse aesthetic theories of the cinema and their application to selected films. May be repeated for credit when different film creator studied. Mr. d'Harnoncourt, Mr. Baker

121A. Advanced Acting. (4) I.

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 21B and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources. The Staff

121B. Advanced Acting. (4) II.

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 121A and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources. The Staff

124A. Principles of Theatrical Design. (3) I.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 24 or consent of instructor. Scene design: drafting methods, working draw-

ings, rendering techniques, scale models, methods and materials of scenery construction.
Mr. Chesley

124B. Principles of Theatrical Design. (4) II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 124A. Analysis of plays in terms of scene design, elements of design, execution of designs for modern and period plays.
Mr. Snyder

124C. Principles of Theatrical Design. (3) III.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 24 or consent of instructor. Theories of lighting the stage, equipment and control systems, execution of lighting plots.
Mr. Chesley

124D. Principles of Theatrical Design. (3) II.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 24 or consent of instructor. Source materials for theatrical costuming, selecting fabrics, elements of design, analysis of plays in terms of costume design, execution of designs for modern and period plays. Miss Kress

***125. History of Scene Design and Staging Methods. (4) II.**

Lecture—4 hours. Study of scenic developments from the Renaissance to the present.
Mr. Sarlos

127A. Principles of Directing. (4) I.

Lecture—2 hours; laboratory—4 hours; rehearsal. Prerequisite: courses 21A and 21B. The director's creative approach to the play and to its staging. (Deferred grading only pending completion of sequence, for students taking both 127A–127B.)
Mr. Rossi

127B. Principles of Directing. (4) II.

Lecture—2 hours; laboratory—4 hours; rehearsal. Prerequisite: course 127A and consent of instructor for non-majors. The director's creative approach to the actor. (Deferred grading only pending completion of sequence, for students taking both 127A–127B.)
Mr. Rossi

150. American Drama. (4) III.

Lecture—4 hours. Selected plays and the history of the theatre from Colonial times to the present.
Mr. Sarlos

155. Black Theatre. (4) III.

Lecture-discussion—4 hours. Black Theatre and drama today: the history, impact, and current direction of the work of Blacks in the theatre.
Mr. Johnson

156. European Theatre and Drama: Greek to Renaissance. (5) I.

Lecture—4 hours; papers and conferences. Selected plays and the history of the theatre

from ancient Greece through the Italian and Spanish Renaissance.
Mr. Sarlos

157. European Theatre and Drama: Renaissance to Romantic. (5) II.

Lecture—4 hours; papers and conferences. Selected plays and the history of the theatre from the English Renaissance through German and French Romanticism.
Mr. Sarlos

158. European and American Theatre and Drama: Romantic to the Present. (5) III.

Lecture—4 hours; papers and conferences. Selected plays and the history of the theatre from English Romanticism to the Present.
Mr. Fahrner

159. Contemporary Experimental Theatre and Drama. (5) II.

Lecture—4 hours; papers and conferences. Examination and evaluation of the "New Theatre." Course includes attending theatre events.
The Staff

160A–160B. Principles of Playwriting. (4–4) I–II.

Lecture-Seminar—4 hours. Prerequisite: two courses in Dramatic Art or related courses in other departments. Analysis of dramatic structure; preparation of scenarios; the composition of plays.
Mr. Shank

161. Collective Theatre. (4) I.

Workshop—4 hours. Prerequisite: experience in at least two of the following areas: playwrighting, directing, design, acting, kinetic or environmental sculpture; consent of instructor. Participation in the collective creation of a theatre piece. May be repeated twice for credit.
Mr. Shank

***169A–D. Intercultural Literary Colloquium: The Avant Garde. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Literary innovation and rebellion in Western Culture since World War I. Content will alternate among the following segments: A. Dada and Surrealism; B. The Absurdist Tradition; C. The "New Novel"; D. Proletarian and Epic Theater. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, French, German, and Russian 169A–D.)
The Staff

180. Theatre Laboratory. (1–5) I, II, III.

Prerequisite: upper division standing and course 25, or consent of instructor. Projects in acting, production, scene design, costuming, lighting, directing, and playwrighting. Participation in departmental productions. May be repeated for credit.
The Staff

NOTE: For key to footnote symbols, see page 191.

190. Senior Projects in Dramatic Art. (4) II, III.

Seminar—3 hours; consultation, seminar, rehearsal, laboratory, research papers. Prerequisite: senior standing in Dramatic Art. Study of specific areas of dramatic art culminating in independent creative and scholarly research projects. The Staff

198. Directed Group Study. (1-4) I, II, III.

Lecture—1-4 hours. Prerequisite: consent of instructor. The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. The Staff (Chairman in charge)

Graduate Courses**200. Methods and Materials in Theatre Research.**

(4) I.

Seminar—3 hours. Essential research tools in theatre and related fields; bibliographies, primary sources; methods of evaluating and presenting evidence; delineating research areas in the field. Mr. Sarlos

211. Advanced Voice and Speech. (1) I, II, III.

Laboratory—2 hours. Voice production and speech related to specific acting problems in classical plays, particularly in verse. Mr. Johnson

212. Advanced Stage Movement. (1) I, II, III.

Laboratory—2 hours. Rhythmic movement patterns relating to acting problems in classic and modern plays. Mr. Johnson

221A. Special Problems in Advanced Acting. (4) I.

Seminar—2 hours; laboratory—4 hours. Advanced acting problems arising from differences in the type and style of plays selected from Greece to the Renaissance. Mr. Stambusky

221B. Special Problems in Advanced Acting. (4) II.

Seminar—2 hours; laboratory—4 hours. Advanced acting problems relating to plays selected from the Renaissance to Romanticism. Mr. Rossi

221C. Special Problems in Advanced Acting. (4) III.

Seminar—2 hours; laboratory—4 hours. Advanced acting problems in plays drawn from Romanticism to the present. Mr. Rossi

224A. Advanced Principles and Theories of

Theatrical Design. (4) I.

Seminar—3 hours. Selected problems in the visual and auditory aspects of theatrical production. Mr. Snyder

224B. Advanced Principles and Theories of

Theatrical Design. (4) II.

Seminar—3 hours. Selected problems in the

design of stage scenery and costumes; practice in design. Mr. Chesley

224C. Advanced Principles and Theories of Theatrical Design. (4) III.

Seminar—3 hours. Design of a production for three different types of theatres: open stage, arena, and proscenium. Mr. Chesley

***226. History of Directing. (4) II.**

Seminar—3 hours. Survey of the theories and practice of internationally recognized stage directors from 1874 to the present. Mr. Stambusky

227. Advanced Directing. (4) III.

Seminar—2 hours; laboratory—2 hours. Advanced directing techniques; specialized procedures in styles of drama. Projects in directing scenes from dramas of different types and periods. Mr. Stambusky

***228A. Seminar in Directing. (4) III.**

Seminar—3 hours. Development of directorial conceptions for contemporary productions of selected plays from the Greek to the Renaissance periods. Mr. Copelin

228B. Seminar in Directing. (4) II.

Seminar—3 hours. Directorial conceptions for contemporary productions of selected plays from the Renaissance to Romanticism. Mr. d'Harnoncourt

228C. Seminar in Directing. (4) I.

Seminar—3 hours. Directorial conceptions for contemporary productions of selected plays from Romanticism to the present. Mr. Stambusky

229A. Special Problems in Directing. (4) II.

Seminar—2 hours; laboratory—2 hours. Specialized directorial procedures in styles of drama. Projects in directing scenes selected from plays of the Greek to Renaissance periods. Mr. Stambusky

229B. Special Problems in Directing. (4) II.

Seminar—2 hours; laboratory—2 hours. Projects in directing scenes from plays of the Renaissance to Romanticism. Mr. Rossi

229C. Special Problems in Directing. (4) II.

Seminar—2 hours; laboratory—2 hours. The direction of a full-length play from a classical period. Mr. Stambusky

230A-230B. Classic and Medieval Theatre.

(4-4) II, III.

Seminar—3 hours. The theatre of Greece, Rome and Middle Ages; emphasis on relationship of dramas of the period to physical circumstances of production. Course 230A (may be taken separately) includes readings and discussion; 230B emphasizes research culminating in

a substantial scholarly paper. (Deferred grading only, pending completion of sequence, can be in effect.)
Mr. Sarlos, Mr. Stambusky

***235A-235B. Renaissance and Baroque Theatre.**
(4-4) II, III.

Seminar—3 hours. The theatre of Italy, Spain, England, and France 1500-1660; emphasis on relationship of dramas of the period to physical circumstances of production. Course 235A includes readings and discussion and may be taken separately; 235B emphasizes research culminating in a scholarly paper. (Deferred grading only, pending completion of sequence, can be in effect.)
Mr. Copelin, Mr. Sarlos

***240A-240B. Neoclassic and Romantic Theatre.**
(4-4) II, III.

Seminar—3 hours. The theatre of France, England, Germany, Italy, and America, 1660-1860; emphasis on relationship of dramas of the period to physical circumstances of production. Course 240A (may be taken separately) includes readings and discussion; 240B emphasizes research culminating in a scholarly paper. (Deferred grading only, pending completion of sequence, can be in effect.)
Mr. Fahrner, Mr. Sarlos

250. Modern Theatre. (4) I.

Seminar—3 hours. The theatre of Europe and America, 1860-1940, with emphasis on the relationship of the dramas of the period to the physical circumstances under which they were produced.
Mr. d'Harmoncourt

259. Contemporary Theatre. (4) II.

Seminar—3 hours. World theatre since 1940, with emphasis on the relationship of the dramas of our period to the physical circumstances under which they are produced.
Ms. Cohn

EAST ASIAN STUDIES

Joyce K. Kallgren, Ph.D., *Chairman of the Committee*
Committee Office, 254 Voorhies Hall

Committee in Charge:

Kenne H-K Chang, Ph.D. (*Anthropology*)
Joyce K. Kallgren, Ph.D. (*Political Science*)
Key H. Kim, M.A. (*Oriental Languages*)
Kwang-Ching Liu, Ph.D. (*History*)
Richard J. Miller, Ph.D. (*History*)
Benjamin E. Wallacker, Ph.D. (*Oriental Languages*)

260. Advanced Playwriting. (4) I, II, III.

Seminar—3 hours. Dramatic structure, character, and dialogue. Advanced projects in playwriting.
Mr. Shank

***265. Theory of Dramatic Art. (4) I.**

Seminar—3 hours. Theory and aesthetic principles of dramatic art as a fine art.
Mr. Copelin

280. Theatre Laboratory. (1-12) I, II, III.

Advanced practice in acting, designing, directing, playwriting, and technical theatre.
The Staff

292. Contemporary Theatre Practice. (2) III.

Seminar—2 hours. Seminar in the techniques and requirements for pursuit of a career as a theatre professional. Includes survey of Broadway, Off-Broadway, Regional, University, and Community theatres.
The Staff

298. Group Study. (1-4) I, II, III.

Seminar—1-4 hours. Prerequisite: consent of instructor.
The Staff (Chairman in charge)

299. Individual Study. (1-12) I, II, III.

The Staff (Chairman in charge)

299D. Dissertation Research. (1-6) I, II, III.

(S/U grading only.)
The Staff Chairman in charge

Professional Courses

413. Stage Make-Up. (1) II.

Lecture-laboratory—2 hours. Lectures, demonstrations, and practical work in aspects of theatrical make-up. May be repeated for credit.
The Staff

414. Swordplay for the Theatre. (1) II.

Laboratory—2 hours. Techniques of the stage use of historical weapons; the choreography of stage duels with emphasis on safety and theatrical effectiveness. May be repeated for credit.
The Staff

The major in East Asian Studies is designed to give the student a better understanding of East Asia (especially China and Japan) through interdisciplinary studies and particularly by combining sustained work in an oriental language with courses on East Asian countries. The program is planned in such a way that the student can regard it either as training for a career that involves working with East Asian affairs and people (e.g., journalism, business, govern-

NOTE: For key to footnote symbols, see page 191.

ment service, teaching and counseling), or as preparation for graduate studies in the East Asian field.

Each student will be required to develop a special field (for example, anthropology, history, oriental languages, or political science) in this major, to be chosen in consultation with the Committee in charge. Since seven quarters of language work is required, the interested student should apply to this program normally at the beginning of the sophomore year.

In addition to the requirements for the East Asian major, the student is urged to take courses that would provide a substantial background in Euro-American civilization (e.g., courses in Western history, government, or philosophy), as a basis for comparison and for a deeper understanding of America's relations with East Asia.

Lower Division Courses.—Required: History 9A–9B and Political Science 9C (normally taken

in freshman year), plus History 90 or Oriental Languages 35A–35B.

Language Requirements.—Required: Two years plus one quarter (28 units) of Chinese or Japanese to be satisfied by course work or examination, normally to be started no later than the fall of the sophomore year, and including one quarter of upper division work.

Upper Division Courses.—Required: History 192A–192B or 194A–194B; Political Science 148A–148B; Anthropology 190 or 191; and four courses to be chosen from: Agricultural Economics 125; Anthropology 109, 110, 111, 112, 120, 122, 123, 124, 128, 162, 165, 190, 191, 192; Economics 115A, 115B, 116; Geography 143; History 102G, 102H, 102N, 191A, 191B, 191C, 192A, 192B, 193, 194A, 194B; Oriental Languages 100, 101, 102, 121, 131, 132A, 132B, 142, 170; Political Science 132, 137, 142, 145, 148A, 148B; Sociology 118, 141, 142, 170.

Other appropriate courses as approved by the Committee in charge.

ECOLOGY (A Graduate Group)

R. Merton Love, Ph.D., *Chairman of the Group*
Group Office, 255 Hunt Hall.

Graduate Courses

201A. Ecological Theory. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: a course in ecology, e.g., Environmental Studies 100, and graduate standing. Course will focus on the ecological community as a unit. The major generalizations concerning the structure and functioning of the community will be examined together with the generalizations relating both structure and function to the abiotic environment and its fluctuations. (Same course as Botany, Geology and Zoology 201A.)

Messrs. Salt, Major, Valentine

201B. Analysis of A Selected Ecosystem. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing and course 201A or consent of instructor. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a particular ecosystem. Recent advances in theory, technique, and basic information are emphasized.

Lectures will be given by specialists from several fields. May be repeated for credit. (Same course as Botany, Geology and Zoology 201B.)

The Staff (Mr. Goddard in charge)

201C. The Changing Biosphere. (3) III.

Lecture—2 hours; 1 assigned problem. Prerequisite: graduate standing and courses 201A, 201B; or consent of instructor. Course deals with changing gas balance and weather in the biosphere and effects on plants and animals, the effects of structural, chemical and physical changes on living systems, changes in species diversity, effects on human population increase, and related topics. (Same course as Botany, Geology and Zoology 201C.)

The Staff (Mr. Richerson in charge)

290. Seminar in Ecology. (1) I, II, III.

Seminar—1 hour. Topics in ecology and resource management.

The Staff (Chairman in charge)

ECONOMICS

*Frank C. Child, Ph.D., *Chairman of the Department*

Department Office, 380 Academic Office Building III

Professors:

Andrzej Brzeski, Ph.D.

*Frank C. Child, Ph.D.

Bruce Glassburner, Ph.D.

Thomas Mayer, Ph.D.

Tsung-yuen Shen, Ph.D.

Elias H. Tuma, Ph.D.

Leon L. Wegge, Ph.D.

Associate Professors:

Richard R. Cornwall, Ph.D.
^{2,3}Hiromitsu Kaneda, Ph.D.
 Martin P. Oettinger, Ph.D.

Assistant Professors:

Victor P. Goldberg, Ph.D.
 Thomas M. Lenard, Ph.D.
 William G. Moss, B.A. (*Acting*)
^{2,3}Alan L. Olmstead, Ph.D.
 Refugio I. Rochin, Ph.D.
 C. Daniel Vencill, Ph.D.

Lecturers:

W. Eric Gustafson, Ph.D.
 James A. Roumasset, M.A.



Departmental Major Advisers.—Mr. Brzeski, Mr. Goldberg, Mr. Gustafson, Mr. Lenard, Mr. Moss, Mr. Olmstead, Mr. Rochin, Mr. Roumasset, Mr. Shen.

Graduate Advisers.—Mr. Cornwall, Mr. Glassburner, Mr. Mayer, Mr. Oettinger, Mr. Tuma, Mr. Vencill, Mr. Wegge.

The American History and Institutions requirement may be satisfied in part by Economics 111. (See also page 38.)

The Major Program

Lower Division Courses.—Required: Economics 1A, 1B, or the sequence, Economics 2A–2B–2C; Economics 12; and at least a C average in these courses. Students planning to major in economics should normally complete these courses by the end of the sophomore year.

Students considering graduate study in economics or business administration are strongly urged to take Mathematics 21A, 21B, 21C, and 22A.

Upper Division Courses.—Required: A total of 36 units of economics including (1) Economics 100 and 101; (2) either Economics 110A or 110B or 111; and (3) one of the following sequences of courses: 102A–102B; 110A–110B, 110A–111, or 110B–111; 115A–115B; 116–117; 121A–121B; 125A–125B; 130A–130B; 135A–135B–135C; 150–151, or 150–152; 160–161.

Economics 100 may be taken before, concurrently with, or after Economics 101. The Department recommends that these courses be taken as soon as possible after the introductory course. Except under extraordinary circumstances, not more than three economics courses may be taken in any one quarter. In special cases, the department will accept a limited number of related upper division courses from other departments in satisfaction of the economics upper division course requirements. Approval

from a departmental adviser is required in all such cases.

Economics is an appropriate major for undergraduates contemplating graduate study in business administration, law, regional planning or public affairs. For further information consult with a departmental adviser.

Teaching Major and Minor.—Economics is acceptable for the secondary credential.

Teaching Major.—Same as for the undergraduate major for the A.B. degree.

Teaching Minor.—Thirty units in economics including Economics 1A, 1B; or 2A, 2B, 2C; and 12. The student should consult with the subject representative.

Subject Representative: Mr. Brzeski.

Graduate Study.—Students who meet the admission requirements of the Graduate Division and the Department of Economics may pursue studies leading to the M.A. and Ph.D. degrees. Fields of emphasis for graduate study include: Economic Theory, Monetary Economics, Economic Development, Economic History, International Economics, Labor Economics, Industrial Organization, Economic Systems, Public Finance, Mathematical Economics, and Quantitative Methods (Econometrics).

For information about admission to graduate study, degree requirements, and financial aid, students should consult the *Announcement of the Graduate Division* and contact the chairman of the departmental graduate committee.

*Lower Division Courses***1A. Principles of Economics. (5) I, II.**

Lecture—3 hours; discussion—2 hours. Courses 1A and 1B may be taken in either order. Analysis of the allocation of resources and the distribution of income through a price system; competition and monopoly; the role of public policy; comparative economic systems.

Mr. Cornwall, Mr. Glassburner

1B. Principles of Economics. (5) II, III.

Lecture—3 hours; discussion—2 hours. Courses 1A and 1B may be taken in either order. Analysis of the economy as a whole: determinants of the level of income, employment, and prices; money and banking, economic fluctuations, international trade, economic development; the role of public policy.

Mr. Mayer, Mr. Goldberg

2A–2B–2C. Principles of Economics. (4–3–3)**I–II–III.**

Lecture—3–2–2 hours; discussion—1–1–1 hour. Same as Economics 1A and 1B. Students enrolling for a full year of Principles of Economics must complete either 1A–1B or 2A–2B–2C.

Mr. Gustafson

NOTE: For key to footnote symbols, see page 191.

11A. Elementary Accounting. (4) I.

Lecture—3 hours; laboratory—2 hours. The history and basic concepts of accounting; the ledger, journals, income statement, and the balance sheet; inventory valuation; depreciation; introduction to cost accounting; analysis of financial statements; social accounting. (Deferred grading only, pending completion of sequence.)

11B. Elementary Accounting. (3) II.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 11A. Continuation of course 11A. (Deferred grading only, pending completion of sequence.)

12. Introduction to Quantitative Methods in Economics. (5) I, III.

Lecture—4 hours; laboratory—2 hours. Prerequisite: two years of high school algebra. Not open to students having credit for Mathematics 13. Methods of analyzing quantitative economic data including descriptive statistics: sampling and statistical inference index numbers, correlation, and time series. Emphasis on the logic of procedures, interpretation, and application.

Mr. Brzeski and Staff

***49. Lower Division Seminar. (1-3) II.**

Seminar—1-3 hours. Prerequisite: lower division standing; consent of instructor.

The Staff (Chairman in charge)

98. Group Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students.

The Staff (Mr. Glassburner in charge)

99. Individual Study for Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Glassburner in charge)

Upper Division Courses**100. Intermediate Micro Theory. (5) I, II, III.**

Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. Price and distribution theory under condition of perfect and imperfect competition. Welfare economics.

The Staff

101. Intermediate Macro Theory. (5) I, II, III.

Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. Theory of income, employment and prices under static and dynamic conditions.

The Staff

102A. Advanced Micro Theory. (4) II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 12, 100, Mathematics 16A-16B; or consent of instructor. Selected topics in micro-economic theory.

Mr. Moss

102B. Advanced Macro Theory. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 12, 101, and 102A; Mathematics 16A-16B or consent of instructor. Selected topics in macroeconomic theory.

Mr. Lenard

103. Theory of Economic Optimization. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100, 101; Mathematics 16A-16B. Analytics of economic optimizing behavior for consumers and firms, using linear algebra, partial differentiation, quasi-concave functions, and the Kuhn-Tucker theorems. (Same course as Agricultural Economics 103.)

Mr. Burt, Mr. Wegge

105. History of Economic Thought. (4) III.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C, or consent of instructor. Historical survey of economic doctrine: the Classical School and its antecedents. Neoclassical thought, criticism of classical thought, emergence of modern economic thought.

Mr. Glassburner

110A. Economic History. (4) I.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C, or consent of instructor. Survey of economic change in Europe prior to the year 1700; reference to other regions of the Eastern Hemisphere; implications for contemporary economic development.

Mr. Tuma

110B. Economic History. (4) II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C, or consent of instructor. Survey of economic change in Europe from the year 1700 to the present; reference to other regions of the Eastern Hemisphere; implications for contemporary economic development.

Mr. Tuma

111. Economic History. (4) III.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C, or consent of instructor. Survey of economic change in the United States beginning with the Colonial Period; reference to other regions of the Western Hemisphere; implications for contemporary economic problems.

Mr. Olmstead

115A-115B. Economic Development. (4-4) I-II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C, or consent of instructor. Theories of economic development and underdevelopment, economic policy for growth and development. Contemporary and historical case studies.

Mr. Glassburner, Mr. Kaneda

116. Economic Systems. (4) II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C, or

consent of instructor. Critical examination of major economic systems, their goals and institutions; capitalism, fascism, and varieties of socialism; problems of economic planning in USSR, India, China, and other industrializing economies. Mr. Brzeski

117. The Soviet Economy. (4) III.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C, or consent of instructor. Survey of Soviet economic development: economic organization, methods of planning, and performance. Mr. Brzeski

118. Political Economy of Agrarian Reform. (4) II.

Lecture—3 hours; discussion—1 hour to be arranged. Prerequisite: courses 1A and 1B or equivalent. Theory and concepts of reform; illustrations from various periods and regions. Impact on economic development; problems of change and stability. Relationship to economic, social, and political institutions. Mr. Tuma

121A. Industrial Organization. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C and course 100, or consent of instructor. An appraisal of the role of competition and monopoly in the American economy; market structure, conduct, and economic performance of a variety of industries. Mr. Shen

121B. Industrial Organization. (4) II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 121A. Public policy in a private enterprise economy; antitrust and other policies toward industry; economies of regulated industries. Mr. Goldberg

123. Ecology and Economics. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 2A-2B-2C; or consent of instructor. Economics and populations as self-regulating systems; economic regulation of man's interaction with his environment. Topics: population growth and its economic determinants; optimal rates of use of exhaustible and renewable resources; implications of common property in resources; prospects for agricultural growth. Mr. Gustafson

125A-125B. Urban Economics. (4-4) II-III.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. Analysis of the structure and growth of the urban economy. Topics include: land use, residential and business growth, housing markets, transportation; metropolitan fiscal problems; urban decay and renewal, poverty, discrimination; public policy. Mr. Moss

130A-130B. Economics of the Public Sector. (4-4)

I-II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C, or consent of instructor. Impact of the public sector on income, employment, prices, allocation of resources, and distribution of income; related topics such as the budgetary process, public debt, revenue and expenditure problems, fiscal institutions. Mr. Roumasset

134. Corporation Finance. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C and course 11A. The corporation as a form of business organization; promotion, organization, operation, expansion, consolidation, failure, and reorganization; the capital market, financial instruments and institutions; security markets. Mr. Sosnick

135A. Money, Income, and Monetary Policy. (3) I.

Lecture—3 hours. Prerequisite: courses 1A-1B or 2A-2B-2C, or consent of instructor. Monetary institutions, the banking system, money creation, the Federal Reserve System, the tools of monetary policy. Mr. Vencill

135B. Money, Income, and Monetary Policy. (4) II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 101 and 135A. Monetary theory; the impact of changes in the quantity of money and of liquid assets on money income. Mr. Vencill

135C. Money, Income, and Monetary Policy. (3) III.

Lecture—3 hours. Prerequisite: course 135B. Evaluation of monetary policy, its impact on the economy and past performance, the problem of inflation. Mr. Mayer

*141. The Permanent Arms Economy. (3) II, III.

Lecture-discussion—3 hours. Prerequisite: courses 1A, 1B. The economic impact of large and permanent military establishments. Stabilizing and destabilizing effects of arms expenditures in the West; impact of military technology; the Russian arms economy; defense and development in the Third World.

150. Trade Unions and the Labor Market. (4) I.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C, or consent of instructor. Theory and philosophy of labor movements in America, Western Europe and the developing world. The structure and government of labor unions. Current labor market issues. Mr. Oettinger

151. Wage Determination. (4) II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 100 and 101 or consent

of instructor. The theory and practice of wage determination on the micro and macro level. The impact of legal minimum wages. Wage-price and wage-employment relationships. Offered in odd-numbered years. Mr. Vencill

***152. Labor and Public Policy. (4) III.**

Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 150 or consent of instructor. The economic impact of labor legislation. Collective bargaining, strikes, dispute settlement and government intervention. Manpower and welfare programs. Offered in even-numbered years. Mr. Oettinger

160. International Trade. (4) I.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A–1B or 2A–2B–2C, or consent of instructor. International trade theory; impact of trade on the domestic and the world economies; public policy toward external trade. Mr. Shen

161. International Finance. (4) II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A–1B or 2A–2B–2C, or consent of instructor. International money and capital markets and their impact on the domestic and world economies; international financial institutions and policies. Mr. Shen

189A–189B. Field Work in Economics. (2–3) II–III.

Seminar—1 hour; variable field work. Prerequisite: upper division standing; consent of instructor. Applied economics: stresses research methods, empirical analysis, and the relevance of microeconomic theory for resolving government, labor, or business issues at the community or state level. Individual topics variable. (Deferred grading only, pending completion of sequence.) Mr. Vencill

190. Senior Seminar. (5) I.

Seminar—4 hours. Prerequisite: open only to economics majors with senior standing; consent of instructor. Selected topics in economic analysis and public policy. Mr. Vencill

197T. Tutoring in Economics. (1–5) I, II, III.

Undergraduate tutors will lead small voluntary discussion groups affiliated with one of the department's regular courses, under the supervision of, and at the option of the instructor in charge of the course.

The Staff (Mr. Glassburner in charge)

198. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Glassburner in charge)

199. Special Study for Advanced Undergraduates. (1–5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Glassburner in charge)

Graduate Courses

200A. Microeconomic Theory. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A or consent of instructor. Theory of the Firm under Perfect Competition; programming and dynamic models of the firm. (Same course as Agricultural Economics 200A.) Mr. Rausser

200B. Microeconomic Theory. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A and Mathematics 16B or consent of instructor. Static and dynamic consumer behavior, imperfect competition, market and multi-market equilibrium, introduction to welfare economics and externalities. (Same course as Agricultural Economics 200B.)

Mr. Cornwall

200C. Microeconomic Theory. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 103 and 200B. Linear economic systems, the static Leontief system, competitive general equilibrium, welfare economics, comparative statics, and risk. (Same course as Agricultural Economics 200C.) Mr. Cornwall

200D. Macroeconomic Theory. (4) II.

Lecture—3 hours. Macro static theory of income, employment, and prices. Mr. Shen

200E. Macroeconomic Theory. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 103, 200B, and 200D; Mathematics 16A–16B; or consent of instructor. Macrodynamical theory of income, employment, and prices. Mr. Lenard

201. History of Economic Thought. (4) III.

Lecture—3 hours; to be arranged—1 hour. Development of economic thought from classical Greece to modern times. Mr. Shen

***202. Topics in Economic Theory. (4) I.**

Seminar—4 hours. Prerequisite: courses 200A–200E or consent of instructor. Recent developments in economic theory.

Mr. Wegge, Mr. Shen

203A. Advanced Economic Theory. (4) II.

Seminar—4 hours. Prerequisite: course 200C. Advanced topics in the theory of the firm; distribution theory; welfare economics.

Mr. Wegge

203B. Advanced Economic Theory. (4) I.

Seminar—4 hours. Prerequisite: courses 200C and 200E. General equilibrium theory; capital theory; growth theory. Mr. Lenard

207. Special Topics in Mathematical Economics. (4) III.

Seminar—3 hours. Prerequisite: courses 203A and 203B or consent of instructor. Advanced topics in mathematical economics. Contents may vary from one year to another. Mr. Cornwall

210A. Economic History. (4) I.

Seminar—3 hours. Method and theory of economic history. Critical analysis of the methodology of economic history and theories of economic change as illustrated by major economic phenomena drawn from the history of different countries. Mr. Tuma

210B. Economic History. (3) II.

Lecture-discussion—3 hours. Problems in economic history of the eastern hemisphere from the beginning of the Middle Ages up to the end of the eighteenth century; emphasis on Europe. Mr. Tuma

***210C. Economic History. (3) II.**

Lecture-discussion—3 hours. Problems in economic history of the eastern hemisphere since the eighteenth century; emphasis on England, France, and Germany. Mr. Olmstead

210D. Economic History. (3) III.

Lecture-discussion—3 hours. Problems in economic history of the western hemisphere since the eighteenth century; emphasis on United States. Mr. Olmstead

215A-215B. Economic Development. (4-4) I-II.

Lecture—3 hours; to be arranged—1 hour. Theories of economic development, policies for growth, problems from selected areas.

Mr. Glassburner, Mr. Gustafson

215C. Development Programming. (4) III.

Seminar—4 hours. Prerequisite: courses 200B, 200E, 215B; consent of instructor. Analysis of development plans, programs, and policies; application of input-output, programming, and operations research methods to development planning. Mr. Kaneda

216. Economic Systems. (4) II.

Lecture—4 hours. Comparative study of economic systems, with reference to their organization and institutions, their values and goals, and their economic performance. Mr. Brzeski

217. Economics of Planning. (4) III.

Lecture—4 hours. Theories and principles of economic planning under various economic systems. Mr. Brzeski

***221A. Industrial Organization. (4) I.**

Lecture—3 hours; to be arranged—1 hour. Analysis of market structure, business behavior, and economic performance under conditions of limited governmental interference. Mr. Goldberg

***221B. Industrial Organization. (4) II.**

Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 221A. Social standards and public policies toward the business sector of the economy. Mr. Goldberg

225. Urban Economics. (4) III.

Lecture-discussion—4 hours. Prerequisite: course 200A. Application of economic theory and quantitative methods to the urban economy: structure, growth, and problems. Mr. Moss

230. Public Finance. (4) I.

Lecture—3 hours; to be arranged—1 hour. Role of the public sector; tax and expenditure theories; related topics. Mr. Roumasset

231. Problems of the Public Sector. (4) II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 230. Public sector institutions, problems, and policies. Mr. Roumasset

235A-235B-235C. Monetary Economics. (3-3-3)**I-II-III.**

Lecture—3 hours. Monetary theory, policy, and problems. Mr. Mayer

240A. Econometric Methods. (4) III.

Lecture—4 hours; term paper. Prerequisite: Mathematics 130B and course in linear algebra. Statistical models and their use in estimation of economic relationships; single and multiple equation systems. (Same course as Agricultural Economics 210.) Mr. Roumasset

240B. Advanced Econometrics: Theory. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A; Mathematics 131A, 131B-131C recommended. Multivariate analysis, specification analysis, simultaneous equation models, identification, estimating methods, small sample properties. (Same course as Agricultural Economics 211.) Mr. Wegge

240C. Advanced Econometrics: Applications. (3) II.

Lecture—3 hours. Prerequisite: course 240A. Time series analysis and distributed lags, pooling of time series and cross-section data, Bayesian analysis, applications for prediction and policy. (Same course as Agricultural Economics 212.) Mr. Rausser

250A. Labor Economics. (4) II.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 150 and 151. Philosophy and theory of the labor movement; union structure and organization under changing labor market conditions; labor market issues.

Mr. Oettinger

250B. Labor Economics. (4) III.

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 150 and 151. Theory of the labor market; analysis of wage-employment, wage-investment, and wage-price relationships.

Mr. Vencill

260A. International Economics. (4) I.

Lecture—3 hours; to be arranged—1 hour. Economic structure and factors that underlie

NOTE: For key to footnote symbols, see page 191.

international trade; policies for regulating external trade.
Mr. Wegge

260B. International Economics. (4) II.

Lecture—3 hours; to be arranged—1 hour. Significance of international transactions for the national income; international monetary mechanisms.
Mr. Child

260C. International Economics. (4) III.

Seminar—4 hours. Prerequisite: courses 200C, 200E, 240A, and 260A. Survey of current literature in International Trade theory.
Mr. Wegge

298. Group Study. (1-5) I, II, III.

Discussion—1-5 hours. Prerequisite: graduate standing and consent of instructor. (S/U grading only.) The Staff (Chairman in charge)

299. Individual Study. (1-6) I, II, III.

Prerequisite: consent of instructor and graduate standing. (S/U grading only.)
The Staff (Chairman in charge)

299D. Dissertation Research. (1-6) I, II, III.

(S/U grading only.) The Staff

EDUCATION

Julius M. Sassenrath, Ph.D., *Chairman of the Department*

Douglas L. Minnis, Ed.D., *Head of Teacher Education*

Department Office, 174 Academic Office Building III

Professors:

Donald G. Arnstine, Ph.D.
Hugh C. Black, Ph.D.
Julius M. Sassenrath, Ph.D.

Associate Professors:

Leroy F. Troutner, Ph.D.
George D. Yonge, Ph.D.

Assistant Professors:

Vincent A. Crockenberg, Ph.D.
Linnea C. Ehri, Ph.D.
D. Steven Lynch, Ph.D.
Carlton J. Spring, Jr., Ph.D.

*Lecturers in and Supervisors of
Teacher Education:*

Helen G. Bacon, Ed.D.
W. Augustus Davis, M.Ed.
Larry D. Estes, M.A.
Jane Garritson, M.A.
Maryann E. Gatheral, B.A.
Robert E. Hapworth, M.A.
Burt Liebert, M.F.A.
Jack E. Lowry, M.A.T.
Walter T. Mara, M.S.
Douglas L. Minnis, Ed.D.
Susan A. Ostergard, M.A.
Victor A. Perkes, Ed.D.
S. Joan Skinner, M.A.
David R. Wampler, Ph.D.



Credentials Counselors:

Elementary.—Mrs. Bacon, Mrs. Garritson, Mrs. Gatheral, Mr. Hapworth, Mrs. Ostergard, Mrs. Skinner, Mr. Wampler.

Secondary.—Mr. Davis, Mr. Estes, Mr. Liebert, Mr. Lowry, Mr. Mara, Mr. Perkes.

Junior College.—Mr. Mara.

Curricula for Teacher Education.—(See page 187.) For a statement of complete requirements and appointments with credential counselors, apply to the departmental office. Applicants for the credential program should consult the department early in the fall quarter of the senior year.

Required courses in the "Professional Preparation" part of the requirements:

For Secondary Teaching: courses 110, 120, 320A, 320C, and 320E.

For Elementary Teaching: courses 110, 120, 300, 302, 303, 330A, 330C, and 330E.

Upper Division Courses

100. Field Experience in Education. (2) I, II, III.

Discussion—1 hour; laboratory—3 hours (in schools and care centers). Prerequisite: upper division standing. Course designed to provide faculty assistance to students who work as tutors or teachers aides. Limited to 30 students per section. May be repeated only once for credit. (P/NP grading only.) The Staff

110. Introduction to Educational Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: upper division or graduate standing; Psychology 1A, 1C, or 10. The learning process; physical, mental, and social development; individual differences and their measurement; mental hygiene; the role of the teacher in guidance and counseling.

Mrs. Ehri, Messrs. Lynch, Sassenrath, Spring, Yonge

114. Quantitative Methods in Educational Research. (4) I.

Lecture—2 hours; discussion—2 hours. Prerequisite: two years of high school algebra. Problems and methods in data analysis. Design of research projects. Emphasis will be on procedures suited to digital computers. Mr. Yonge

117. The Psychology of Reading Disability. (3) III.

Lecture—1 hour; discussion—2 hours. Prerequisite: Psychology 1A or equivalent; upper division or graduate standing. Cognitive and motivational processes involved in the acquisition of reading ability. Processes which may be impaired in the slow reader will be identified. Mr. Spring

119. Tests and Measurements. (4) II.

Lecture—4 hours. Prerequisite: course 110 (may be taken concurrently). A critical survey of teacher-made and standardized tests; principles and functions of measurement in education, current practices in school marks; supervised work in test administration, scoring and interpretation. Mr. Yonge

120. Philosophical and Social Foundations of Education. (4) I, II, III.

Lecture—4 hours. Prerequisite: upper division or graduate standing. Philosophical, historical, and sociological study of education and the school in our society. Messrs. Arnstine, Black, Crockenberg, Troutner

121. The Romantic Critics of Education. (4) III.

Lecture—2 hours; discussion—2 hours. Critical philosophic examination of the concept of the free school and of the assumptions about the educative process and prescriptions for educational reform of such writers as Rousseau, Tolstoy, Dewey, Neill, Goodman, Holt, Kohl, Denison, Leonard, and others. Mr. Crockenberg

15DA. Educating and Tutoring Minority Children and Youth. (2) I.

Lecture—1 hour; laboratory—3 hours. Poverty as it affects a person's performance in the school with emphasis on how to deal with it in the school and community. Mr. Davis, Mr. Liebert

150B. Educating and Tutoring Minority Children and Youth. (2) II.

Lecture—1 hour; laboratory—3 hours. Racism as it affects a person's performance in the school with emphasis on how to deal with it in the school and community. Mr. Davis, Mr. Liebert

150C. Educating and Tutoring Minority Children and Youth. (2) III.

Lecture—1 hour; laboratory—3 hours. Youth cultures as they affect a person's performance

in the school with emphasis on how to deal with them in the school and community.

Mr. Davis, Mr. Liebert

151. Language Problems of the Mexican-American Child. (4) II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: upper division standing. Problems of phonology, syntax, and lexicon encountered by the Mexican-American child in English-speaking public school systems.

163. Guidance and Counseling. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 110 (may be taken concurrently). Nature and scope of pupil personnel services; basic tools and techniques of guidance; theory and practice of counseling psychology, with emphasis on educational and vocational adjustment. Mr. Lynch

164. Practicum in Counseling. (2) I, II, III.

Seminar—1 hour; laboratory—5 hours. Prerequisite: course 163 and consent of instructor. Seminar and supervised practice in counseling youth and adults. May be repeated twice for credit. (P/NP grading only.) Mr. Lynch

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Chairman in charge)

Graduate Courses

201. History and Philosophy of Education: Ancient Period. (4) I.

Lecture—2 hours; seminar—2 hours. Scope, influence, and significance of the major educational ideas from selected ancient societies and cultures with emphasis upon the historical and philosophical contexts. Mr. Black

202. History and Philosophy of Education: Middle Period. (4) II.

Lecture—2 hours; seminar—2 hours. Scope, influence, and significance of the major educational ideas from selected societies and cultures of the middle period (through the eighteenth century) with emphasis upon the historical and philosophical contexts. Mr. Arnstine, Mr. Black

203. Twentieth Century Issues Over the Schools. (4) III.

Lecture—2 hours; discussion—2 hours. A study of John Dewey and contrasting theories of education in relation to controversies over the aims, organization, curriculum, and instructional practices in schools. Mr. Black, Mr. Crockenberg

NOTE: For key to footnote symbols, see page 191.

204. Existential Thought and Education. (4) II.

Lecture—1 hour; discussion—1 hour; seminar—2 hours. A study and critical analysis of the implications of existential thought for education. Mr. Troutner

205. The Concept of Mind in Teaching. (4) I.

Seminar—4 hours. A philosophical analysis of the problems of educational practice which are created, aggravated, and sometimes solved by varying conceptualizations of mind and thinking. Mr. Arnstine

210. Learning and Instruction. (4) II.

Seminar—4 hours. Prerequisite: consent of instructor. A critical consideration of selected problems and procedures in the study of learning and instruction. Mr. Sassenrath, Mr. Spring

211. Thinking and Problem Solving. (4) I.

Seminar—4 hours. Prerequisite: consent of instructor. Critical consideration of thinking with special reference to conceptual behavior, problem solving, creativity, home, school, and personality influences. Mr. Yonge

212. Language and Intellectual Development. (4) II.

Seminar—4 hours. Prerequisite: consent of instructor. Theory and research on the development of language and thought in children; emergence of grammatical semantic systems and operational thought; implications for education. Mrs. Ehri

219. Human Differences and Educational Evaluation. (4) III.

Seminar—4 hours. Prerequisite: consent of instructor. Critical study of individual and group differences in ability and personality as related to educational evaluation and measurement. Mr. Sassenrath

263. Counseling Theories and Psychotherapy. (4) III.

Seminar—4 hours. Prerequisite: course 163 or equivalent; Psychology 165, 168; and consent of instructor. Theory and research in psychotherapy and counseling systems. The major psychotherapeutic systems (psycho-analytic, behaviorist, client-centered, gestalt, etc.) will be examined with special attention given to the processes of change. Mr. Lynch

270. Issues in English and Reading Instruction. (4) I.

Seminar—3 hours; laboratory—3 hours. Prerequisite: consent of instructor. Analysis and evaluation of instructional materials in reading, literature, composition, vocabulary development, spelling, and linguistics as elements of human communication. Mrs. Bacon

271. Recent Developments in Social Studies Education. (4) II.

Seminar—3 hours; laboratory—2 hours. Prerequisite: consent of instructor. An analysis of the rationales, goals and objectives assumptions about learning and teaching strategies, and evaluation techniques in selected social studies curriculum projects. Mr. Wampler

272. Recent Developments in Science Education. (4) III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: consent of instructor. Analysis of contemporary science programs with special emphasis upon philosophical, psychological, and pedagogical attributes of their design; trends, issues, and research in science curriculum and instruction. Mr. Perkes

273. Modern Mathematics Curricula. (4) III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: consent of instructor. Survey of modern mathematics curricula; analyzing goals, defining objectives, and structuring content of a mathematics program; design and use of manipulative materials and media to promote mathematical insight and discovery; evaluating curriculum effectiveness. Mr. Mara

274. Analysis of Teacher Behavior. (2) II.

Seminar—2 hours. Prerequisite: courses 330A or 320A; and consent of instructor. Study of major systems used to describe classroom behavior of pupils and teachers. Design of new systems to describe behavior in special classroom situations. Use of descriptive systems in developing teaching strategies. Mr. Minnis

290. Seminar. (3) I, II, III.

Seminar—3 hours.

The Staff (Chairman in charge)

299. Research. (1-6) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

Professional Courses***300. Reading and Language Arts in the Elementary School. (4) I, II, III.**

Lecture—3 hours; laboratory—2 hours. Prerequisite: consent of instructor. Principles, procedures and curriculum materials for the teaching of reading and the oral and written language arts. Includes phonics and other developmental reading skills.

Mrs. Bacon, Mrs. Gatheral, Mrs. Skinner

* Open only to interns and student teachers. These 300 series courses are scheduled as extra-session courses, to begin with the opening of the public schools and to end with the closing of the second semester in the public schools. Thus teaching assignments in the fall quarter, 1973, will begin on or about September 2. For the spring quarter, they will end on or about June 2. Students should make arrangements accordingly.

°301. Reading in the Secondary School. (4) I, II, III.

Discussion—4 hours. Prerequisite: must be taken with courses 320C and 320E. Principles, procedures, and materials to help secondary teachers improve the reading competence of high school students. Mr. Liebert

°302. Elementary School Curriculum: Social Studies. (2) I, II, III.

Lecture—2 hours. Current conceptions of the elementary school curriculum, with emphasis on the contributions from the social sciences and on effective teaching methods.

Mr. Minnis, Mr. Wampler

°303. Elementary School Curriculum: Science. (2) I, II, III.

Lecture—2 hours. Current conceptions of the elementary school curriculum with emphasis on the role of science and on effective teaching methods. Mr. Hapworth, Mrs. Ostergard

°309. Early Childhood and Kindergarten Education. (2) I.

Lecture—2 hours. Prerequisite: consent of instructor. Methods, materials, and history of nursery school and kindergarten education.

Mrs. Skinner

°313. Middle Grade School Curriculum: Science and Social Science. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor. Current conception of middle grade school curriculum and effective teaching in science and social science. Mr. Perkes, Mr. Estes

°°320A. Introduction to Teaching in Secondary Schools. (3) I, II, III.

Lecture—2 hours; laboratory—3 hours. Lectures, conferences, and laboratory work; observation of and participation in classroom activities in the public elementary schools and University experimental classroom. The Staff

°°320C. Supervised Teaching in Secondary Schools. (4-12) I, II, III.

Laboratory—4-12 hours. Prerequisite: course 320A; course 320E (must be taken concurrently). Directed teaching for candidates for the secondary credential. (S/U grading only.)

The Staff

⁸ Students must make their own transportation arrangements for observations and student teaching.

⁹ Open only to interns and student teachers. These 300 series courses are scheduled as extra-session courses, to begin with the opening of the public schools and to end with the closing of the second semester in the public schools. Thus teaching assignments in the fall quarter, 1973, will begin on or about September 2. For the spring quarter, they will end on or about June 2. Students should make arrangements accordingly.

°320E. Methods of Teaching in Secondary Schools. (2-3) I, II, III.

Seminar—3 hours. Prerequisite: course 320A; course 320C (must be taken concurrently). Methods of teaching in the secondary school: selection, organization, and evaluation of teaching materials including the use of audio-visual aids and the services of counseling and guidance programs. May be repeated for credit up to a total of 8 units. The Staff

°322. Methods in Secondary Social Studies. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: acceptance into credential program with a social science major or minor. Recent developments in secondary social studies teaching strategies and curriculum materials with an emphasis on inquiry approaches. Mr. Lowry

°323. Secondary School Curriculum: Science. (3) I.

Lecture—2 hours; laboratory—3 hours. Conceptions of science curriculum and instruction. Scientific knowledge and methods as applied to course design and teaching; rationale and objectives of science programs; laboratory as an environment for learning. Lecture, laboratory, observation, and participation in public schools. Mr. Perkes

°°330A. Introduction to Teaching in Elementary Schools. (3) I, II, III.

Lecture—2 hours; laboratory—3 hours. Lectures, conferences, and laboratory work; observation of and participation in classroom activities in the public elementary schools and the University experimental classroom. The Staff

°°330C. Supervised Teaching in Elementary Schools. (2-12) I, II, III.

Laboratory—2-12 hours. Prerequisite: course 330E (must be taken concurrently). Directed teaching for candidates for the elementary credential. May only be taken for credit for a total of 12 units. (S/U grading only.) The Staff

°330E. Methods of Teaching in Elementary Schools. (1-3) I, II, III.

Lecture—1-3 hours. Prerequisite: course 330C (must be taken concurrently). Selection, organization, and evaluation of teaching materials including audio-visual aids. May be repeated for credit up to a total of 6 units. The Staff

°°340. Supervised Teaching in Junior Colleges. (5) I, II, III.

Discussion—1 hour; supervised teaching—minimum 45 clock hours. Prerequisite: consent of instructor. Directed teaching for candidates for the standard teaching credential with specialization in junior college teaching. (S/U grading only.) Mr. Mara

NOTE: For key to footnote symbols, see page 191.

ENGINEERING

John D. Kemper, Ph.D., *Dean of the College*
 Roy Bainer, M.S., LL.D., *Dean of the College, Emeritus*
 Don O. Brush, Ph.D., *Associate Dean—Undergraduate Study*
 Warren H. Giedt, Ph.D., *Associate Dean—Graduate Study*
 Ray B. Krone, Ph.D., *Associate Dean—Research*

College Office, 2132 Bainer Hall

Associate Professors:

John R. Beljan, M.D. (*School of Medicine*)
 G. Worden Waring, Ph.D. (*School of Medicine*)



Lower Division Courses

1. Plane Surveying. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: plane trigonometry. Not open to students in Engineering. Principles of measurement of horizontal distances, horizontal angles, elevations and leveling, including stadia methods. Field problems, including mapping with special reference to agricultural and landscaping applications. Mr. Goss

3. Introduction to Engineering Systems. (3) I, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 21A recommended (may be taken concurrently). An introduction to the profession of engineering and to the role of the engineer as a responsible agent for the planning and shaping of the human environment. (P/NP grading only.) Mr. Hutchinson

4. Engineering Graphics in Design. (3) I, II.

Lecture—2 hours; laboratory—3 hours. Principles of descriptive geometry and of mechanical and free-hand drawing; their application in the representation, visualization, and solution of engineering problems. Computer aided graphics. Introduction to engineering design. Mr. Brandt

5A. Engineering Applications of Computers.

(3) II, III.

Lecture—2 hours; discussion—1 hour. Prerequisite: Mathematics 21B (may be taken concurrently); Physics 4A (may be taken concurrently); not open for credit to students who have completed Mathematics 29. Introduction to digital computer structure, computer languages, and time sharing systems; programming digital computers with applications to engineering problems of both numerical and non-numerical natures. Mr. Loomis, Mr. Kozdrowicki

10. Technology and Society. (3) II.

Lecture—2 hours; discussion—1 hour. Types of technology: communication, computation, defense technology, information development, and transportation. World energy resources and so-

ciety's energy needs. Effects of technology on society: population control, personality development, technology and the economy. (P/NP grading only.) Mr. Dorf, Mr. Schroeder

17. Circuits. (3) I, II, III.

Lecture—3 hours. Prerequisite: Mathematics 22B (may be taken concurrently); Physics 4C. Basic circuit analysis techniques; transient and steady-state solutions using differential equations. Mr. LaPatra, Mr. Owen

35. Statics. (3) I, II, III.

Lecture—3 hours. Prerequisite: Mathematics 21C; Physics 4A. Force systems and equilibrium conditions with emphasis on engineering problems. The Staff (Mr. Larock in charge)

45. Properties of Materials. (4) I, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: sophomore standing in engineering. Introductory course on the properties of engineering materials and their relation to the internal structure of the materials. Mr. Mukherjee, Mr. Munir

92. Internship in Engineering. (1-5) I, II, III.

Work-learn experience. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work-study experience in engineering. May be repeated for credit. (P/NP grading only.) The Staff (Mr. Brush in charge)

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. The Staff (Mr. Brush in charge)

Upper Division Courses

100. Electronic Circuits and Systems. (4) I, II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 17. Introduction to the theory and application of analog and digital circuits and systems. Mr. Mitra, Mr. Hatfield

102A. Dynamics. (3) I, II.

Lecture—3 hours. Prerequisite: course 35; Mathematics 22B, 22C. Kinematics and kinetics of particles, of systems of particles, and of rigid bodies applied to engineering problems. Mr. J. M. Henderson

102B. Dynamics. (3) II, III.

Lecture—3 hours. Prerequisite: course 102A. Topics in rigid body dynamics; elementary dynamics of vibrating systems; introduction to energy methods. Mr. J. M. Henderson

103A. Elementary Fluid Mechanics. (3) I, II.

Lecture—3 hours. Prerequisite: course 102A (may be taken concurrently). Fluid properties; fluid statics; continuity and linear momentum equations for control volumes; flow of incompressible fluids in pipes; dimensional analysis; laminar, transition, and turbulent flow regimes. Mr. Dwyer

103B. Elementary Fluid Mechanics. (3) II, III.

Lecture—3 hours. Prerequisite: course 103A. Potential flow; open channel flow; boundary layer flow; one dimensional compressible flow. Mr. Dwyer

104A. Mechanics of Materials. (3) I, II.

Lecture—3 hours. Prerequisite: course 35; Mathematics 22B, 22C (may be taken concurrently). Concepts of stress, strain, elasticity; stress and deformation analysis for axially loaded members, torsion of round shafts, bending, deflection, and shear of beams; combined stresses. The Staff (Mr. Herrmann in charge)

104B. Mechanics of Materials. (3) II, III.

Lecture—3 hours. Prerequisite: course 104A. Beams: unsymmetrical loading, shear center, indeterminate problems, inelastic bending, buckling and lateral instability. Energy methods; failure theories; torsion of thin-walled sections. The Staff (Mr. Herrmann in charge)

104C. Mechanics of Materials. (3) III.

Lecture—3 hours. Prerequisite: course 104B. Selected topics including curved machine components and arches; membrane stresses in shells; rotating disks and shafts; pressure effects on thick-walled cylinders and bending of thin-walled cylinders, including an introduction to plate bending. Students who have had course 183 may not receive credit for this course. Mr. Hutchinson

105A. Thermodynamics. (3) I, II.

Lecture—3 hours. Prerequisite: Mathematics 22B, 22C. Equations of state and thermodynamics of one-component systems; first and second laws; phase equilibria. Mr. Giedt

105B. Thermodynamics. (3) II.

Lecture—3 hours. Prerequisite: course 105A. Gas mixtures; work-producing and work-absorbing cycles (vapor and gas); measures of performance. Recent developments. Mr. Giedt

106. Engineering Economics. (3) II.

Lecture—3 hours. Prerequisite: upper division standing in engineering. The analysis of

problems in engineering economy; the selection of alternatives; replacement decisions. Compounding, tax, origins and cost of capital, economic life, and risk and uncertainty are applied to methods of selecting most economic alternatives. Mr. Garrett

110. Introduction to Engineering Principles. (3) I.

Lecture—3 hours. Prerequisite: open to all students not enrolled in the College of Engineering. Introduction to engineering principles and techniques for nonengineering students. Mr. J. M. Henderson

115. Systems Diagnosis and Modeling. (3) I.

Lecture—3 hours. Prerequisite: upper division standing. The systems approach to complex problem definition. Analysis optimization and simulation techniques. Implementation of results. Micro and macro modeling. Application areas studied as projects may include social processes, economics, urban problems, justice systems, and others. Mr. LaPatra

122. Introduction to Mechanical Vibrations. (3) I.

Lecture—3 hours. Prerequisite: course 102B. Free and forced vibrations in lumped-parameter systems with and without damping; vibrations in coupled systems; electromechanical analogs; use of energy conservation principles. Mr. Beadle

130. Solid-State Thermodynamics. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: senior standing in Engineering, or consent of instructor. The thermodynamics of the solid state, relation between thermodynamic and physical properties, free energy of heterogeneous reactions, quasichemical approach to solutions, free energy of binary systems and thermodynamics of interfaces. Mr. Mukherjee

140. Materials in Engineering Design. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: senior standing in Engineering, or consent of instructor. Descriptive treatment of common engineering materials. Mechanical properties of typical materials including metals, woods, cements, polymers and glasses. Principles of heat treatment and fabrication as they affect design parameters, and applications in engineering will be emphasized. Mr. Munir

142. Principles of Nondestructive Testing. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Basic principles of nondestructive testing using radiological, ultrasonic, electrical, magnetic, penetrant methods, etc. Typical results expected from these tests and their application in material characterization, flow detection, crystallographic

information, chemical inhomogeneity, residual stress analysis, etc., are emphasized.

Mr. Mukherjee

145. Recycling of materials. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 45 and 105A, or consent of instructor. Discussion and analysis of the recycling of metallic, ceramic, and polymeric materials from an energy and material conservation point of view. Case studies emphasizing energy limitations and technical feasibilities of the recycling of common solid wastes. Mr. Munir

180. Engineering Analysis. (3) I, III.

Lecture—3 hours. Analysis of steady-state and nonsteady-state problems for discrete and continuous systems; analytic and approximate solutions. Typical engineering problems in heat transfer, fluid mechanics, electrical networks, mechanical vibrations, and elasticity. Mr. McKillop

184. Experimental Stress Analysis. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 104B. Experimental methods for the analysis of stress and strain, including photoelasticity, brittle lacquers, mechanical and electrical strain gages and instrumentation. Mr. Beadle

188. Physical Metallurgy Principles. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 45, 105A or consent of instructor. The physical principles in metallurgy are outlined. The elementary theory of metals, rate of approach to equilibrium, thermal behavior of metals, structure and free energy of alloy phases, diffusion phenomenon and strengthening mechanisms in solids are discussed. Mr. Mukherjee

190. Professional Responsibilities of Engineers.

(3) II, III.

Lecture—2 hours; discussion—1 hour. Organization of the engineering profession; engineering and management; introduction to contracts, specifications, and business law; oral presentations by class members on the interaction between engineering and society. Mr. Beadle

192. Internship in Engineering. (1-5) I, II, III.

Work-learn experience. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work-study experience in engineering. May be repeated for credit. (P/NP grading only.) The Staff (Mr. Brush in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. The Staff (Mr. Brush in charge)

Graduate Courses

290A. Advanced Graduate Study in Systems.

(1) I, II, III.

Seminar—1 hour. Primarily for advanced graduate students. Seminar on current and advanced topics in dynamic systems; oriented towards advanced students. Topics to change each quarter. Messrs. Amorocho, Bell, Karnopp, Mitra

291. Seminar in Teaching. (1) III.

Seminar—1 hour. Discussion of previous experience as a student and actual practice as a teacher. (S/U grading only.) Mr. J. M. Henderson

ENGINEERING: AGRICULTURAL†

John R. Goss, M.S., *Chairman of the Department*
Department Office, 2030 Bainer Hall

Professors:

Norman B. Akesson, M.S. (*Agricultural Engineering*)

Roy Bainer, M.S., LL.D. (*Engineering and Agricultural Engineering, Emeritus*)

William J. Chancellor, Ph.D.

Robert B. Fridley, M.S.

John R. Goss, M.S.

S. Milton Henderson, M.S.

Coby Lorenzen, Jr., M.S. (*Agricultural Engineering, Emeritus*)

Robert A. Kepner, B.S.

Michael O'Brien, Ph.D. (*Agricultural Engineering*)

Loren W. Neubauer, Ph.D. (*Engineering and Agricultural Engineering, Emeritus*)

Wesley E. Yates, M.S. (*Agricultural Engineering*)

Associate Professors:

Roger E. Garrett, Ph.D. (*Agricultural Engineering*)

Stanton R. Morrison, Ph.D. (*Agricultural Engineering*)

Assistant Professors:

Louis D. Albright, Ph.D.

Thomas H. Burkhardt, Ph.D.

† Courses listed here are in the College of Engineering. For further course offerings, see *Agricultural Engineering Technology*, page 198; and *Consumer Technology*, page 246.

Lecturers:

Pictiaw (Paul) Chen, Ph.D.
Henry E. Studer, M.S.

**Lower Division Courses****1. The Agricultural Engineer in Tomorrow's World. (1) II.**

Discussion—2 hours. Exploration of opportunities in Agricultural Engineering as they relate to society, environment, and biological systems, including interdisciplinary approaches. Discussions and demonstrations of agricultural engineering projects illustrating design, development, testing, and evaluation methods. (P/NP grading only.) The Staff (Mr. Goss in charge)

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. The Staff (Mr. Goss in charge)

99. Special Study for Lower Division Students.

(1-5) I, II, III. The Staff (Mr. Goss in charge)

Upper Division Courses**114. Principles of Field Machinery Design. (4) III.**

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 102B. Functional requirements, performance characteristics, basic principles, and design of field machines; use of instrumentation and computer techniques for analysis of specific machines. Mr. Yates

116. Power Units for Agriculture, Industry and Transportation. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 105A. Energy sources and power units for transportation, industry, and agriculture. Operational and performance characteristics of internal combustion engines, electric motors, and alternative power units: fuels, solar energy, human and animal power. Pollution control devices. Mr. Burkhardt

118. Development Engineering. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mechanical Engineering 150. Failure modes: determination of the causes of systems malfunction by analysis of interactions and variations in effects; experiment design; development procedures. Mr. Studer

119. Hydraulic and Pneumatic Systems. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 103A. Design of hydraulic and pneumatic systems for powering, sensing and controlling machine functions. Characteristics of pumps, motors, control valves, fluidic

devices, servo-mechanisms, and hydraulic fluid. Testing of component and system performance. Mr. Studer

125. Agricultural Structures: Environmental Aspects. (3) II.

Lecture—3 hours. Prerequisite: Engineering 105A. Environmental and functional design of agricultural storage and production facilities; plans and systems; ventilating, heating, lighting, insulating; psychrometrics, energy balances, vapor transmission; solar heat loads, sol-air concept; methods of waste management.

Mr. Albright

126. Agricultural Structures: Construction Aspects. (4) III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: Engineering 104B. Agricultural building loads and codes; design with steel, concrete, and timber; beams and columns; grain bins and silos; trusses and arches; connections; sandwich and stressed-skin panels; computer aided design. Offered in odd-numbered years. Mr. Neubauer

132. Unit Operations in Agricultural Processing. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103A and 105A. Thermodynamics and mass transfer principles applied to such processes as drying, dehydration, refrigeration, size reduction, separation, and materials handling. Mr. Henderson

141. Engineering Properties of Agricultural Materials. (3) I.

Lecture—2 hours; laboratory—3 hours. Selected topics, with emphasis on mechanical and rheological properties and design applications. Techniques for measuring and recording static and dynamic properties. Mr. Chen

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Goss in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III. The Staff (Mr. Goss in charge)

Graduate Courses**215. Soil-Machine Relations in Tillage and Traction. (3) I.**

Lecture—3 hours. Prerequisite: courses 114 and 116; Civil Engineering 171 and Soil and Water Science 101 recommended. Mechanics of interactions between agricultural soils and tillage and traction devices; determination of relevant physical properties of soil; analyses of stresses and strains in soil due to machine-

applied loads; experimental and analytical methods for synthesizing characteristics of overall systems.
Mr. Chancellor

225. Advanced Agricultural Structures Design. (3) II.

Lecture—3 hours. Prerequisite: course 126. Recommended: Civil Engineering 132B and 132C. Critical evaluation of codes as applied to agricultural structures; safe design criteria, load sharing, and statistical reliability concepts; computer analysis of indeterminate wood structures; stressed skin construction; ultimate strength design in reinforced concrete; applications of new materials and methods. To be given if sufficient number of students enroll.

Mr. Neubauer

235. Advanced Unit Operations in Agricultural Processing. (3) III.

Lecture—3 hours. Prerequisite: course 132 or equivalent. Basic engineering procedures applicable to agricultural processing; e.g., size reduction, fluidization of granular particles, heat, and mass transfer applications to drying and freezing, respiration of biomaterials.

Mr. Henderson

245. Agricultural Waste Management. (3) III.

Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor. Animal, crop and food processing wastes; pesticides, fertilizers, odors, dust and smoke in relation to environmental pollution. Disposal needs, present and future. Regulation, economics and pub-

lic concern; coordination with municipal and industrial wastes management. Mr. Akesson

255. Environmental Engineering in Agriculture. (3) III.

Lecture—3 hours. Prerequisite: Mechanical Engineering 186. The description, methods of measurement and effect on man, animals and plants of physical environmental factors, and the design of systems for their control.

Mr. Morrison

265. Design and Analysis of Engineering Experiments. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: at least one undergraduate course in statistics or consent of instructor. Design, management, and analysis of engineering experiments with emphasis on criteria for the selection and utilization of statistical methods. Problems necessitating the use of campus and departmental computing facilities will be assigned.

Mr. Burkhardt

290. Seminar. (1) I, III.

Seminar—1 hour. (S/U grading only.)

The Staff (Mr. Fridley in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Henderson in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Mr. Henderson in charge)

ENGINEERING: APPLIED SCIENCE

Harold P. Smith, Jr., Ph.D., *Chairman of the Department*

Frederick O. Wooten, Ph.D., *Vice-Chairman of the Department*

Department Office, 228 Walker Hall

Professors:

Henry H. Barschall, Ph.D. (*Visiting*)

Stewart D. Bloom, Ph.D.

Richard J. Borg, Ph.D.

John Killeen, Ph.D.

Richard F. Post, Ph.D. (*In Residence*)

Harold P. Smith, Jr., Ph.D.

Edward Teller, Ph.D. (*Professor at Large*)

Frederick O. Wooten, Ph.D.

Associate Professors:

Carl A. Jensen, Ph.D.

Wilson K. Talley, Ph.D.

Yin Yeh, Ph.D. (*Acting*)

Assistant Professor:

John S. DeGroot, Ph.D.

Lecturers:

Berni J. Alder, Ph.D.

Sidney S. Fernbach, Ph.D.

Robert A. Fisher, Ph.D.

Joseph A. Fleck, Ph.D.

John G. Fletcher, Ph.D.

John C. Garrison, Ph.D.

Michael W. Guinan, Ph.D.

Laurence S. Hall, Ph.D.

Robert J. Harrach, Ph.D.

William G. Hoover, Ph.D.

Tony Huen, Ph.D.

Montgomery H. Johnson, Ph.D.

Roger N. Keeler, Ph.D.

Gilbert Leppelmeier, Ph.D.

Hans M. Mark, Ph.D.

Kenneth D. Marx, Ph.D.

Michael M. May, Ph.D.

William A. Newcomb, Ph.D.

Jacques B. J. Read, Ph.D.

Charles K. Rhodes, Ph.D.

Harry L. Sahlin, Ph.D.

Michael Schwab, Ph.D.

Richard N. Stuart, Ph.D.
 C. Bruce Tarter, Ph.D.
 John J. Walton, Ph.D.
 Daniel W. Wilson, Ph.D.
 Mary E. Zosel, Ph.D.



Davis

Upper Division Courses

115. Introduction to Numerical Methods for Computers. (3) I, II, III.

Lecture—3 hours. Prerequisite: Engineering 5A, Mathematics 22C. Lectures and laboratory work on electronic computers and their application to engineering problems. The Staff

116. Application of Computers to Physical Problems. (3) III.

Lecture—3 hours. Prerequisite: course 115. Application of computers to the solution of physical problems. Boundary value and eigenvalue problems; partial differential equations and data approximation. Mr. DeGroot

135A. Introductory Nuclear Science and Technology. (3) I.

Lecture—3 hours. Prerequisite: Physics 121 or equivalent. Introductory aspects of nuclear phenomena, nuclear masses, size energy, and decay modes. Interaction of particles and electromagnetic radiation with matter. Instrumentation and theory of measurements; neutron technology. Nuclear chemistry.

Mr. Bloom, Mr. Barschall

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.
 The Staff (Chairman in charge)

Graduate Courses

210A-210B-210C. Advanced Methods of Computational Physics. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 205C. Numerical solution of partial differential equations. Difference methods for initial and boundary value problems. Problems in gas dynamics, neutron transport, meteorology, magnetohydrodynamics, plasma physics. Computer simulation of plasma and many-body problems. Mr. Marx

230A-230B-230C. Structure of Matter. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 205C. Classical properties of matter; introduction of quantum mechanics by the correspondence principle; perturbation theory; electron theory of atoms, molecules and solids; quantum theory of cooperative effects. Mr. Yeh

234A-234B-234C. Electromagnetic Theory. (3-3-3) II-III-I.

Lecture—3 hours. Prerequisite: Electrical Engineering 131B and Mathematics 101. Review basic electromagnetic field theory. Special relativity. Charges in fields. Radiation from charges: generation, scattering, diffraction. Electrodynamics of continuous media: conductors, dielectrics, superconductors, magnetic materials, plasmas. Transmission of electromagnetic waves through material. Modern applications of theory. Mr. May

246. Nuclear Explosives: Phenomenology. (3) II.

Lecture—3 hours. Prerequisite: Mathematics 220A. The phenomenology of nuclear explosives; the theoretical and empirical laws for such effects; the scientific uses of such phenomena. Offered in odd-numbered years. The Staff

260A-260B-260C. Statistical Mechanics of Equilibrium and Transport Phenomena. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: Physics 121; Mathematics 118A. Statistical formulation of thermodynamics and transport phenomena. Computer calculation and simulation of many-body systems. Mr. Hoover

280A-280B-280C. Plasma Kinetic Theory with Applications. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: Electrical Engineering 240. Thermal equilibrium; plasma kinetic equations; linear Vlasov theory-Landau damping and beam plasma interactions; Non-linear Vlasov theory—Quasi-linear effects, plasma turbulence and shocks; plasma sources and instabilities in controlled fusion. Mr. DeGroot

290. Seminar. (1-2) I, II, III.

Seminar—1-2 hours. (S/U grading only.)
 The Staff (Chairman in charge)

298. Group Study. (1-3) I, II, III.

Lecture—1-3 hours. Such topics as neutron physics, nuclear technology, advanced hydrodynamics, plasma physics, or advanced mathematics. The Staff (Chairman in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)
 The Staff (Chairman in charge)

Livermore

Upper Division Courses

105. Special Topics in Applied Science. (2) I.

Lecture—2 hours. Use of laws and concepts covered in undergraduate curricula in applied science. The variety of subjects covered will include problems of space physics, a discussion

of gravity and capillary waves, and some problems in optics such as lasers. Mr. Teller

115. Introduction to Numerical Methods for Computers. (3) I.

Lecture—3 hours. Prerequisite: Engineering 5A, Mathematics 22C. Lectures and laboratory work on electronic computers and their application to engineering problems. Mr. Stuart

121A. Chemical Physics. (3) I.

Lecture—3 hours. Prerequisite: Chemistry 1C; Mathematics 101. Chemical thermodynamics; first and second laws of thermodynamics with emphasis on fundamentals; equations of state; phase diagrams; chemical equilibrium; phase transitions; partition functions. Mr. Borg

121B. Chemical Physics. (3) II.

Lecture—3 hours. Prerequisite: course 121A. Chemical kinetics including mechanisms of chemical reactions, transition state theory, catalysis, and surface reactions; quantum theory of atoms; atomic spectra; Zeeman and Stark effects; transitions and selection rules; hyperfine interactions; the periodic table. Mr. Borg

121C. Chemical Physics. (3) III.

Lecture—3 hours. Prerequisite: course 121B. Molecular structure; molecular orbital and valence bond theories; molecular spectra; electronic, rotational and vibrational transitions; magnetic effects, Ligand field theory; the chemical bond. Mr. Teller

134. Introduction to Electromagnetic Theory. (3) I.

Lecture—3 hours. Prerequisite: ordinary differential equations and elementary classical mechanics. Electrostatic and magnetostatic properties of materials; electromagnetic waves in vacuum, dielectric media, and at interfaces; radiative effects from moving particles; charged particles in electromagnetic fields. Mr. Bloom

135A. Introductory Nuclear Science and Technology. (3) I.

Lecture—3 hours. Prerequisite: Physics 121 or equivalent. Introductory aspects of nuclear phenomena, nuclear masses, size energy, and decay modes. Interaction of particles and electromagnetic radiation with matter. Instrumentation and theory of measurements; neutron technology. Nuclear chemistry. Mr. Bloom, Mr. Barschall

135B. Introductory Nuclear Science and Technology. (3) II.

Lecture—3 hours. Prerequisite: course 135A or equivalent. Techniques of radiation and particle detection; nuclear instrumentation techniques; pulse height analysis, coincidence measurement; technology of charged particles and neutrons. Mr. Bloom, Mr. Barschall

135C. Introductory Nuclear Science and Technology. (3) III.

Lecture—3 hours. Prerequisite: course 135B or equivalent. Production and uses of radioisotopes in industry, chemical, and biochemical research. Chemistry of radioactivity in the environment. Chemistry and properties of uncommon materials for reactor operation, e.g., zirconium, thorium, and major fission products. Wastes from nuclear power plants. Mr. Read

199. Special Study for Advanced Undergraduates. (1–5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Chairman in charge)

Graduate Courses

201. Computational Algorithms. (3) I.

Lecture—3 hours. Prerequisite: Electrical Engineering 177 or equivalent; consent of instructor. Methods and practice in writing non-numerical or semi-numerical algorithms for computer execution, including recursion, sorting and searching, random numbers. Offered in odd-numbered years. Mr. Fletcher

202. Computer Languages. (3) I.

Lecture—3 hours. Prerequisite: course 201 (may be taken concurrently); Electrical Engineering 176 or equivalent. Survey of several types of computer languages, with an example of each: assembly, macro, numerical, string, list, simulation. Offered in odd-numbered years. The Staff

205A. Mathematical Methods. (3) I.

Lecture—3 hours. Prerequisite: introductory courses in ordinary differential equations, vector analysis, infinite series, and functions of a complex variable. Calculus of finite and infinite dimensional vector spaces; orthonormal functions; linear equations. Applications of these analytical techniques to physical systems. Mr. Killeen

205B. Mathematical Methods. (3) II.

Lecture—3 hours. Prerequisite: course 205A or the equivalent. Differential equations in the complex plane; contour integration; conformal mapping; Fourier and Laplace transforms; calculus of variations; applications of these techniques to physical systems. Mr. Killeen

205C. Mathematical Methods. (3) III.

Lecture—3 hours. Prerequisite: course 205B or equivalent. Eigenvalue problems; solution of linear differential and integral equations by expansions in orthonormal functions; Green's functions; approximation methods; applications to physical systems. Mr. Killeen

207A–207B. Software Systems. (3–3) I–II.

Lecture—3 hours. Prerequisite: course 201 or equivalent. Organization and design of operating systems and computer networks, including

hardware requirements, interfacing, communication, buffering, processes, scheduling, resource control, file structure, and user interaction. The Octopus network as an example. Programming practice provided. Offered in even-numbered years. Mr. Fletcher

210A-210B-210C. Advanced Methods of Computational Physics. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 205C. Numerical solution of partial differential equations. Difference methods for initial and boundary value problems. Problems in gas dynamics, neutron transport, meteorology, magnetohydrodynamics, plasma physics. Computer simulation of plasma and many-body problems. Mr. Marx

211. Computer Mathematics. (3) II.

Lecture—3 hours. Prerequisite: course 115 (may be taken concurrently). Review and survey of mathematical fields fundamental to computer science. Theory of sets, Boolean algebra and propositional calculus, predicate calculus, probability and statistics, mathematical programming, general number system, information theory and coding. Offered in odd-numbered years. Ms. Zosel

212A-212B. Compilers and Interpreters. (3-3) II-III.

Lecture—3 hours. Prerequisite: courses 201 and 211 or equivalent. Theory and practice of designing and writing compilers and interpreters. Offered in even-numbered years. Ms. Zosel

213. Switching Theory. (3) II.

Lecture—3 hours. Prerequisite: course 211. Minimization techniques, switching function realization with electronic circuits, trees, storage devices, and elementary sequential machines. Offered in odd-numbered years. The Staff

214. Computing with Symbolic Expressions. (3) III.

Lecture—3 hours. Prerequisite: courses 201 and 211 or their equivalents. Theory and practice of computing with symbolic expressions. The LISP and SNOBOL programming languages. Writing programs to manipulate symbolic expressions. Algebraic manipulation. Proving the equivalence of algorithms. Survey of symbol manipulation languages. Offered in even-numbered years. Mr. Fletcher

216. Infinite Automata. (3) III.

Lecture—3 hours. Prerequisite: courses 201 and 211 or their equivalents. Ideal computing machines, including Turing machines. Limitations of finite machines; regular sets. Computability and decidability. Godel's proof. Offered in odd-numbered years. Mr. Fletcher

219. Computer Science Applications. (3) III.

Lecture—3 hours. Prerequisite: courses 201 and 211 or their equivalents. The solution of (chiefly non-numerical) problems by computer. One or more such problems will be chosen (based on the interests of instructor and students) from such areas as artificial intelligence, language translation, process control, image analysis, etc. Mr. Fletcher

220. Physical Chemistry of Solids. (3) I-II-III.

Lecture—3 hours. Prerequisite: courses 121C and 260B. Equations of state—heterogeneous equilibria—phase diagrams—two-body potential functions, the Debye model statistical thermodynamics of solid solutions, phase transformations and order—disorder phenomena—surface thermodynamics. Mr. Borg

221. Materials Science. (3) II.

Lecture—3 hours. Prerequisite: course 205C. Facts and theories of crystal defect physics and their application to such problems as the mechanical properties of solids, radiation damage, phase transformations, etc. Covers thermodynamics of point defects, diffusion, elasticity dislocation theory. Mr. Borg

230A-230B-230C. Structure of Matter. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 205C. Classical properties of matter; introduction of quantum mechanics by the correspondence principle; perturbation theory; electron theory of atoms, molecules and solids; quantum theory of cooperative effects. Mr. Sahlin

233A-233B-233C. Theory and Applications of Solid State Physics. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 230C or equivalent. Structure and properties of crystals; theory of dielectrics, metals and alloys; magnetism, superconductivity, and semiconductors. Applications to various solid-state devices. Mr. Schwab, Mr. Fisher

234A-234B-234C. Electromagnetic Theory. (3-3-3) II-III-I.

Lecture—3 hours. Prerequisite: Electrical Engineering 131B and Mathematics 101. Review basic electromagnetic field theory. Special relativity. Charges in fields. Radiation from charges: generation, scattering, diffraction. Electrodynamics of continuous media: conductors, dielectrics, superconductors, magnetic materials, plasmas. Transmission of electromagnetic waves through material. Modern applications of theory. Mr. May

235A-235B. Nuclear Physics. (3-3) II-III.

Lecture—3 hours. Prerequisite: course 230C. Basic properties of nuclei; radioactive decay;

NOTE: For key to footnote symbols, see page 191.

nuclear models; low energy nuclear reactions; neutron physics. Interaction of particles and radiation with matter. Mr. Bloom

236. Theory of Particle Reactions. (3) I.

Lecture—3 hours. Prerequisite: courses 135A, 230C, 234B. General theory of atomic and nuclear reactions; cross-sections for the collision of electrons, photons, and nuclear particles with atoms and/or nuclei. Decay properties by particles emission of unstable atoms or nuclei. Mr. Bloom

237A–237B. Neutron Physics. (3–3) II–III.

Lecture—3 hours. Prerequisite: course 135A. Properties of neutrons, cross-sections and nuclear structure, fast neutrons, neutron resonances, fission process, thermal neutrons, neutron optics, diffraction, applications of neutron diffraction, and optics to studies of the structure of matter. Offered in odd-numbered years. Mr. Mark

239A–239B. Nuclear Chemistry. (3–3) II–III.

Lecture—3 hours. Prerequisite: course 135A. Radiochemistry as an analytical technique in the study of chemical and nuclear processes: activation analysis, fission, properties of the actinides, current theories of the properties of the trans-actinides, radiolysis, "hot atom" chemistry, and mechanisms of biological radiation damage. Offered in even-numbered years. Mr. Read

255. Classical Mechanics. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor. General principles of analytical mechanics; variational principles; Lagrange's and Hamilton's equations; kinematics; collisions. Mr. Newcomb

256. Continuum Mechanics. (3) II.

Lecture—3 hours. Prerequisite: course 205C. Hydrodynamics of incompressible and compressible flows in two and three dimensions; problems of hydrodynamic instability; viscous hydrodynamics; boundary layer theory. Mr. Newcomb

257. Magnetohydrodynamics. (3) III.

Lecture—3 hours. Prerequisite: course 234B. Fundamental MHD equations, MHD waves (both linear and nonlinear), shocks, Lagrangian formulation; theory of stability, gyroscopic effects, finite-resistivity effects. Mr. Newcomb

260A–260B–260C. Statistical Mechanics of Equilibrium and Transport Phenomena. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: Physics 121; Mathematics 118A. Statistical formulation of

thermodynamics and transport phenomena. Computer calculation and simulation of many-body systems. Mr. Hoover

263. Material Properties at High Pressures and Temperatures. (3) III.

Lecture—3 hours. Prerequisite: course 260C. Theory of the properties of matter at extremely high pressure and temperatures. Terrestrial and astrophysical applications. Mr. Keeler

265A–265B–265C. Theory and Applications of Lasers. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 230C or equivalent and 270B or equivalent. Theory of lasers, properties of laser systems, electro-optical devices. Interaction of light with matter, laser spectroscopy, nonlinear optics. Theory of the coherent photon field, Fourier optics, holography, application of lasers in technology. Messrs. Harrach, Rhodes, Fisher

275A–275B–275C. Plasma Physics. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 234C. The basic equations governing the behavior of a fully ionized plasma in a magnetic field; simple plasma configurations in controlled fusion research and space applications. Theory of plasma waves and instabilities. Transport coefficients and radiation phenomena. Mr. Johnson

285A–285B–285C. Advanced Plasma Physics.

(3) I–II–III.

Lecture—3 hours. Prerequisite: course 275C. Plasma kinetic theory; applications of the Fokker-Planck equation; advanced instability theory. Practical problems of plasma production and confinement. Nonlinear and relativistic effects including quasi-linear theory, relativistic beams, synchrotron radiation and laser heating of plasmas. Computer simulation of plasma phenomena. Mr. Post

290. Seminar. (1–2) I, II, III.

Seminar—1–2 hours. (S/U grading only.)
The Staff (Chairman in charge)

298. Group Study. (1–3) I, II, III.

Lecture—1–3 hours. Such topics as computer science, plasma physics, materials science, laser applications, bio-medicine.

The Staff (Chairman in charge)

299. Research. (1–12) I, II, III.

(S/U grading only.)
The Staff (Chairman in charge)

ENGINEERING: CHEMICAL

Richard L. Bell, Ph.D., *Chairman of the Department*

Department Office, 3092 Bainer Hall

Professors:

J. M. Smith, Sc.D.
Stephen Whitaker, Ph.D.

Associate Professor:

Richard L. Bell, Ph.D.

Assistant Professors:

Neil A. Dougharty, Ph.D.
Alan P. Jackman, Ph.D.
Benjamin J. McCoy, Ph.D.

**Lower Division Courses****1. The Scope of Chemical Engineering. (1) II.**

Lecture—1 hour; discussion—1 hour. Demonstrations and discussions of the opportunities in chemical engineering for professional development, contributions to basic knowledge, and service to society. (P/NP grading only.)

The Staff (Chairman in charge)

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. Students may enroll in more than one section. (P/NP grading only.)

The Staff (Mr. Bell in charge)

99. Special Study for Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Mr. Bell in charge)

Upper Division Courses**150A. Chemical Engineering Fluid Mechanics.**

(3) II.

Lecture—3 hours. Prerequisite: Engineering 102A. Fluid statics and one-dimensional laminar flows. Kinematics of point and integral functions. The stress vector-stress tensor relation. Newton's law of viscosity and application of the Navier-Stokes equations to laminar flow and dimensional analysis. Flow of non-Newtonian fluids. Students electing this course may not receive credit for Engineering 103A. Mr. Bell

150B. Chemical Engineering Fluid Mechanics.

(3) III.

Lecture—3 hours. Prerequisite: course 150A. Turbulent flows and time averaging. Application of Bernoulli's equation and the macroscopic mass, momentum, and mechanical energy balances to a variety of practical problems. Introduction to compressible flow. The entropy equation and isentropic processes. Shock waves and choke flow. Students electing this course may not receive credit for Engineering 103B.

Mr. Bell

151. Material and Energy Balances. (3) I.

Lecture—3 hours. Prerequisite: Chemistry 110A (may be taken concurrently). Use of principles of conservation of mass and energy in chemical process calculations. Mr. Whitaker

152A. Chemical Engineering Thermodynamics. (3) II.

Lecture—3 hours. Prerequisite: course 151; Chemistry 110A. Application of principles of thermodynamics to chemical processes.

Mr. Smith

152B. Chemical Engineering Thermodynamics.

(3) III.

Lecture—3 hours. Prerequisite: course 152A. Continuation of course 152A. Mr. Smith

153. Chemical Engineering Heat Transfer. (4) II.

Lecture—4 hours. Prerequisite: course 150A. Steady and transient heat conduction. The thermal energy equation, analysis of forced and free convective heat transfer. Turbulence, macroscopic balances, and heat transfer coefficients. The photon transport equation and radiant energy exchange. The design of heat exchangers.

Mr. McCoy

154A. Mass Transfer. (3) I.

Lecture—3 hours. Prerequisite: course 153 Chemistry 110A. Fundamental concepts of mass transfer in fluids. Problems in pure diffusion and convective mass transfer. Mr. McCoy

154B. Applications of Mass Transfer. (3) II.

Lecture—3 hours. Prerequisite: course 154A. Application of the principles of mass transfer and thermodynamic equilibrium to absorption, extraction, distillation and other separation processes.

Mr. Bell

155A. Chemical Engineering Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: course 154A. Laboratory experiments in heat, mass, and momentum transfer and in chemical kinetics.

Mr. Bell

155B. Chemical Engineering Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: courses 154B and 155A. Continuation of course 155A.

Mr. Bell

156A. Chemical Engineering Kinetics. (3) II.

Lecture—3 hours. Prerequisite: course 152B, 154A; and Chemistry 110C (may be taken concurrently). Chemical kinetics and introduction to homogeneous and heterogeneous reactor design.

Mr. Dougharty

156B. Chemical Engineering Kinetics. (3) III.

Lecture—3 hours. Prerequisite: course 156A. Continuation of course 156A. Mr. Dougharty

NOTE: For key to footnote symbols, see page 191.

157. Chemical Engineering Process Dynamics.

(4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 154B and 156A. A study of stability and the transient state of chemical processing systems. Mr. Jackman

158. Chemical Engineering Process Design. (3) III.

Lecture—3 hours. Prerequisite: courses 154B and 156A. Chemical Engineering process design; optimization and economics. Mr. McCoy

159. Chemical Engineering Analysis. (3) I.

Lecture—3 hours. Chemical engineering applications of partial differential equations, tensors, systems of linear equations, and operational calculus. Mr. Jackman

198. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics. Student groups may be organized in instrumentation and design problems. Students may enroll in one or more separate subjects. (P/NP grading only.) The Staff (Mr. Bell in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Mr. Bell in charge)

Graduate Courses**252A. Advanced Thermodynamics. (3) I.**

Lecture—3 hours. Prerequisite: course 152B or Engineering 105B. A general treatment of the first and second laws; applications of thermodynamic relationships to phase and chemical reaction equilibria; introduction to statistical thermodynamics. Mr. Smith

253A. Advanced Transport Phenomena. (4) I.

Lecture—4 hours. Prerequisite: Mechanical Engineering 186. Tensor and vector methods in the formulation of equations of mass, momentum, energy, and entropy in continuous media with particular emphasis on fluids. Applications to the formulation of rheological equations of state for viscoelastic fluids and fluid interfaces. Mr. McCoy

253B. Advanced Transport Phenomena. (4) II.

Lecture—4 hours. Prerequisite: course 253A. Continuation of course 253A, with application to both differential and integral mass, momentum, and energy balances. Radiant energy transport and heat transfer in reacting systems. Mr. Jackman

253C. Advanced Transport Phenomena. (3) III.

Lecture—3 hours. Prerequisite: course 253B. Continuation of course 253B with special emphasis on multicomponent systems. The laws of molecular diffusion and energy transport, including the effects of concentration, temperature, electric and pressure fields. Convective mass transfer and chemically reacting flows. Mr. Bell

254. Molecular Theory of Transport Phenomena.

(3) II.

Lecture—3 hours. The transport of mass, momentum, and energy is considered from the molecular point of view. Derivations of the Boltzmann equation are considered, and solutions for special cases are discussed. Methods for calculating transport coefficients are presented. Mr. McCoy

255A-255B. Separation Processes. (3-3) III-I.

Lecture—3 hours. Prerequisite: course 154B or equivalent; course 253C (concurrently) or consent of instructor. Analysis and design of chemical separation processes: adsorption, chromatography, reverse osmosis, dialysis, absorption, aerosol, and colloid processes. Advances in distillation, extraction, crystallization, evaporation, drying, cooling, and humidification. Emphasis on petrochemical processes and pollution abatement design. Mr. McCoy

256A. Applied Kinetics and Reactor Design. (3) II.

Lecture—3 hours. Prerequisite: courses 156B and 252A. Application of kinetics and molecular transport rates to the design of chemical reactors, with emphasis on homogeneous systems. Mr. Dougharty

258. Chemical Process Dynamics. (3) I.

Lecture—3 hours. Prerequisite: courses 154B, 156B. Unsteady-state process analysis, examples of first and second order process systems, coupling of mixed order processes including chemical reaction kinetics, mass and heat transfer and fluid mechanics, simulation of chemical processes. Mr. Bell

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)

The Staff (Chairman in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

ENGINEERING: CIVIL

Leonard R. Herrmann, Ph.D., *Chairman of the Department*
Department Office, 2092 Bainer Hall

Professors:

- Jaime Amorocho, Ph.D. (*Civil Engineering and Water Science and Engineering*)
 Don O. Brush, Ph.D.
 Robert H. Burgy, M.S. (*Civil Engineering and Water Science and Engineering*)
 Leonard R. Herrmann, Ph.D.
 Ray B. Krone, Ph.D.
²James N. Luthin, Ph.D. (*Civil Engineering and Water Science and Engineering*)
 Gerald T. Orlob, Ph.D.
 Verne H. Scott, Ph.D. (*Civil Engineering and Water Science and Engineering*)

Associate Professors:

- ¹Kandiah Arulananandan, Ph.D.
 James A. Cheney, Ph.D.
 James R. Hutchinson, Ph.D.
 Bruce E. Larock, Ph.D.
 Melvin R. Ramey, Ph.D.
¹Karl M. Romstad, Ph.D.
¹Edward D. Schroeder, Ph.D.
 Chih-Kang Shen, Ph.D.
 Theodor S. Strelkoff, Ph.D., (*Civil Engineering and Water Science and Engineering*)
 George Tchobanoglous, Ph.D.

Assistant Professors:

- Michael A. Taylor, Ph.D.

Lecturers:

- Richard J. Farris, Ph.D.
 Jerome B. Gilbert, M.S.
 William K. Johnson, M.S.

**Lower Division Courses****1. The Civil Engineer in Society. (1) I.**

Lecture—1 hour. A description of the field of civil engineering and the function of the professional civil engineer. Discussion of professional practice with respect to application of engineering principles, ethics, and responsibilities. (P/NP grading only.)

The Staff (Mr. Ramey in charge)

10. Introduction to Surveying. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: lower division standing in the College. Theory and practice of measurements for distance, elevations, and angles; the analyses and adjustments for systematic and random measurement errors; line directions, traverse computations, horizontal and vertical curves; astronomical observations and calculations for latitude, longitude, azimuth, and time.

Mr. Tchobanoglous

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. The Staff (Chairman in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)
 The Staff (Chairman in charge)

Upper Division Courses**131. Structural Analysis. (3) I, III.**

Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Structural analysis of determinate and indeterminate beams, trusses and frames; influence lines, moving loads, deflection analysis. Mr. Romstad

132A. Structural Design: Metallic Elements. (3) II, III.

Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Metallic beams, columns, other members; analysis and design of riveted, bolted, and welded joints; design of simple beam connections, moment resistant connections, and column base plates.

Mr. Ramey

132B. Structural Design: Concrete Elements. (3) I, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104B. Reinforced concrete beams, columns, slabs, and footings; elastic theory and ultimate design. Introduction to prestressed concrete and plastics. Mr. Taylor

132C. Structural Design: Timber Elements. (2) III.

Lecture—2 hours. Prerequisite: course 132A. Elements of timber structures and laminated structures, including connection design.

Mr. Ramey

133. Matrix Structural Analysis. (3) II.

Lecture—3 hours. Prerequisite: course 131 or 135. General force and displacement methods of structural analysis using matrix methods. Applications to civil and aerospace structures.

Mr. Romstad

134. Analysis and Design of Buildings. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 131, 132B. Vertical dead and live loading; earthquake and wind forces. Building code and structural requirements for the use of timber, steel frame, reinforced concrete, and brick. Supervised classroom design.

Mr. Taylor

135. Aerospace Structures. (3) III.

Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Analysis of stiffened and unstiffened shell structures; analysis of statically indeterminate box beams, rings and arches. Buckling of flat plates and shells.

Mr. Cheney

NOTE: For key to footnote symbols, see page 191.

136. Properties of Concrete. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 45, Chemistry 4B. Introduction to the chemistry and physics of cement hydration; cements of different types; properties of hardened cement and concrete including strength, elasticity, shrinkage, and creep, and the influence of aggregates, environment, etc., upon these properties. Concrete mix design.
Mr. Taylor

137. Construction Principles. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: senior standing in engineering. Study of the construction industry; its form, evolution, and methods of operation; fundamental principles underlying construction practices; economic factors in planning, organizing, and operating a construction force. Field trips and analysis of local construction projects. Mr. Taylor

138. Dynamic Loads on Stationary Structures. (3) II.

Lecture—3 hours. Prerequisite: course 131; Engineering 102B, 103B. Determination of loads on structures due to base movements (earthquakes), steady and non-steady aerodynamic forces (wind and blast), and impact and vibration forces; comparison of dynamic loads with stationary loads and determination of equivalent load factors. Mr. Cheney

141. Engineering Hydromechanics. (3) I.

Lecture—3 hours. Prerequisite: Engineering 103B. Application of principles of mechanics to flows of heavy, incompressible fluids. Flow visualization, configuration of free surfaces, streamlines, flow nets, separation, cavitation; pressure distribution in non-uniform, unsteady flow; turbulence; surface and form drag; conduit flow. Engineering approximations.
Mr. Strelkoff

142. Water Supply. (3) I, II.

Lecture—3 hours. Prerequisite: Engineering 103B (may be taken concurrently), or consent of instructor. Study of surface and ground water supplies; analysis for prediction of surface and ground water yields; water requirements; water supply and distribution systems including dams, reservoirs, wells, pumping plants, open channels, and pipe lines; water treatment methods and processes. Mr. Schroeder

143. Water Resources Engineering. (3) II.

Lecture—3 hours. Prerequisite: course 142. Basic concepts of water resources planning; water inventories, use, and control; water conservation measures and legislation; multiple-purpose project planning; domestic and foreign water development projects; simulation, optimization, and dynamic programming studies.
Mr. Scott

144. Groundwater and Seepage. (3) III.

Lecture—3 hours. Prerequisite: Engineering 103B. Elements of seepage through porous

media, water chemistry, basic equations of groundwater flow, application to seepage under dams, drainage of airports and agricultural lands, well exploration and design. Reclamation procedures. Mr. Luthin

145. Hydraulic System Design. (3) III.

Lecture—3 hours. Prerequisite: Engineering 103B. Principles of project planning; methods of analysis and hydraulic design of storage systems, diversion structures, conveyance and regulation systems, and structures for irrigation, power, and flood control projects. Mr. Larock

146. Hydraulic Engineering Laboratory. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: Engineering 103B (may be taken concurrently). Experimental analysis of flow about hydraulic structural elements such as gates, weirs, orifices, spillways and energy dissipators; centrifugal pump; open channel wave motion; measurements and instrumentation. Mr. Burgy

147. Solid and Radioactive Waste Management. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 103B. Characteristics and amounts of solid wastes; collection systems; introduction to waste treatment processes and return of treated wastes to the environment. Origin, nature, and management of radioactive wastes. Mr. Tchobanoglous

148. Waterborne Waste Management. (3) II.

Lecture—3 hours. Prerequisite: Engineering 103B. Introduction to industrial and domestic waterborne waste collection and treatment systems; methods of treated waste release.
Mr. Schroeder

149. Air Pollution Control. (3) III.

Lecture—3 hours. Prerequisite: Engineering 103A. Origins, characteristics, and amounts of air pollutants; atmospheric reactions and behavior of airborne wastes; methods of control. Mr. Schroeder

160. Highway Engineering. (3) III.

Lecture—3 hours. Prerequisite: course 171; senior standing in engineering. Highway planning, economy, surveys and plans; highway design to include highway capacity, cross section, vertical and horizontal alignment, intersections, and drainage. Highway construction, grading and pavements. Mr. Shen

171. Soil Mechanics. (3) I, III.

Lecture—3 hours. Prerequisite: Engineering 104A (may be taken concurrently). Soil formations, mass-volume relationships, principle of effective stress, soil characteristics (classification and identification), compaction, capillarity and permeability, compressibility and consolidation, strength—state of stress and failure criteria.
Mr. Shen

172. Soil Properties, Soil Behavior and Engineering Applications. (2) I, III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 171 (may be taken concurrently). Detailed study of the physical and mechanical properties of soils, including experimental determination of these properties and their engineering applications. Introduction to physicochemical principles and influence of physicochemical factors on soil behavior.

Mr. Shen

173. Soil Mechanics and Foundation Design. (4) II.

Lecture—4 hours. Prerequisite: courses 132B and 171. Site exploration, bearing capacity, footing design, lateral earth pressures, retaining walls, slope stability, theory of consolidation and application of foundation design, methods of minimizing settlements and effect of settlement on structures.

Mr. Shen

174. Nuclear Civil Engineering Laboratory. (2) I.

Lecture—1 hour; laboratory—3 hours. Prerequisite: senior standing in engineering. Phenomenology and potentials of nuclear explosives as a construction tool. Hazards associated with underground detonation. Laboratory experiments on radioisotope transport in groundwater, cratering with explosives, and slope stability. Offered in odd-numbered years.

Mr. Cheney

175. Introduction to Geological Engineering. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: junior standing in civil engineering, geology, and related fields with consent of instructor. Introduction to the principles of geology, and study of geologic features that affect engineering structures. Discussion of geological aspects of engineering construction problems by means of case history studies. (Same course as Geology 175.)

Mr. Shen, Mr. Matthews

177. Steady Flow in Open Channels. (3) II.

Lecture—3 hours. Prerequisite: course 141; Mathematics 22B, 22C. Backwater curves; qualitative surface profiles; free surface flow; resistance in uniform flows; gradually and rapidly varied flows; critical depth; supercritical flows.

Mr. Strelkoff

177L. Computer Laboratory in Steady Open Channel Flow. (1) II.

Discussion—1 hour. Prerequisite: course 177 (may be taken concurrently); a short course in Fortran programming. Development of computer programming for calculating discharge in a trapezoidal canal connecting two reservoirs, location of a hydraulic jump, and submerged flow from under a sluice gate.

Mr. Strelkoff

181. Plastic Analysis of Structures. (3) I.

Lecture—3 hours. Prerequisite: course 132A. Structural behavior in the plastic range;

methods of predicting strength and deformation in the inelastic range; analysis and design of continuous beams and frames; rules of practice for plastic design of structures.

Mr. Romstad

182. Prestressed Concrete. (3) II.

Lecture—3 hours. Prerequisite: course 132B. Analysis and design of prestressed concrete structures; statically determinate and indeterminate structures; principles and applications of ultimate strength; applications to buildings, bridges and tanks.

Mr. Taylor

198. Directed Group Study. (1-5) I, II, III.

Lecture—1-5 hours. Prerequisite: consent of instructor. Selected topics. Students may enroll in one or more separate sections.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: senior standing in engineering and at least a B average. (P/NP grading only.)

The Staff (Chairman in charge)

Graduate Courses**201. Introduction to Theory of Elasticity. (3) I.**

Lecture—3 hours. Prerequisite: Engineering 104B. Fundamental equations of elasticity in three dimensions; plane stress and plane strain; flexure and torsion of bars of various shapes. Introduction to variational and approximate methods.

Mr. Hutchinson

225. Theory of Elasticity. (3) II.

Lecture—3 hours. Prerequisite: course 201. Tensor formulation of the elastic field equations. Variational principles. Introduction to nonlinear elasticity. Approximate and exact solutions for plane stress and plane strain problems. Introduction to three-dimensional problems. Offered in even-numbered years.

Mr. Hutchinson

226A. Theory of Elastic Stability. (3) II.

Lecture—3 hours. Prerequisite: course 201. Basic concepts of the stability of elastic systems. Adjacent-equilibrium and minimum potential energy theories of stability. Application to bars, frames, and rings. Offered in even-numbered years.

Mr. Brush

226B. Theory of Elastic Stability. (3) III.

Lecture—3 hours. Prerequisite: courses 226A, 227. Continuation of course 226A. Application to plates and shells. Offered in even-numbered years.

Mr. Brush

227. Theory of Plates. (3) II.

Lecture—3 hours. Prerequisite: course 201. Stress and deformation analysis of plates bent by transverse loads; applications to circular, rectangular, and other shapes.

Mr. Herrmann

NOTE: For key to footnote symbols, see page 191.

228. Theory of Shells. (3) III.

Lecture—3 hours. Prerequisite: course 201. Direct stresses in shells with axial symmetry. Applications to shell roofs, tanks, cylindrical shells, pipelines; bending stresses in shells. Offered in odd-numbered years. Mr. Brush

229. Theory of Plasticity. (3) III.

Lecture—3 hours. Prerequisite: course 201. Fundamentals of plasticity, the concept of yield and the associated constitutive equations in the theory of elastic-plastic solids. Variational theorems, the piecewise linear loading functions and related minimum principles. Application to earth structures, torsion and plane problems of plasticity. Offered in odd-numbered years. Mr. Hutchinson

230. Theory of Viscoelasticity. (3) III.

Lecture—3 hours. Prerequisite: course 201. Fundamentals of viscoelasticity, representation of linear viscoelastic material behavior in integral and differential operator forms. Application to earth structure, buckling, plane and axisymmetric problems. Introduction to non-linear viscoelasticity. Offered in even-numbered years. Mr. Herrmann

231. Advanced Analysis Procedures in Solid Mechanics. (4) I.

Lecture—4 hours. Prerequisite: courses 133, 201 (may be taken concurrently), Fundamentals of the finite element and related procedures. Application to torsion, plane stress, plane strain, axisymmetric, plate and shell bending, thermal stress and soil mechanics problems. Consideration of inelastic and nonlinear problems. Mr. Herrmann

240. Water Quality. (3) I.

Lecture—3 hours. Prerequisite: course 141, Chemistry 110A (may be taken concurrently). Water quality requirements for domestic, industrial, agricultural, and recreational and wild-life water uses; properties of natural surface and groundwaters; transport and fates of waterborne pollutants; methods of analysis. Mr. Orlob

241. Land Quality. (2) II.

Lecture—2 hours. Prerequisite: Chemistry 110A. Factors determining land quality for use in man's activities; land modification for temperature control; out-of-doors noise and its control; interrelations of land and vegetation on qualities of air and water. Mr. Krone

242. Air Quality. (3) III.

Lecture—3 hours. Prerequisite: Engineering 105A; Chemistry 110A recommended. Properties of the air and the atmosphere; atmospheric phenomena; factors determining air quality; origins, transport and degradation of atmospheric pollutants; effects of pollutants on man, plants, soil, and water. Mr. Krone

243A. Water and Waste Treatment. (3) I.

Lecture—3 hours. Prerequisite: Engineering 103B; courses 148, 149 recommended. Characteristics of water- and airborne-wastes; treatment processes and process kinetics; treatment system design. Mr. Tchobanoglous

243B. Water and Waste Treatment. (3) II.

Lecture—3 hours. Prerequisite: course 243A. Continuation of course 243A. Mr. Tchobanoglous

243C. Water and Waste Treatment Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 243B. Operation of model treatment units; measurements of waste and process effluent characteristics; evaluation of process parameters. Mr. Tchobanoglous

244. Environment Quality Management. (2) III.

Lecture—2 hours. Prerequisite: courses 240, 241, 242 (may be taken concurrently). Fates of pollutants in the overall environment; requirements for environment quality; monitoring methods; environment quality control methods. Mr. Orlob, Mr. Krone

247. Soil Dynamics. (3) III.

Lecture—3 hours. Dynamic soil properties, wave propagation in soils, seismic exploration, soil and foundation vibration, dynamic bearing capacity and penetration, response to blast loading, earthquake problems, soil-structure interaction. Mr. Cheney

251. Advanced Matrix Structural Analysis. (3) III.

Lecture—3 hours. Prerequisite: course 133. Analysis of indeterminate structures by displacement and force methods; development of large-capacity computer program for frameworks; treatment of tapered and curved members and semi-elastic connections; emphasis on efficient digital-computer solutions; introduction to matrix stability analysis and structural optimization. Mr. Romstad

252. Advanced Topics in Metal Structures. (3) II.

Lecture—3 hours. Prerequisite: consent of instructor. Residual stresses, recent developments in welded structures and high-strength bolt connections, light gage and alloy steels, aluminum and other metals; aerospace structures, three dimensional space frames. Offered in odd-numbered years. Mr. Ramey

253. Advanced Topics in Concrete Structures. (3) I.

Lecture—3 hours. Prerequisite: consent of instructor. Advanced analysis and design of concrete folded plates, thin shells and gravity dams; yield line theory; lift slabs; effects of shrinkage and creep upon stress and deflection. Mr. Taylor

257. Analysis of Structures under Dynamic**Loading. (3) I.**

Lecture—3 hours. Prerequisite: course 138. Analysis of earthquake and blast resistant structures; method of lateral forces; current research about earthquake and blast loading and structural effects. Offered in even-numbered years.

Mr. Romstad

260. Noncohesive Sediment Transportation. (3) II.

Lecture—3 hours. Prerequisite: course 177 (may be taken concurrently) or consent of instructor. Sediment materials. Particle suspension by currents, waves, and winds. Modes of transport. Bed load relations and suspended load relations. Calculation of total loads in streams. Similarity criteria for movable bed models. Stable channel design. Offered in odd-numbered years.

Mr. Krone

261. Cohesive Particle Transportation. (3) III.

Lecture—3 hours. Prerequisite: course 177 or consent of instructor. Cohesion; cohesive particulate materials; processes of aggregation and dispersion; aggregate properties; deposition and scour; channel and harbor design and maintenance. Offered in odd-numbered years.

Mr. Krone

271. Advanced Topics in Surface Water Hydrology. (2) III.

Lecture—2 hours. Prerequisite: course 142; Water Science 141; consent of instructor. Analysis of hydrologic processes and procedures in water supply investigations including topics in atmospheric relationships, research methods, water balances, and water yield prediction methods. Offered in odd-numbered years. Mr. Burgy

272. Groundwater Flow and Seepage. (3) II.

Lecture—3 hours. Prerequisite: Engineering 103B. Flow of fluids through porous media. Anisotropy. Solution of steady state problems by: mathematical analysis, models, analogs, graphical methods. Dupuit-Forchheimer assumptions. Method of images. Boussinesq's equation for transient problems, solution by Laplace transform. Seepage under dams.

Mr. Luthin

273. Groundwater Hydrology. (3) III.

Lecture—3 hours. Prerequisite: course 272. Analyses and methods of groundwater development; geophysical exploration and analysis; artificial recharge concepts; hydraulics of wells, including analytical treatment of transient flow problems; and problems of well design. Numerical and experimental methods of groundwater flow.

Mr. Scott

274. Hydraulics of Pipe Lines. (3) I.

Lecture—3 hours. Prerequisite: course 141 (may be taken concurrently); Engineering 5A

or equivalent, or consent of instructor. Mechanics of liquid flow in pipes and pipe network systems. Steady flow, unsteady flow, surge and water-hammer problems. Introduction to stability and resonance phenomena. Offered in odd-numbered years.

Mr. Larock

275. Stochastic Hydrology. (3) III.

Lecture—3 hours. Prerequisite: course 142 or Water Science 141 or equivalent. Application of modern statistical analysis in hydrology: time series analysis, stochastic models, simulation by Monte Carlo methods, statistical assessment of predictive capacity of models.

Mr. Amorocho

276. Hydrologic Systems Analysis. (3) II.

Lecture—3 hours. Prerequisite: course 142 or Water Science 141 or equivalent; Mathematics 22A, 22B, 22C, 24. Theory and application of the methods of modern systems analysis and mathematical statistics to problems of hydrological prediction. Emphasis on current developments in parametric and stochastic hydrologies.

Mr. Amorocho

277. Unsteady Flow in Open Channels. (3) III.

Lecture—3 hours. Prerequisite: course 177. Long waves in open-channel systems; Saint-Venant equations; method of characteristics; explicit and implicit finite-difference solutions, stability of numerical schemes, double-sweep method; influence of hydraulic structures; flood routing; bores; dam break; long waves in two-space dimensions.

Mr. Strelkoff

277L. Computer Laboratory in Water Waves. (1) III.

Laboratory—1 hour. Prerequisite: course 277 (may be taken concurrently); a short course in Fortran programming. Development of computer programming for computing long waves in open channels. Explicit and implicit schemes, hydraulic bores, computation of catastrophic, dam-break floods.

Mr. Strelkoff

278. Hydrodynamics. (3) II.

Lecture—3 hours. Prerequisite: Mathematics 24, 185A; Mechanical Engineering 185. Recommended: a short course in Fortran programming (may be taken concurrently). General equations of continuity, momentum, and energy. Stream functions; velocity potential; conformal mapping. Direct solutions for irrotational flow around bodies and in conduits; gravitational effects. Offered in even-numbered years.

Mr. Larock

279. Advanced Mechanics of Fluids. (4) I.

Lecture—4 hours. Prerequisite: Mathematics 22B, 22C, 24; Mechanical Engineering 185. Rotational flows. Navier-Stokes equations and solutions for laminar, viscous flows; turbulent flow and Reynolds equations, isotropy simplifica-

tion, diffusion, phenomenological theories; the boundary layer approximation. Offered in even-numbered years. Mr. Larock

281A. Advanced Soil Mechanics. (3) I.

Lecture—3 hours. Prerequisite: course 173. Theories of consolidation, secondary compression, stress distribution, bearing capacity, lateral earth pressures, shear strength, yielding of soils, creep, effect of type of compaction on the behavior of compacted clays. Mr. Shen

281B. Advanced Soil Mechanics. (3) II.

Lecture—3 hours. Prerequisite: course 281A. Theories of slope stability. Analysis of slope stability problems for static and dynamic loading conditions. Anisotropic stress conditions in soils. Lateral earth pressure theories. Design of anchored bulkheads. Mr. Shen

282. Advanced Soil Laboratory. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 281A. Subsurface exploration, advanced laboratory techniques including consolidation, shear strength, pore water pressure measurement, electrical properties measurement, pavement design tests, field strength and load bearing tests. Mr. Shen

283. Physicochemical Properties of Soils and Soil Behavior. (3) I.

Lecture—3 hours. Prerequisite: course 171. Analysis of the mechanical behavior of soils from consideration of clay mineralogy, colloidal

phenomena, ion-exchange and soil-water characteristics. Conduction phenomena, deformation mechanisms, strength, swelling, compaction. Microscopic theories to explain yielding of soils. Mr. Shen

285. Pavement Design and Soil Stabilization. (3) II.

Lecture—3 hours. Prerequisite: course 171 or equivalent. Principles and methods of pavement design for highway and airport pavements; purposes, principles, and methods of soil stabilization and design of stabilized pavement layers. Offered in even-numbered years. Mr. Shen

286. Seepage and Earth Dams. (3) II.

Lecture—3 hours. Prerequisite: course 171 or equivalent. Groundwater flow around dams; principles of earth dam design, types of failure, and design and construction procedures. Offered in odd-numbered years. Mr. Arulanandan

290. Seminar. (1) I, III.

Seminar—1 hour. Discussion of current graduate research, and guest lectures on recent advances. Oral presentation of individual study. Course required of graduate degree candidates. (S/U grading only.) Chairman in charge

298. Group Study. (1-5) I, II, III.

Lecture—1-5 hours.
The Staff (Chairman in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)
The Staff (Chairman in charge)

ENGINEERING: ELECTRICAL

Herschel H. Loomis, Jr., Ph.D., *Chairman of the Department*

Department Office, 3118 Bainer Hall

Professors:

Richard C. Dorf, Ph.D.
Herman J. Fink, Ph.D.
Sanjit K. Mitra, Ph.D.
John B. Powers, Ph.D. (*Emeritus*)
Ronald F. Soohoo, Ph.D.

Associate Professors:

Vidal R. Algazi, Ph.D.
John N. Churchill, Ph.D.
Tien C. Hsia, Ph.D.
Jack W. LaPatra, Ph.D.
Herschel H. Loomis, Jr., Ph.D.
Earle W. Owen, D.Engr.Sci.

Assistant Professors:

George R. Branner, Ph.D.
William A. Gardner, Ph.D.
Lansing Hatfield, Ph.D.
Hartley J. Jensen, Ph.D.
Edward W. Kozdrowicki, Ph.D.

P. James Stoll, Ph.D.
Myron F. Uman, Ph.D.



Lower Division Courses

1. Introduction to Electrical Engineering. (1) III.

Lecture—1 hour. Electrical Engineering as a professional activity. What Electrical Engineers know and how they use their knowledge. Problems they are concerned with and how they go about solving them. A presentation of basic ideas and their applications. Examination of some case studies. (P/NP grading only.)

The Staff (Mr. Algazi in charge)

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. The Staff (Chairman in charge)

99. Special Study for Lower Division Students.

(1-5) I, II, III.

The Staff (Mr. Loomis in charge)

Upper Division Courses

110A. Electronic Circuits. (3) I.

Lecture—3 hours. Prerequisite: course 140B and Engineering 100. Analysis of linear amplifiers; single stage and multistage amplifiers, tuned amplifiers, oscillators. Mr. Jensen

110B. Electronic Circuits. (3) II.

Lecture—3 hours. Prerequisite: course 110A. Nonlinear electronic circuits; large signal amplifiers, oscillators, and switching circuits. Mr. Jensen

111A. Electronics Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: course 110A (may be taken concurrently); Engineering 100. Properties of transistors and vacuum tubes. Small-signal analysis of single-stage and multi-stage resistance-coupled and transformer-coupled class A amplifiers. Mr. Jensen

111B. Electronics Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: courses 110B (may be taken concurrently), 111A. Tuned amplifiers and oscillators. Switching circuits and large signal amplifiers. Mr. Jensen

112A. Linear Systems Analysis. (3) I.

Lecture—3 hours. Prerequisite: Engineering 17. Properties and classification of linear systems. Signal characterization by basis functions. Convolution integral and Fourier techniques. Fourier and Laplace transform methods, applications. Mr. LaPatra

112B. Linear Systems Analysis. (3) III.

Lecture—3 hours. Prerequisite: course 112A. State variables introduction to feedback, and sampled data systems. Random processes. Sampling and regression statistics, matrices. Mr. LaPatra

113. Digital and Sampled Data Systems. (3) I.

Lecture—3 hours. Prerequisite: course 112A or equivalent. Introduction to digital and sampled data systems. Difference equations and z transformation and their applications to linear discrete systems analysis. State variable methods, discrete models of continuous systems. Digital computer simulation and analysis techniques. Mr. Hsia, Mr. Hatfield

114. Electronic Integrated Circuit Applications. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110B. Analysis and design of monolithic integrated circuits emphasizing circuit and system aspects rather than fabrication. Mr. Jensen

116. Network Analysis. (3) I.

Lecture—3 hours. Prerequisite: course 112A. Topics in modern network analysis, including

two-port networks, matrix methods, graph theory, nonlinear circuits, and computer solutions. Mr. Stoll

117. Network Synthesis. (3) III.

Lecture—3 hours. Prerequisite: course 112A. An introduction to modern network synthesis techniques. Topics include one- and two-port networks, approximation problems, realization procedures, and filter theory. Mr. LaPatra

130A. Introductory Electromagnetics. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 22B, 22C. Static electric and magnetic fields, properties of materials, time-varying electromagnetic phenomena, Maxwell's equations. Mr. Uman

130B. Introductory Electromagnetics. (3) II.

Lecture—3 hours. Prerequisite: course 130A. Propagation of plane electromagnetic waves, guided waves, transmission lines, antennas. Mr. Uman

131A. Electromagnetic Fields and Waves. (3) I.

Lecture—3 hours. Prerequisite: course 130B or equivalent. Propagation and reflection of plane waves in isotropic media. Guided electromagnetic waves. Rectangular and circular wave guides. Mr. Fink

131B. Electromagnetic Fields and Waves. (3) II.

Lecture—3 hours. Prerequisite: course 131A or equivalent. Dielectric guides. Helix and slow-wave structures. Wave propagation in media with anisotropic permittivity and permeability. Mr. Fink

131C. Electromagnetic Fields and Waves. (3) III.

Lecture—3 hours. Prerequisite: course 131B or equivalent. Resonant cavities; microwave network components; antennas; ionospheric propagation. Mr. Fink

133. High-Frequency Laboratory. (2) III

Laboratory—6 hours. Prerequisite: course 130B. Steady-state and transient transmission line behavior; wave propagation in linear and nonlinear artificial lines; rudimentary experiments with reflex klystrons and wave guides. Mr. Stoll

140A. Introduction to Physical Electronics. (3) II.

Lecture—3 hours. Prerequisite: course 130A. Introduction to fundamental physics of electronic conduction, developing models to explain operation of modern devices; equilibrium and nonequilibrium statistical mechanics, conductivity, diffusion, gaseous and beam electrons, plasmas, quantum mechanics. Mr. Uman

140B. Introduction to Physical Electronics. (3) III.

Lecture—3 hours. Prerequisite: course 140A. Electrons in solids, band theory, electrons and

NOTE: For key to footnote symbols, see page 191.

holes, semiconductors, junction device physics and models. Mr. Churchill

145A. Solid-State Electronics. (3) I.

Lecture—3 hours. Prerequisite: Physics 121. Electric and magnetic properties of solids. Topics discussed include electrical conductivity, dielectric constant, and various types of magnetism in solids. Mr. Churchill, Mr. Soohoo

145B. Solid-State Electronics. (3) II.

Lecture—3 hours. Prerequisite: course 145A. Electrical characteristics of dielectric and semiconducting materials, with application to such solid-state electronics devices as transistors, tunnel diodes, parametric amplifiers, and their associated circuits. Mr. Churchill, Mr. Soohoo

145C. Solid-State Electronics. (3) III.

Lecture—3 hours. Prerequisite: course 145A. Characteristics of magnetic materials, with application to such magnetic devices as ferrite cores, thin films, and their associated computer memory and logic circuits. Mr. Churchill, Mr. Soohoo

150. Instrumentation Systems. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 100. Analytical and design methods common to all instrumentation systems; dynamic response; transducers; signal conditioning. Mr. Owen

155A. Electronic Instrumentation for Biology, Chemistry and Medicine. (3) I.

Lecture—3 hours. Prerequisite: Mathematics 16A, 16B; a freshman physics course. Electric circuits, amplifiers, operational amplifiers, transducers and transducer systems, differentiators and integrators, dynamic response. Emphasis is on external characteristics of instruments and the errors inherent in measurement. Engineering majors can not receive credit for this course. Mr. Owen

155B. Electronic Instrumentation for Biology, Chemistry and Medicine. (3) II.

Lecture—3 hours. Prerequisite: course 155A. Dynamic response, signal processing, electrical impedance, noise and interference, electrical safety, digital-to-analog conversion, digital data processing. Engineering majors cannot receive credit for this course. Mr. Owen

157A. Control Systems. (3) II.

Lecture—3 hours. Prerequisite: course 112B. Design and analysis of closed loop automatic control systems. Examples are drawn from all engineering fields. The mathematical representation of systems; frequency, s-plane and state space methods; stability criteria. Mr. Hsia, Mr. Owen

157B. Control Systems. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 157A. Introduction to non-linear and sampled data systems. Applications of digital and analog computers. Mr. Hsia, Mr. Owen

161. Introduction to Biomedical Systems. (3) II.

Lecture—3 hours. Prerequisite: Engineering 100. Introduction to the function of regulatory mechanisms in living organisms from an engineering systems point of view. Specific topics include heart and circulation, respiration, nerve and muscle, temperature regulation. Mr. Stoll

172. Switching Circuit Theory. (3) I.

Lecture—3 hours. Prerequisite: Engineering 5A or equivalent and 100 (may be taken concurrently). Analysis and design of switching circuits. Boolean and switching algebras. Realizations of switching functions. Introduction to sequential machines. Mr. Loomis

173. Digital System Design. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 174. Study of the logic design and hardware implementation of digital systems, including computers, interfaces and special-purpose machines, and laboratory projects involving the design, simulation, and realization of digital subsystems. Mr. Hatfield

174. Computer Organization. (3) II.

Lecture—3 hours. Prerequisite: course 172. Structure and operation of a simple digital computer. Variations of this structure, including multi-address machines, stacks, and microprogramming. Digital computer subsystems including processors, control units, memory units, data channels, and input/output units; special structures. Mr. Hatfield

175. Computer Devices and Systems. (3) III.

Lecture—3 hours. Prerequisite: course 140B. Essential elements of the computer and their interdependence. Characteristics of computer input and output devices, main and auxiliary storage including magnetic cores; films, drums, and discs, and the central processor. Computer integrated circuits and large scale integration (LSI). Mr. Soohoo

176. Programming Languages. (3) I.

Lecture—3 hours. Prerequisite: Engineering 5A. Limits of FORTRAN; display terminal language; job control language; FORMAC; COBOL and SNOBOL. Use of languages for maximum computer performance. Emphasis on applications of various languages. Symbolic differentiation and integration. Treatment of natural language by machine. Mr. Kozdrowicki

***177. Programming Techniques and File Manipulation. (3) III.**

Lecture—3 hours. Prerequisite: Engineering 5A. Basic programming techniques, scatter tables or hash coding, lists, searching and insertion, sorting, string processing, input-output fundamentals, indexed sequential files, relative files, swapping of files, system programming techniques, multiprocessing software, program utilities. Offered in odd-numbered years.

Mr. Kozdrowski

182. Probabilistic Systems Analysis. (3) I.

Lecture—3 hours. Probabilistic models in engineering. Elements of probability theory and applications to engineering problems.

Mr. Algazi, Mr. Hatfield

184. Principles of Communications. (3) II.

Lecture—3 hours. Prerequisite: course 182. Probabilistic analysis of digital and analog communication systems; elements of information theory.

Mr. Algazi, Mr. Hatfield

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Group study of selected topics.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

***201. Optimization Techniques with Applications. (3) II.**

Lecture—3 hours. Prerequisite: knowledge of FORTRAN programming and graduate status. The theory of computer oriented optimization techniques with applications in system design. Offered in odd-numbered years.

Mr. Mitra

204. Digital Processing of Signals. (3) III.

Lecture—3 hours. Prerequisite: course 112B or graduate status. The theory of digital signal-processing operations with emphasis on the frequency domain description of digital filtering. Examples of applications to spectrum analysis and to the processing of images.

Mr. Algazi, Mr. Mitra

212A. System Analysis. (3) I.

Lecture—3 hours. Prerequisite: course 112B. Mathematical representation and analysis of linear continuous-time dynamical systems by state variable techniques: matrices and linear spaces, state space, solutions of state variable equations, multivariable and composite systems, stability, controllability and observability, state feedback and state estimators.

Mr. Hsia, Mr. Owen

212B. System Analysis. (3) II.

Lecture—3 hours. Prerequisite: course 212A. Mathematical representation and analysis of discrete-time signals and dynamical systems: state space methods, transform methods, difference equations, sampling and data reconstruction, systems with both continuous- and discrete-time elements, sampled-data control, digital simulation techniques. Mr. Hsia, Mr. Owen

214. Nonlinear Electronic Circuits. (3) I.

Lecture—3 hours. Prerequisite: course 110B. The design and analysis of nonlinear electronic circuits under transient conditions. Emphasis on device models used in computer transient analysis programs. A study of some of the numerical methods employed. Application to sampling and sweep circuitry.

Mr. Jensen

216. Network Theory. (3) II.

Lecture—3 hours. Prerequisite: course 112B or equivalent. Foundations of network theory. Generalized network analysis, state-variable approach, energy functions, equivalent networks and normal coordinates, scattering matrices, integral theorems and network limitations. Offered in even-numbered years.

Mr. Mitra

***217. Passive Network Synthesis. (3) I.**

Lecture—3 hours. Prerequisite: course 117 or equivalent. Advanced topics in synthesis of passive networks. Driving-point and transfer function realizations, matching networks, n-port realizations, approximation techniques. Offered in even-numbered years.

Mr. Mitra

***218. Active Network Synthesis. (3) III.**

Lecture—3 hours. Prerequisite: course 117 or equivalent. Advanced topics in synthesis of active networks with lumped R,C and distributed R,C elements. Realization using monolithic integrated operational amplifiers of driving-point and transfer functions. Sensitivity and stability considerations. Offered in odd-numbered years.

Mr. Mitra

***226A. Quantum Electronics. (3) I.**

Lecture—3 hours. Prerequisite: course 130B (or equivalent), course 140B (or equivalent). Some basic concepts of quantum theory, density operator, Hamiltonian, and parity. Electric dipole transition; equation of motion of magnetic dipole; resonant processes, absorption, dispersion and saturation; transient behavior of electric dipole transitions, coupled amplitude equations and rate equations. Offered in even-numbered years.

Mr. Fink, Mr. Soohoo

***226B. Quantum Electronics. (3) II.**

Lecture—3 hours. Prerequisite: course 226A. Laser, masers: population inversion, threshold

NOTE: For key to footnote symbols, see page 191.

requirement, steady-state and transient behavior, Q-switching. Interaction between radiation and phonons. Offered in odd-numbered years.

Mr. Fink, Mr. Soohoo

227A. Microwave Electronics. (3) I.

Lecture—3 hours. Prerequisite: course 130B (or equivalent), course 140B (or equivalent). Theory of microwaves, waveguides and cavities. Interaction between electromagnetic fields and the electron charge. Lorentz force law, energy levels in matter and Zeeman splitting. Comparison between conventional and microwave tubes and other new types of microwave oscillators and amplifiers. Offered in odd-numbered years.

Mr. Soohoo, Mr. Fink

227B. Microwave Electronics. (3) II.

Lecture—3 hours. Prerequisite: course 227A or equivalent. Theory of interaction between electromagnetic fields and electronic charge, with applications to electron beam and solid state devices. Beam formation, velocity and density modulation, plasma oscillation, space charge wave propagation in klystrons. Parametric amplifiers tunnel and IMPATT diodes, Gunn oscillators. Offered in even-numbered years.

Mr. Soohoo, Mr. Fink

*230A. Advanced Electromagnetic Theory. (3) I.

Lecture—3 hours. Prerequisite: course 131C or equivalent. The exact formulation of electromagnetic problems by using vector potentials and Green's functions. Applications of these techniques to radiation and transmission problems.

230B. Advanced Electromagnetic Theory. (3) II.

Lecture—3 hours. Prerequisite: course 230A. Advanced topics in propagation such as propagation through anisotropic media, duct theory of propagation over the earth, ray tracing through the ionosphere. Offered in even-numbered years.

*230C. Advanced Electromagnetic Theory. (3) III.

Lecture—3 hours. Prerequisite: course 230A. Advanced topics in radiation and scattering such as reception of statistically varying signals, diffracted ray theory, and quasi static solutions.

240. Engineering Problems in Plasma Physics.

(3) III.

Lecture—3 hours. Prerequisite: courses 130B and 140B. Plasma oscillations and sheaths, measurement of plasma parameters, magnetized plasmas, kinetic and fluid descriptions, waves; applications to problems in communications, devices, power generation, propulsion and controlled thermonuclear fusion research. Mr. Uman

245A. Applied Solid-State Physics. (3) I.

Lecture—3 hours. Prerequisite: course 145C or equivalent. The physics of solids relevant to solid-state applications. Topics include classical

statistics, band theory of solids, electric polarization, conductivity, and magnetism in solids.

Messrs. Fink, Soohoo, Churchill

245B. Applied Solid-State Physics. (3) II.

Lecture—3 hours. Prerequisite: course 245A. Theory of semiconductors with application to transistors. Topics include electrons, holes, mobility, and transistor circuitry. Brief discussion of superconductivity and superconducting solenoids. Offered in even-numbered years.

Messrs. Fink, Soohoo, Churchill

*245C. Applied Solid-State Physics. (3) III.

Lecture—3 hours. Prerequisite: course 245A. Theory of magnetism in solids, with application to ferromagnetic devices and circuits. Topics include paramagnetism, ferromagnetism, magnetic resonance, and switching properties of individual magnetic elements and magnetic arrays. Offered in odd-numbered years.

Messrs. Fink, Soohoo, Churchill

251. Nonlinear Control Systems. (3) III.

Lecture—3 hours. Prerequisite: course 157B and 212B. Techniques for solving nonlinear control problems; state space methods, stability theorems; Lyapunov's methods; sinusoidal describing function and on-off systems. Offered in even-numbered years.

Mr. Owen

*252. Control System Optimization. (3) III.

Lecture—3 hours. Prerequisite: course 157B and 212B. Optimization of systems by the adjustment of parameters; deterministic inputs, stochastic inputs. Optimization of systems by the calculus of variations: Pontryagin's maximum principle, Bellman's principle of optimality. Offered in odd-numbered years.

Mr. Hsia

261. Biological Signals and Systems. (3) III.

Lecture—3 hours. Prerequisite: Human Physiology 260 or the combination of course 157A and a basic physiology course (such as Zoology 2 or Physiology 110A). Measurement and analysis of biological system dynamics by power spectral methods, with application to the cardiorespiratory and other systems. Methods of simulation and identification of linear and nonlinear biological system transfer relationships.

Mr. Stoll

270. Sequential Machines. (3) II.

Lecture—3 hours. Prerequisite: course 172. Study of the algebraic structure theory of sequential machines and the development of sequential machine synthesis techniques.

Mr. Loomis

271. Advanced Digital System Design. (3) III.

Lecture—3 hours. Prerequisite: course 174. Advanced topics in the design of digital systems; high speed and high rate arithmetic; the state assignment problem.

Mr. Loomis

***276. Symbol Manipulation Languages. (3) II.**

Lecture—3 hours. Prerequisite: course 176 or equivalent language experience. The mathematical programming language LISP; recursive programming using LISP and SNOBOL. Use of SNOBOL to write a LISP compiler. ALGOL-68; PL/I; compiler-compilers; algorithms for compilers and interpreters; compilation *vs.* interpretation; algorithms for automatic differentiation and integration. Offered in odd-numbered years.
Mr. Kozdrowicki

279A–279B. Artificial Intelligence. (3–3) II–III.

Lecture—3 hours. Prerequisite: consent of instructor. Achievement of artificial intelligence through attempted realization of macroscopic descriptions of intelligent behavior; heuristic programming; game playing; mechanical theorem proving; concept formation by machine; perception of geometrical figures; analogical reasoning; natural language processors; the brain-modeling problem.
Mr. Kozdrowicki

284A. Noise, Communication and Information**Theory. (3) II.**

Lecture—3 hours. Prerequisite: course 182 or equivalent. Fundamentals of the theory of random processes pertinent to communications, control and other physical applications. Review of probability theory. Characterization of random processes. Correlation functions and power spectra. Linear and nonlinear operations on random processes.
Mr. Algazi

284B. Noise, Communication and Information**Theory. (3) III.**

Lecture—3 hours. Prerequisite: course 284A. Application of statistical techniques to the areas of detection, estimation, and modulation theory. Detection problem and application to radar and digital communication. Estimation theory for signals described by finite parameter sets. Linear and nonlinear modulation and efficient demodulators.
Mr. Algazi

284C. Noise, Communication and Information*Theory. (3) I.**

Lecture—3 hours. Prerequisite: course 182. Information theory and coding. Definition of a measure of information and study of its properties. Introduction to channel capacity and error free communications over noisy channels. Encoding and decoding of data for transmission over noisy channels. Offered in even-numbered years.
Mr. Algazi

290. Seminar. (1) I, II, III.

Seminar—1 hour. Discussion and presentation of current research and development. (S/U grading only.) The Staff (Chairman in charge)

298. Group Study. (1–5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1–12) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

ENGINEERING: MECHANICAL

Harry Brandt, Ph.D., *Chairman of the Department*

Department Office, 2020 Bainer Hall

Professors:

Harry Brandt, Ph.D.
Clyne F. Garland, M.S. (*Emeritus*)
Warren H. Giedt, Ph.D.
Myron A. Hoffman, Sc.D.
Dean C. Karnopp, Ph.D.
John D. Kemper, Ph.D.
Allan A. McKillop, Ph.D.
Amiya K. Mukherjee, D.Phil.
Zuhair A. Munir, Ph.D.
An Tzu Yang, D.E.Sc.

Associate Professors:

Charles W. Beadle, Ph.D.
John W. Brewer, Ph.D.
Harry A. Dwyer, Ph.D.
Jerald M. Henderson, D.Eng.
(*Mechanical Engineering and Food Science and Technology*)

Assistant Professors:

Murray Hill, Ph.D.
Walter V. Loscutoff, Ph.D.
Donald L. Margolis, Ph.D.

Lecturer:

Paul S. Moller, Ph.D.

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Lower Division Courses**1. Mechanical Engineering. (1) II.**

Lecture—1 hour. Description of the field of mechanical engineering with examples taken from industrial applications; discussion of the practice with respect to engineering principles, ethics and responsibilities. (P/NP grading only.)
The Staff (Mr. Karnopp in charge)

99. Special Study for Undergraduates. (1–5) I, II, III.

Prerequisite: consent of instructor; lower division standing. The Staff (Mr. Brandt in charge)

NOTE: For key to footnote symbols, see page 191.

Upper Division Courses

111. Engineering Principles Laboratory. (4) III.

Discussion—2 hours; laboratory—4 hours. Prerequisite: Engineering 103A, 104A, 105B. Experimental investigation of the steady-state and transient behavior of thermal, mechanical, structural, and fluid systems. Mr. Brandt

114. Kinematics of Mechanisms. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 102B. Classification of kinematic elements and mechanisms; graphical and analytical determination of displacements, velocities, and accelerations within planar mechanisms involving turning, sliding, and higher pairs. Kinematic design of cams, gears, and gear trains; intermittent-motion mechanisms. Mr. Yang

115. Dynamics of Machinery. (3) II.

Lecture—3 hours. Prerequisite: Engineering 102B. Analysis of dynamic response of machine elements such as cams, springs, gears, and links, with emphasis on high speed operation; gyroscopic forces in machines; balancing of machinery. Mr. Yang

121. Manufacturing Methods. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104A. Introduction to the methods employed in modern manufacturing, with particular emphasis on the interrelationships between engineering design and manufacturing methods. Introduction to the theoretical basis of metal forming. Mr. Henderson

123A–123B. Experimental Engineering.

(2–2) I–II; II–III.

Laboratory—6 hours. Prerequisite: senior standing in engineering. Performance of a two-quarter long project which includes the design, construction, and evaluation of a mechanical engineering system or related experiment intended to give the student experience in theoretical modelling and experimental evaluation. Mr. Henderson

125. Fluid and Gas Dynamics. (4) I.

Lecture—4 hours. Prerequisite: Engineering 103B. Development of the basic equations of inviscid fluid flow in control volume and differential form. Extensive applications to gas dynamics: wave propagation, shock waves, Prandtl-Meyer flow, flow in ducts. Further applications to aerofoils, cavitation, water hammer and geophysical flow. Mr. Dwyer

126A–126B–126C. Experimental Aeronautical Engineering. (2–2–2) I–II–III.

Laboratory—6 hours. Prerequisite: Engineering 102B, 103B, 105B. Projects are chosen to acquaint students with experimental methods in aeronautical design as they relate to aerodynamics, stability, control, structures and overall vehicle performance. Mr. Moller

127. Vehicle Aerodynamics. (3) I.

Lecture—3 hours. Prerequisite: Engineering 103B. Modeling and dimensional analysis. Instrumentation in experimental work. Aerodynamic loading on vehicle structures, boundary layer control, compressibility effects, static and elementary dynamic stability, propulsion. Mr. Moller

128A–128B. Vehicle Design. (2–2) II–III.

Lecture—1 hour; discussion—1 hour. Prerequisite: Engineering 104B. Design of aeronautically related systems, including the influence of aerodynamic and inertial loading on structural integrity, stability, and control. Mr. Moller

134. Vehicle Stability. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 102B. Introduction to the static and dynamic stability characteristics of transportation vehicles with examples drawn from aircraft, high-performance automobiles and water-borne vehicles including hovercraft. Laboratory experiments illustrate response to various inputs such as gusts, surface roughness, and control deflections. Mr. Loscuttoff

135. Gas Turbine Power Plants. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B. Study of gas turbines with principal emphasis on their application to aircraft propulsion. Analysis of both the idealized jet engine performance and the more realistic performance including component losses. Comparison of turbojet, turbofan, and ramjet engines for various aircraft applications. Brief look at use of gas turbines for power generation. Mr. Hoffman

137. Modern Power Generation. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B. Study of new concepts for generating electrical power with higher efficiency and lower pollution of the environment. Emphasis on the fluid mechanics, heat transfer and thermodynamics of high temperature energy converters such as magnetohydrodynamic (MHD) generators and advanced gas turbines with nuclear reactor heat sources. Mr. Hoffman

150. Mechanical Design. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 4, 104A; course 121 recommended. Applications of the principles of engineering mechanics in the design of mechanical components, with special emphasis on stress concentration, theories of failure, fatigue, and fluctuating stresses. Mr. Beadle

151. Advanced Mechanical Design. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 150. Continuation of course 150 with special emphasis on advanced design

analysis. Computer aided design methods. Noise control in machinery. Mr. Beadle

155. Engineering Systems Design. (3) III.

Lecture—2 hours; discussion—1 hour. The engineering design process and its use; design projects; engineering case studies.

Mr. Henderson

171. Analysis, Simulation, and Design of Dynamic Systems. (4) I, II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 180. Structural models for dynamic systems. Design of control systems to improve linearity, accuracy and speed of response. Design of feedback systems which maintain quality of performance in spite of parameter variations. Analog and digital computer simulation. Messrs. Brewer, Karnopp, Loscutoff

172. Analysis, Simulation, and Design of Dynamic Systems. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 171. Phenomenological models for dynamic systems. Control system design using frequency domain methods. Stability of nonlinear control systems. Introduction to state space techniques.

Messrs. Brewer, Karnopp, Loscutoff

175. Environmental Technological Systems. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: senior standing in engineering. Description of transient and steady-state models of population, pollution, and conflict. Application of engineering thermodynamics and system theory to the analysis of social and ecological systems. Review of current social criticisms of technology. Interactions of society with technology. Mr. Brewer

185. Real Fluid Flow. (4) II.

Lecture—4 hours. Prerequisite: Engineering 103B. An introduction to the properties of real fluids. Derivation of the Navier-Stokes equations and dynamical similarity. Low Reynolds number flow. Boundary layer concepts. Turbulent flow. Mr. Dwyer

186. Heat Transfer. (4) III.

Lecture—4 hours. Prerequisite: Engineering 103B (may be taken concurrently). Fundamental concepts of heat transfer: conduction, convection, and radiation. Mr. McKillop

198. Directed Group Study. (1-5) I, II, III.

Lecture—1-5 hours. Prerequisite: consent of instructor. Group study of selected topics.

The Staff (Mr. Brandt in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Mr. Brandt in charge)

Graduate Courses

204. Heat Conduction. (3) II.

Lecture—3 hours. Prerequisite: Engineering 180, course 186. Steady-state and transient problems in heat conduction, using both mathematical and numerical methods of solution. Offered in even-numbered years. Mr. Giedt

205. Thermal Radiation. (3) II.

Lecture—3 hours. Prerequisite: course 186 or consent of instructor. The transfer of radiant energy. Geometrical and spectral characteristics of systems involving thermal radiation. Gaseous radiation. Offered in odd-numbered years. Mr. Brandt

210A. Advanced Fluid Dynamics. (4) I.

Lecture—4 hours. Prerequisite: graduate standing. Derivation of Navier-Stokes and energy equations. Exact solutions of both equations. Low Reynolds number flow. Boundary layers for two-dimensional flow. Similarity solutions of boundary layer equations. Axially symmetric and three-dimensional boundary layers. Heat transfers in boundary layers.

Messrs. Dwyer, Brandt, Giedt, McKillop

210B. Advanced Fluid Dynamics. (4) II.

Lecture—4 hours. Prerequisite: course 210A. Derivation and analysis of the equations of turbulent flow. Modeling of Reynolds stress terms based on experimental evidence: application to boundary layers, jets, and wakes. Compressible boundary layers, free convective flows, boundary layer mass transfer; other selected topics.

Messrs. Brandt, Dwyer, Giedt, McKillop

210C. Numerical Methods in Boundary Layer Flows. (3) III.

Lecture—3 hours. Prerequisite: course 210B. Development of the basic finite difference schemes for the Navier-Stokes equations, laminar and turbulent boundary layer equations, and the potential flow equations. Analysis of the stability and convergence of these schemes with practical examples. Mr. Dwyer, Mr. McKillop

211. Transitional and Turbulent Flows. (3) I.

Lecture—3 hours. Prerequisite: course 210B. Wave motion in fluids; stability of Couette flow, plane Poiseuille flow and boundary layers; description of turbulent flow; structure of the turbulent energy spectrum; turbulent transport phenomena; turbulent shear flows and their measurement; new theories in turbulence. Offered in even-numbered years. Mr. Dwyer

213. Theory of Jets. (3) III.

Lecture—3 hours. Prerequisite: course 210A or consent of instructor. Turbulent jets of incompressible and compressible fluids; free jets and jets confined to finite spaces; wakes behind

NOTE: For key to footnote symbols, see page 191.

bluff bodies; practical applications of turbulent jets. Offered in even-numbered years.

Mr. Brandt

214. Aerodynamics. (3) III.

Lecture—3 hours. Prerequisite: courses 125, 127, 185. Development and examination of the potential and viscous flow concepts useful in evaluating the aerodynamic loads and performance of flight vehicles. Applications of these concepts will be made through complete system analysis and optimization with particular emphasis on V.T.O.L. aircraft.

Mr. Moller

215. Gas Dynamics. (3) I.

Lecture—3 hours. Prerequisite: Engineering 103B, 105B. Derivation and analysis of the basic equations of motion of inviscid gases at subsonic and supersonic speeds. Prandtl-Meyer flow and the method of characteristics; applications to unsteady transonic and hypersonic flow; shock theory. Offered in odd-numbered years.

Mr. Dwyer

216. Advanced Thermodynamics. (3) II.

Lecture—3 hours. Prerequisite: Engineering 105B. Classical thermodynamics and quantum statistical mechanics of nonreacting and chemically reacting gases, gas mixtures, and other substances.

Mr. Dwyer, Mr. Hoffman

217. High Temperature Gas Transport Phenomena. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B. Development and calculation of free molecule and continuum transport property models. Free molecular heat transfer and flow. Derivation of the Boltzmann Eq. with application to pure gases, gas mixtures and ionized gas. Chapman-Enskog and Lorent solutions. Offered in even-numbered years.

Mr. Dwyer, Mr. Hoffman

*218. MHD Energy Conversion. (4) III.

Lecture—4 hours. Prerequisite: Engineering 103B, 105B. Study of the direct conversion of thermal energy to electrical energy utilizing a magnetohydrodynamic (MHD) generator with chemical and nuclear heat sources. Evaluation of complete MHD power systems for both public utility power and space power supplies. Offered in odd-numbered years.

Mr. Hoffman

220A-220B. Mechanical Vibrations. (3-3) II-III.

Lecture—3 hours. Prerequisite: Engineering 122. Applications of vibration theory to systems with many degrees of freedom and continuous systems. Introduction to random vibrations.

Mr. Karnopp

222. Advanced Dynamics. (3) I.

Lecture—3 hours. Prerequisite: Engineering 102B. Dynamics of particles and of rigid bodies with advanced engineering applications; generalized coordinates; Hamilton's Principles; Lagrange's Equations; Hamilton-Jacobi theory.

Mr. Beadle

224. Kinematic Design of Mechanisms. (3) II.

Lecture—3 hours. Prerequisite: course 114. Introduction to Bernemster theory of the rational design of link mechanisms. Geometric concept of two- and three-dimensional rigid-body displacements, instantaneous invariants, higher-order path curvature analysis, circle- and center-point curves. Graphic and computer methods for kinematic design.

Mr. Yang

226. Acoustics and Noise Control. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 122. Description of sound using normal modes and waves; interaction between vibrating solids and sound fields; sound absorption in enclosed spaces; sound transmission through barriers; applications in design of mufflers, acoustic enclosures, room acoustics, design of quiet machinery.

Mr. Beadle, Mr. Karnopp

240. Theory of Crystal Dislocations. (3) I.

Lecture—3 hours. Prerequisite: Engineering 142 or 201, or consent of instructor. Edge, screw and mixed dislocation concepts. The stress field and energy of dislocations. Force on a dislocation. Motion of dislocations and its relation to plastic deformation. Dislocation multiplication and interaction with point, line, and surface defects. Offered in odd-numbered years.

Mr. Mukherjee

241. Applications of Dislocation Theory. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 240; Engineering 188 or consent of instructor. Concepts of dislocation theory are applied to explain plasticity of crystalline solids. Glide and climb of dislocations, imperfect dislocations, strain hardening, recrystallization, theories of creep processes and interaction of dislocation with solute atoms, precipitates and impurity clouds are discussed. Offered in even-numbered years.

Mr. Mukherjee

242. Advanced Mechanical Properties of Materials. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 188 or consent of instructor. Strength and structure of engineering materials. The dependence of their mechanical properties on time, stress and temperature. Generalized concepts of dislocation theory in plastic deformation, including fracture, and creep. Influence of microstructure in optimizing the mechanical strength properties. Offered in odd-numbered years.

Mr. Mukherjee

243. Solid-State Phase Transformation. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 188, 105A; or consent of instructor. The theory of alloying, kinetics of phase changes, homogeneous and heterogeneous transformation, transformation by shear, order-disorder reactions and the phase changes during

the heat treatment of iron-carbon alloys are discussed. Offered in odd-numbered years.

Mr. Mukherjee

244. Interaction of Materials and their Environment. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 45, 105A, or consent of instructor. Thermodynamic and kinetic foundations of the corrosion and oxidation processes. Practical aspects of corrosion control and prevention. Stress-corrosion and gas-embrittlement phenomena. Special topics in corrosion: microbiological and atmospheric corrosion. Offered in even-numbered years.

Mr. Munir

250. Engineering Case Studies. (2) II.

Discussion—2 hours. Studies of selected problems which illustrate various methods of the design process and management in advanced mechanical engineering systems. Mr. Henderson

270. Modeling and Simulation of Engineering Systems. (3) I.

Lecture—3 hours. Prerequisite: course 172 or consent of instructor. Multiport models of mechanical, electrical, hydraulic and thermal devices; bond graphs, block diagrams and state space equations; Hamilton's principle for complex systems; formulation for analog and digital simulation; identification; instrumentation; approximate models of distributed systems.

Messrs. Karnopp, Brewer, Loscutoff

271. Analysis and Control of Multivariable Systems. (3) II.

Lecture—3 hours. Prerequisite: course 270 or consent of instructor. Analysis of multi-input, multi-output systems and synthesis of linear control; comparison of transfer functions and state space methods in feedback control design; application to physical systems for hardware realization. Messrs. Karnopp, Brewer, Loscutoff

272. Analysis and Design of Control Systems. (3) III.

Lecture—3 hours. Prerequisite: course 271 or consent of instructor. Synthesis of automatic control of mechanical engineering systems; both

lumped and distributed parameter systems and continuous and discrete time control will be considered. Messrs. Karnopp, Brewer, Loscutoff

275. Application of Modern Systems and Control Theory to Environmental Problems. (4) III.

Lecture—2 hours; seminar—1 hour; laboratory—3 hours. Prerequisite: courses 175, 270; or consent of instructor. Analysis, simulation, and planning for social, geophysical, and ecosystem environments. Observability, controllability and optimality in socio-technological systems. Large, dynamic systems theory. General systems theory. Emphasis on interdisciplinary research. Offered in odd-numbered years.

Mr. Brewer

280. Advanced Engineering Analysis. (3) III.

Lecture—3 hours. Prerequisite: Engineering 180 or equivalent. Applications in mechanical engineering of advanced analytical and numerical techniques. Topics include probability theory, calculus of variations, classification of differential equations, and advanced numerical methods.

Mr. Dwyer, Mr. Karnopp

289. Presentation of Thesis Research. (1) III.

Seminar—1 hour. Prerequisite: substantial progress toward completion of master's or doctor's thesis. Presentation of the results obtained in a thesis research project. Critical evaluation of experimental and analytical approaches and critique of presentation.

Mr. Giedt

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)

The Staff (Mr. Brandt in charge)

295. Engineering Case Study Preparation. (3) III.

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 250. Preparation of case studies of selected on-going or completed engineering projects from industry. (S/U grading only.)

Mr. Henderson

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Brandt in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Mr. Brandt in charge)

ENGLISH

James L. Woodress, Ph.D., *Chairman of the Department*
Department Office, 100 Sproul Hall

Professors:

^{2,3}Everett Carter, Ph.D.

Thomas A. Hanzo, Ph.D.

Karl J. Shapiro

Gwendolyn B. Needham, Ph.D. (*Emeritus*)

Brom Weber, Ph.D. (*English and American Studies*)

Robert A. Wiggins, Ph.D.

James L. Woodress, Ph.D.

Celeste T. Wright, Ph.D. (*Emeritus*)

NOTE: For key to footnote symbols, see page 191.

Associate Professors:

- ^{3,4}William E. Baker, Ph.D.
 Elliot L. Gilbert, Ph.D.
 Wayne C. Harsh, Ph.D. (*English and Linguistics*)
 John O. Hayden, Ph.D.
 Peter L. Hays, Ph.D.
 Michael J. Hoffman, Ph.D.
 Elizabeth R. Homann, Ph.D.
 Robert H. Hopkins, Ph.D.
 Arthur E. McGuinness, Ph.D.
 Daniel Silvia, Ph.D.

Assistant Professors:

- Caesar B. Adams, B.A. (*Acting*)
 Arthur K. Amos, Jr., Ph.D.
 Sidney Berger, Ph.D.
 Thomas P. Campbell, III, Ph.D.
 Joan C. Carr, M.A., (*Acting*)
 Marianne Cooley, Ph.D.
 Walter J. Hicks, M.A. (*Acting*)
 Paul D. Johnson, Ph.D.
 Diane L. Murray, Ph.D.
 David A. Robertson, Ph.D.
 Robert M. Silvey, M.A. (*Acting*)
 David S. Wilson, Ph.D. (*English and American Studies*)

Lecturers:

- W. Georg Isaak, M.A.
 Mary A. O'Connor, M.A.



Departmental Major Advisers.—Mr. Adams, Mr. Amos, Mr. Baker, Mr. Berger, Mr. Campbell, Mr. Gilbert, Mr. Harsh, Mr. Hayden, Mr. Hays, Mr. Hicks, Mr. Hopkins, Mr. Johnson, Mr. McGuinness, Mr. Robertson, Mr. Shapiro, Mr. Silvey, Mr. Wiggins, Mr. Wilson.

The Major Program

All English majors are required to attend a general meeting for majors at the beginning of each year; all new and transfer English majors are required to attend a general meeting for majors at the beginning of their first quarter in residence; all English majors must see their advisers, individually, in the spring quarters of their sophomore and junior years.

Lower Division Courses.—Required: one course from 1, 2, 3, 4A, or 4B; course 45; 46A, 46B, 46C (these courses should be taken in order). Recommended: courses in the Freshman offerings other than the one chosen to meet the requirements; courses 30A, 30B, 30C; a course in philosophy; and a course in classics.

Upper Division Courses.—Required: Thirty-six units of upper-division courses, which must include at least one in each of the following

groups: Period courses, Genre courses, Author courses, Special Subjects.

Majors must also take at least one upper-division course in four of the following five periods of British literature: 1) Medieval; 2) Renaissance; 3) Restoration and Eighteenth Century; 4) Romanticism and Nineteenth Century; 5) Twentieth Century; and at least one upper-division course in American literature. Courses specified in this paragraph may be combined with courses specified in the preceding paragraph (e.g., a course in Chaucer would serve both as courses in Medieval literature and a single author).

In addition, the student must choose one of four areas of emphasis: General English and American Literature; Writing; Language and Linguistics; Preparation for Teaching. The student must consult with his adviser for specific requirements of each area of emphasis.

General Major.—Requires a minimum of 32 units of literature and four units of language.

Teaching Major.—The English teaching major in the teacher-training curriculum requires not only the core requirements but also courses 103, 105A, 105B, and 300 (which counts as 3 units of credit in education). All credential candidates majoring in English must complete courses 103, 105A, and 105B before being assigned to student teaching or intern programs.

Teaching Minor.—The teaching minor consists of 32 units, including courses 45, 46A, 46B, 46C, 30A or 30B or 30C, and at least 12 units of upper-division work including English 103, 117A or 117B, and 155B or 155C. Course 300 (which counts as 3 units of credit in education) must be taken in the senior or postgraduate year. Recommended in addition to the required 32 units, especially in preparation for course 300: course 105A.

Writing Major.—Core requirements of 20 distributed units of English and American literature; English 100A, 100B, 100C and a 198 seminar in writing techniques.

Linguistics Major.—Core requirements of 20 distributed units of English and American literature; four courses in Linguistics.

Foreign Languages.—Students who contemplate advanced study in English should prepare for foreign-language requirements for higher degrees, and should consult with the graduate adviser.

Honors and Honors Program.—See page 157.

Graduate Study.—The Department of English offers programs of study and research leading to the M.A. and Ph.D. degrees. Detailed information may be obtained from the Graduate Adviser or from the Chairman of the Department.

Subject A.—Students must have passed Subject A before taking any course in English.

Prerequisite: one course from courses 1, 2, 3, 4A, 4B is required for admission to courses

20, 30A, 30B, 30C, 45, 46A, 46B, 46C, 47, and all upper-division courses. Course 45 is recommended as preparation for the 30 and 46 series.

Lower Division Courses

*R. Communications Skills Workshop. (no credit) I, II, III.

Lecture—3 hours; discussion—3 hours; laboratory—3 hours. Workshop in language skills for students from nonstandard-English backgrounds who do not qualify for English for Foreign Students. Course worth 6 units toward minimum study list unit requirement. (Deferred grading only, pending completion of sequence.)

The Staff (Chairman in charge)

1. Expository Writing. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. Composition, the essay, paragraph structure, diction, and related topics. Frequent writing assignments will be made.

The Staff (Mr. Isaak in charge)

2. Language and Stylistics. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. Introduction to modern inquiries into the nature and forms of the English language. Frequent writing assignments will be made.

The Staff (Mr. Harsh in charge)

3. Introduction to Literature. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. Introductory study of several genres of English literature, emphasizing both analysis of particular works and the range of forms and styles in English prose and poetry. Frequent writing assignments will be made.

The Staff (Mr. Isaak in charge)

4A, 4B. Backgrounds for English Literature.

(4, 4) A: I, II, III; B: I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement; course 4A is not prerequisite to 4B. This course, designed to introduce English majors to essential background material, will concentrate on such major literary works as *The Iliad*, *The Bible*, *The Aeneid*, and *The Divine Comedy*. Frequent writing assignments will be made.

The Staff (Mr. Isaak in charge)

5. Introduction to Creative Writing. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement and consent of instructor. Course in the elementary principles of writing fiction and poetry. Students will be expected to experiment with a variety of forms and will be encouraged to do

free and independent work in addition to the restricted assignments of the course.

The Staff (Mr. Isaak in charge)

*20. Intermediate Composition. (4) I, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Designed primarily for non-majors who wish to improve their skills in expository writing; the content of the course includes basic principles of rhetoric and rules of usage in present-day English.

*25. English for Foreign Students. (5) I, II, III.

Lecture—2 hours; discussion—2 hours; laboratory—1 hour. For foreign students only; required of those who do not pass the examination in English. May be repeated for credit.

Miss Cooley

*26. English for Foreign Students. (5) I, II, III.

Lecture—2 hours; discussion—2 hours; laboratory—1 hour. Continuation of course 25.

30A. Survey of American Literature: Literary Traditions. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Origins and development of the traditions of expression, persuasion, entertainment, and reportage in American literature from Captain John Smith to LeRoi Jones, with attention to the ways in which individual writers both function within and modify the traditions.

The Staff (Chairman in charge)

30B. Survey of American Literature: Social-Cultural Issues. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Social-cultural issues, such as religion, class, democracy, technology, slavery, regionalism, and nationalism in American literature, with attention to the ways in which writers have functioned within and modified socio-cultural traditions from colonial times to the present.

The Staff (Chairman in charge)

30C. Survey of American Literature: Major Writers. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Study of four to ten major writers representing Colonial, Pre-Civil War, Post-Civil War, Early and Late Twentieth-Century periods.

The Staff (Chairman in charge)

45. Critical Reading of Poetry. (4) I, II, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Close reading of selections from English and American poetry. Frequent written exercises.

The Staff (Chairman in charge)

NOTE: For key to footnote symbols, see page 191.

46A. Masterpieces of English Literature. (4) I.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected works of principal writers to 1640. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

The Staff (Chairman in charge)

46B. Masterpieces of English Literature. (4) II.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected works of principal writers from 1640 to 1800. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

The Staff (Chairman in charge)

46C. Masterpieces of English Literature. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected works of principal writers from 1800 to the present. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

The Staff (Chairman in charge)

47. Introduction to Modern Literature. (4) III.

Lecture—2 hours; discussion—2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Chief twentieth-century writers of England and America.

Mr. Shapiro

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Directed group study of a special topic. Primarily for lower-division students.

The Staff (Mr. Woodress in charge)

99. Special Study for Undergraduates. (1-5)

I, II, III. The Staff (Chairman in charge)

Upper Division Courses

Note: Each upper-division course is listed under one of the following groups:

- a) Period courses
- b) Genre courses
- c) Author courses
- d) Special subjects
- e) Writing courses
- f) Language and linguistics
- g) Senior seminars

a) **PERIOD COURSES:** *studies of the major writers, the literary traditions and forms they worked in, and the influencing events of an age.*

111. Old English and Early Medieval Literature.

(4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major

types, traditions, and conventions of literature in England from the time of *Beowulf* to the late medieval romances, with special emphasis on the heroic strain, courtly love and its impact, and the development of Arthurian literature. Mostly in translation.

Miss Cooley

112. The Age of Chaucer. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The literary, religious, and social movements of the later fourteenth century in England as they are reflected in the writings of Chaucer. Langland, the *Gawain* poet, and their contemporaries; the fifteenth-century Chaucerians.

Mr. Berger

***116. Sixteenth Century Poetry and Prose. (4) I.**

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Poetry of Skelton, Wyatt, Surrey, Sidney, Spenser, Marlowe, and Shakespeare; selected discursive prose and fiction. Political, religious, and intellectual background.

Mr. Silvey, Mr. Amos

120. Earlier Seventeenth-Century Poetry and Prose.

(4) II.

Lecture—3 hours; term paper or equivalent. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major authors, forms, and styles. Donne, Jonson, Marvell, Bacon, Browne, Hobbes. Tradition and revolution.

Mr. Zender

123. Dryden and His Contemporaries. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The Restoration in English Literature; Neoclassicism, Ancients versus Moderns, Pyrrhonism, the New Philosophy. Drama, criticism, and satire. Emphasis on the work of John Dryden.

***125. The Age of Swift and Pope: Prose and Poetry. (4) III.**

Lecture—3 hours; term paper or equivalent. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The Augustan Age: reason and imagination. Readings in Swift, Addison, Steele, Defoe, Pope, Gay, Thomson, and others.

Mr. McGuinness

127. Prose and Poetry of the Later Eighteenth Century. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from English 1, 2, 3, 4A, 4B. Readings in Johnson, Goldsmith, Boswell, and others; the poetry of the era concluding with Blake.

Mr. Hopkins

130. Early Romantic Literature. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Blake, Burns, Wordsworth, Coleridge, Scott; the eighteenth-century background and the development of Romantic concepts of the imagination.

Mr. Hayden

132. Later Romantic Literature. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Byron, Shelley, Keats. Individualism and revolt.

Mr. Baker

133. Early Victorian Literature. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Tennyson, Browning, Arnold, and selected prose writers. The Victorian temper; the individual and society; the search for faith. The impact of scientific thought upon creative thinkers.

Mrs. Murray

***134. Later Victorian Literature. (4) III.**

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Ruskin, Hardy, Hopkins, and others. The Oxford movement; the Pre-Raphaelites; art and sociology; aestheticism and decadence; pessimism. Tendencies continuing into the Edwardian period.

Mr. Gilbert

136. British Literature from 1880 to 1918. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Yeats, Conrad, Joyce. Aestheticism, naturalism, symbolism, and impressionism. The transition from Victorian to twentieth-century styles and attitudes.

Mrs. O'Connor

137. British Literature from 1918 to 1940. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Lawrence, Eliot, Forster, and others. Post-war attitudes. Modern psychology and the awareness of myth.

Mr. Hanzo

138. British Literature from 1940 to the Present.

(4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Literature of England and Ireland from World War II to the present. Major themes in the novel, poetry, and short story.

Mr. Hanzo

139. Modern Anglo-Irish Writers. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. A study of Yeats, Joyce, George Moore, John Synge, James Stephens and others.

Mr. McGuinness

***140. Origins of American Literature. (4) III.**

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Seventeenth-century American literature; special attention to European literary-intellectual traditions, dominant American forms (poems, sermon, history), and major writers (Ann Bradstreet, Edward Taylor, and others).

Mr. Weber

141. The American Enlightenment and Its Reaction. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Eighteenth-century American literature: rise of neoclassicism, liberal religion, popular literature, scientific thought, satiric tempers; decline of Puritan traditions; major writers, including Franklin, Edwards, Freneau, and Brackenridge.

Mr. Wilson

142. Early Nineteenth-Century American Literature. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Beginnings of American romanticism, sentimentalism. Gothic vogue, cultural nationalism. Southwestern humor; prose and poetry of Brown, Bryant, Irving, Cooper, Poe, and Longstreet.

Mr. Johnson

143. Transcendentalism and Its Reaction. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Flowering of American romanticism; the metaphysical tradition, Oriental and European antecedents, philosophical idealism, and literary achievement of Transcendentalism (Emerson, Thoreau, Whitman); the critical tempers of Hawthorne and Melville; Emily Dickinson.

Mr. Johnson

144. American Literature from 1865 to 1914. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Religion, local color, social criticism, naturalism, *fin de siècle* aestheticism; Twain, James, Crane, Dreiser, Howells.

Mr. Carter

146. Modern American Literature: 1914 to 1940.

(4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The Modernist movement, disillusionment, artistic experimentation, classical revival, New Criticism, proletarian literature, romantic nationalism, European currents, Pound, Fitzgerald, Eliot, Frost, Hemingway, Crane, Faulkner, and Stevens.

Mr. Robertson

147. Modern American Literature: 1940 to the Present. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Contemporary fiction, poetry, and drama. The impact of World War II on the younger writers: experimentation and formalism in poetry and the drama.

Mr. Hicks

***164A-C. Intercultural Literary Colloquium: The Great Periods of International Culture. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies

NOTE: For key to footnote symbols, see page 191.

in the literary crosscurrents, accommodation and dominance that have characterized the literatures of a common Western culture. Content will alternate among the following segments: A. The Middle Ages; B. The Renaissance; C. Rationalism and the Enlightenment. May be repeated for credit in different subject area. (Same course as Comparative Literature, French, German, and Russian 164A-C.) The Staff

***169A-D. Intercultural Literary Colloquium: The Avant Garde. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Literary innovation and rebellion in Western Culture since World War I. Content will alternate among the following segments: A. Dada and Surrealism; B. The Absurdist Tradition; C. The "New Novel"; D. Proletarian and Epic Theater. May be repeated for credit in different subject area. (Same course as Comparative Literature, Dramatic Art, French, German, and Russian 169A-D.) The Staff

b) GENRE COURSES: studies of major literary forms.

150A. English Drama to Marlowe. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Development of the drama from its beginnings to the Renaissance. Miracle and mystery plays; the morality tradition. Early comedy, tragedy, and chronicle plays. Mr. Campbell

150B. English Drama from Marlowe to 1642. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Shakespeare's contemporaries in the drama, including Webster, Jonson, Beaumont and Fletcher, and others. The revenge play and tragicomedy; post-Shakespearean development of dramatic action and blank verse. Miss Carr

150C. English Drama from 1642 to 1890. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Restoration and eighteenth-century drama, including Congreve, Sheridan, and others. Mrs. Homann

***150D. British Drama from 1890 to the Present.**

(4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The rise of dramatic realism; the chief reactions against it. Emphasis on Shaw, O'Casey, and Osborne. Mrs. Homann

152. American Drama from Its Beginnings to the Present. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Critical and historical survey of drama in America from its eighteenth-century origins with emphasis on O'Neill, Williams, Miller, and others. Mr. Hays

***155A. The English Novel: 1700-1770. (4) I.**

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Realism and the rise of the modern novel. Defoe, Richardson, Fielding, Sterne, and Smollett.

155B. The English Novel: 1770-1850. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Sense and Sensibility in the novel. Walpole, Radcliffe, Austen, Scott, Dickens, Bronte sisters. Mrs. Murray

155C. The English Novel: 1850-1900. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major Victorian novelists: their theory and practice. Dickens, Thackeray, Trollope, Eliot, Meredith, and Hardy. Mr. Gilbert

155D. The English Novel: 1900 to the Present. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major figures including Conrad, Joyce, and Lawrence. Impressionism, the revolt against naturalism; the experimental novel; the anti-modernist reaction. Mr. Hoffman

158A. The American Novel to 1900. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Rise and development of the American novel from its beginnings. Hawthorne, Melville, Twain, and others. Mr. Hoffman

158B. The American Novel from 1900 to the Present. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major American novelists of the twentieth century. Faulkner, Hemingway, Fitzgerald, and others. Mr. Hays

160. The English Lyric. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The history of poetic style from the sixteenth to the twentieth centuries. Major examples of the short poem in relation to intellectual history, to foreign influences, and to the development of poetic forms. Mrs. Wright

***166A. Modalities of Modern Literature: The Novel. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Intercultural literary colloquium on the transformations of self, nature, and community in novels by such writers as Dostoevski, Svevo, Kafka, Faulkner, and Robbe-Grillet. (Same course as Comparative Literature, French, German, and Russian 166A.) The Staff

170A. The Epic. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Studies in the development of the epic.

c) AUTHOR COURSES: *studies of the works and development of an author or authors.*

113. Chaucer. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. *Troilus and Criseyde*, selected *Canterbury Tales*; central ideas in the fourteenth century. Mr. Silvia

117A. Shakespeare. (4) I, II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works.

Messrs. Amos, Adams, Silvey, Mrs. Wright

117B. Shakespeare. (4) II, III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works not included in course 117A.

Messrs. Amos, Adams, Silvey, Silvia

122. Milton. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works, including *Paradise Lost*.

189. Study of a Major Writer. (4) I, III.

Seminar—3 hours; term paper. Prerequisite: junior or senior standing; English major or consent of instructor. The artistic development of one major writer. Limited enrollment.

The Staff (Chairman in charge)

d) SPECIAL SUBJECTS: *studies in a special problem in literature.*

***110A. Introduction to Principles of Criticism. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 45 or equivalent. Methods and assumptions of critical theory from Aristotle to the present. Emphasis on major contributions to the history of literary criticism.

Mr. Robertson, Mr. Hayden

***110B. Introduction to Principles of Criticism. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 45. Continuation of course 110A.

Mr. Robertson, Mr. Hayden

***156. The Short Story. (4) II.**

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The short story as a genre: its historical development, techniques, and formal character as a literary form. European as well as American writers.

The Staff (Chairman in charge)

161A-C. Varieties of Authorial Vision. (4) I, II, III.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Study of representative examples of imaginative literature from antiquity to the present. Content will alternate among the following segments: A. The Tragic Vision; B. The Comic Vision; C. The Tragicomic Vision. May be repeated for credit in different subject area. (Same course as Classics, Comparative Literature, French, German, and Russian 161A-C.)

The Staff

163A-C. Intercultural Literary Colloquium: Literature and the Other Arts. (4) II.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. The encounter of literature with other art forms; structural and thematic elements of music and the fine arts reflected as subject matter or compositional principles in literature; contrast and similarity in the creative process of the several media. Content will alternate among the following segments: A. Music and the Artist-Hero; B. Pictorial Arts and Visual Media; C. Theater, Opera, and Dramatic Forms. May be repeated for credit in different subject area. (Same course as Comparative Literature, French, German, and Russian 163A-C.)

The Staff

***165. Intercultural Literary Colloquium: Studies in Fantastic Reality. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. The literary experience of mystery, the fantastic, and the demonic in Western tradition, including works by such writers as Borges, Dostoevski, and Kafka. (Same course as Comparative Literature, French, German, and Russian 165.)

The Staff

***167. Intercultural Literary Colloquium: Comparative Study of Major Authors. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Pivotal works of artists in the Western mainstream, such as Dante, Shakespeare, Cervantes, Goethe, Tolstoi, Proust, and Joyce. (Same course as Comparative Literature, French, German, and Russian 167.)

The Staff

170B. European Influences on the English and American Novel. (4) I.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Studies in the English and American novel, with special reference to continental influences.

171. English Bible as Literature. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Old Testament poetry and prophecy; the Gospels and certain Epistles.

Mr. Robertson

NOTE: For key to footnote symbols, see page 191.

175. American Literary Humor. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The American humorous vision as expressed in such modes as comedy, satire, irony, and their combinations from the seventeenth century to the present, with attention given to such matters as the nature of humor and the cultural influences affecting its development. Mr. Weber

180. Literature for the Elementary and Secondary Schools. (4) I.

Lecture—3 hours; papers. Prerequisite: a first-year English course and one of the following: 30A, 30B, 30C, 45, 46A, 46B, 46C. Intensive study of literature used frequently in elementary and secondary English classes, including such works as *Charlotte's Web*, *Tom Sawyer*, *Red Badge of Courage*, and short stories, drama, poetry; selections from regional, national, and world literature written in English. Mr. Wiggins

181. Black Literature. (4) III.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. A study of the writings of black Americans, including Chesnut and Dunbar in the nineteenth century, the writings of the Harlem Renaissance in the twentieth century, and the more important contemporary black writers, such as Wright, Ellison, Baldwin, Hansberry, and Jones. Mr. Hicks

***183. Film as Narrative. (4) III.**

Lecture—1 hour; discussion—2 hours; laboratory—2 hours; film showings. Prerequisite: Dramatic Art 15 or consent of instructor. A close study of modern cinema (1930-60) as a storytelling medium. Emphasis on the work of American and British artists (Ford, Huston, Hitchcock, Welles). Mr. Baker, Mr. d'Harcourt

***187. Literature and the Other Arts. (4) I, II, III.**

Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of the relationships between the forms of literature and the forms of the other arts, with detailed study of one of the crucial periods of artistic development in western culture. The Staff (Chairman in charge)

188. Special Topics in Literary Studies. (4) I, II, III.

Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of a special topic drawn from English or American literature. Course will be offered in sections according to the topic studied, and papers will be assigned. Limited enrollment. The Staff (Chairman in charge)

e) WRITING COURSES:**100A. Creative Writing. (4) I.**

Lecture—3 hours; evaluation of written materials and conferences with individual students—1 hour. Prerequisite: one course from courses 1, 2, 3, 4A, 4B; consent of instructor. Writing of poetry and fiction. May be repeated for credit with consent of instructor. No final examination. The Staff (Mr. Shapiro in charge)

100B. Creative Writing. (4) II.

Lecture—2 hours; evaluation of written materials and individual student conferences. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Sophomores may enroll with consent of instructor. The writing of poetry and fiction. May be repeated for credit with consent of instructor. No final examination. The Staff (Mr. Shapiro in charge)

100C. Creative Writing. (4) III.

Lecture—2 hours; evaluation of written materials and individual student conferences. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Sophomores may enroll with consent of instructor. The writing of poetry and fiction. May be repeated for credit with consent of instructor. No final examination. The Staff (Mr. Shapiro in charge)

103. Advanced Composition. (4) I, II, III.

Lecture—3 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Survey of prose styles, the principles of prose rhetoric, and the usage patterns of present-day English grammar. Frequent written composition stressing the principles studied. Required of prospective high school English teachers. The Staff (Chairman in charge)

f) LANGUAGE AND LINGUISTICS:**105A. Language. (4) I, II.**

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Present-day English grammar and pronunciation according to the perspectives of traditional grammar and contemporary linguistics. Preparation for stylistic analysis and historical study of English language and literature. Required of prospective English teachers. Miss Cooley, Mr. Harsh

105B. Language. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. History of the English language. Examination of the language as recorded in literary texts from Old English to present-day English. Relationship of English to other languages; development of vocabulary, phonology, and grammatical patterns. Required of prospective English teachers. Mr. Harsh

105C. Language Change Reflected in Literature.

(4) III.

Lecture—3 hours; term paper. Prerequisite: courses 105A–105B. Study of literary texts from the various historical periods in the English language, considering, in addition to other stylistic features, those characteristics particularly connected with development and change in the respective linguistic periods. (Same course as Linguistics 105C.) Mr. Campbell

***105D. Linguistics, Literature, and Composition.**

(4) III.

Lecture—3 hours; term paper. Prerequisite: courses 105A, 105B. Linguistic theories and methods in literary analysis and in composition. Course considers structural linguistics and transformational grammar exemplified in analysis, criticism, and content of belletristic and non-belletristic written materials. Mr. Harsh

***162A–F. The Theory and Practice of Literary**

Translation. (4) II.

Lecture—2 hours; discussion—1 hour, term translation project. Prerequisite: competence in "source" language and consent of instructor. Theories and problems of rendering texts in foreign languages into English; imaginative equivalence and re-creative adaptation demonstrated in terms of various models; comparison of student translation projects. Content will alternate among the following segments: A. French to English; B. German to English; C. Greek/Latin to English; D. Italian to English; E. Russian to English; F. Spanish to English. May be repeated for credit in different subject area. (Same course as Classics, Comparative Literature, French, German, and Russian 162A–F.) The Staff

168A–E. Intercultural Literary Colloquium: Modern Literary Movements and Styles. (4) I.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in popular taste, messianic vision, and elitist polarities. Content will alternate among the following segments: A. Romanticism; B. Symbolist Poetry and Poetics; C. Naturalism and Expressionism; D. Utopianism and Authoritarian Structures; E. Quests of Mystery and Science Fiction. May be repeated for credit in different subject area. (Same course as Comparative Literature, French, German, and Russian 168A–E.) The Staff

***192. Theory and Methods in Modern Linguistics.**

(4) II.

Lecture—3 hours; term paper. Prerequisite: courses 105A–105B. Survey of scholarship in linguistic studies from European backgrounds to present, concentrating primarily but not exclu-

sively on descriptions of the English language. Contrastive analysis with other Germanic languages. (Same course as Linguistics 192.)

Mr. Campbell

***195. Language, Thought, and Expression. (4) II, III.**

Seminar—3 hours; term paper. Prerequisite: course 192. Investigation of a range of theories on the relationship between language structure and thought, from philosophical, linguistic, and historical points of view. Readings will include Chomsky, Empson, Hayakawa, Ogden, Richards, Vygotsky, Whorf, *et al.* (Same course as Linguistics 195.)

***196. Stylistics. (4) I.**

Seminar—3 hours; term paper. Prerequisite: course 192. Analysis of linguistic stylistic variations in specific works to be selected from the corpus of writings in English. (Same course as Linguistics 196.) Mr. Baker

g) SENIOR SEMINARS:**188. Special Topics in Literary Studies. (4)**

I, II, III.

Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of a special topic drawn from English or American literature. Course will be offered in sections according to the topic studied, and papers will be assigned. Limited enrollment.

The Staff (Chairman in charge)

189. Study of a Major Writer. (4) I, III.

Seminar—3 hours; term paper. Prerequisite: junior or senior standing. English major or consent of instructor. The artistic development of one major writer and his intellectual and literary milieu. Limited enrollment.

The Staff (Chairman in charge)

***194H. Special Study for Honors Students.**

(2) I, II, III.

Prerequisite: honors status; one course from courses 1, 2, 3, 4A, 4B. Individual directed study leading to preparation of a long paper. May be repeated once for credit.

The Staff (Chairman in charge)

197T. Tutoring in English. (1–4) I, II, III.

Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit.

The Staff (Chairman in charge)

197TC. Community Tutoring in English. (1–4)

I, II, III.

Prerequisite: upper-division standing and a major in English; consent of instructor. May be repeated for credit.

The Staff (Chairman in charge)

NOTE: For key to footnote symbols, see page 191.

198. Directed Group Study. (4) I, II, III.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses**200. Techniques of Literary Scholarship. (4) I.**

Lecture—3 hours. The elements of bibliography with special attention to literature and discussion of the principal modes of literary investigation—critical, historical, textual, and others.
Mr. Berger, Mr. Woodress

***201. Literary Criticism. (4) I.**

Lecture—3 hours. Survey of the major critics from Aristotle to the present, with emphasis on the relationship of critical theory to the history of literature.
Mr. Hayden

205. Introduction to Old English. (4) I.

Lecture—3 hours; written reports; individual conferences. The language of Anglo-Saxon England; readings in Old English prose and poetry.
Mr. Campbell

***206. Beowulf. (4) III.**

Lecture—3 hours. A study of the poem and the Heroic Age of Germanic literature.
Mr. Campbell

207. Middle and Early Modern English. (4) III.

Lecture—3 hours. Earlier dialects; the new vocabulary; the later sound shifts and changes to the seventeenth century. Readings in illustrative documents.
Miss Cooley

***210. Readings in English and American Literature.**

(4) I, II, III.

Discussion—3 hours. Prerequisite: upper division English course in area to be studied. Offered in multiple sections each quarter. Content varies according to specialty of instructor. Course designed for students preparing for their comprehensive examinations. May be repeated for credit.
The Staff (Chairman in charge)

215. Arthurian Romance. (4) II.

Lecture—3 hours. The sources of Arthurian Romantic literature; Continental and English literary treatment; Malory's synthesis; significant changes of attitudes in post-Malory literature.
Mrs. Homann

225. Topics in Irish Literature. (4) I, II, III.

Seminar—3 hours. Prerequisite: course 139. Course will vary from quarter to quarter and will include such topics as the nineteenth-century novel, contemporary Irish poetry, rise of the drama, or a study of a major author.
Mr. McGuinness

230A. Studies in Major Writers: Chaucer. (4) III.

Seminar—3 hours.

Mr. Silvia

***230B. Studies in Major Writers: Milton. (4) II.**

Seminar—3 hours.

***231. American-European Literary Relations. (4) I.**

Lecture—3 hours. Interchange of ideas and forms between America and Europe.
Mr. Carter

232A. Problems of English Romantic Literature.

(4) III.

Seminar—3 hours. Selected issues in the current study and critical assessment of Romantic literature.
Mr. Hayden

232B. Problems of English Victorian Literature.

(4) II.

Seminar—3 hours. Selected issues in the current study and critical assessment of Victorian literature.
Mr. Gilbert

233. Problems in American Literature. (4) I.

Seminar—3 hours. Selected topics for intensive investigation.
Mr. Weber

234. Dramatic Literature. (4) III.

Seminar—3 hours. Historical introduction to dramatic theory; the genres of tragedy, comedy, and tragicomedy.
Ms. Cohn

235. Fiction. (4) I.

Seminar—3 hours. Theories of fiction as reflected in the practice of writers from the eighteenth century to the present.
Mr. Hanzo

***236. Poetics. (4) II, III.**

Seminar—3 hours. Metaphor, style, and structure in English poetry from the sixteenth century to the present.
Mr. Shapiro

237. Modern Critical Theory. (4) II.

Seminar—3 hours. Examination of problems in the theory underlying the practice of literary criticism from I. A. Richards and T. S. Eliot to the present.
Mr. Hanzo

***240A-240B-240C. Medieval Literature.**

(4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)
Mr. Silvia

***242A-242B-242C. Sixteenth-Century Literature.**

(4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

***244A-244B-244C. Shakespeare. (4-4-4) I-II-III.**

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

†246A-246B-246C. **Seventeenth-Century Literature.**
(4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

*248A-248B-248C. **Eighteenth-Century Literature.**
(4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Mr. Hopkins

250A-250B-S250C. **Romantic Literature.**
(4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Mr. Hayden

*252A-252B-252C. **Victorian Literature.**
(4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Mr. Gilbert, Mrs. Murray

*254A-254B-254C. **Twentieth-Century British Literature.** (4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Mr. Hanzo

*256A-256B-256C. **Early American Literature.**
(4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Mr. Weber

*258A-258B-258C. **American Literature: 1800 to the Civil War.** (4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Mr. Hoffman

260A-260B-S260C. **American Literature: Civil War to 1914.** (4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Mr. Woodress

†262A-262B-262C. **American Literature after 1914.** (4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Mr. Hays

*264A-264B-264C. **Studies in Modern British and American Literature.** (4-4-4) I-II-III.

Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Mr. Hanzo

*289. **Study of a Major Writer.** (4) II, III.

Seminar—3 hours. Artistic development of one major writer and his intellectual and literary milieu. May be repeated for credit when a different writer is studied.

The Staff (Chairman in charge)

290A-290B-290C. **Seminar in Creative Writing.**
(4) I-II-III.

Seminar—2 hours; evaluation of written materials and individual student conferences—1 hour. Prerequisite: consent of instructor; graduate standing with preference to those enrolled in M.A. program in Creative Writing. Writing of poetry and fiction. May be repeated for credit.

The Staff (Mr. Shapiro in charge)

*298. **Directed Group Study.** (1-4) III.

(S/U grading only.)

The Staff (Chairman in charge)

299. **Individual Study.** (1-4) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

299D. **Special Study for the Doctoral Dissertation.**

(1-8) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

Professional Courses

300. **Problems in Teaching English Language, Literature and Composition in Secondary Schools.** (3) III.

Lecture—2 hours. Prerequisite: senior or graduate standing; an English teaching major or minor. This course should be completed before practice teaching. Course is accepted in partial satisfaction of the requirement in education for the general secondary credential.

Mr. Harsh

*301. **The Teaching of English as a Foreign Language.** (4) II.

Lecture—3 hours. Methods for the use of applied linguistics in the teaching of English to nonnative speakers.

390A. **Teaching English at the College Level.** (2) I.

Lecture-discussion—2 hours; observation of freshman English courses—2 hours. Prerequisite: graduate standing. Consideration of the problems and techniques of teaching English composition at the college level. (S/U grading only.) Mr. Isaak

390B. **Teaching English at the College Level.** (2) II.

Lecture-discussion—2 hours; observation of freshman English courses—2 hours. Prerequisite: graduate standing. Consideration of the problems and techniques of teaching literature at the college level. (S/U grading only.) Mr. Isaak

ENTOMOLOGY

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study. See pages 87 and 182.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

1. An Introduction to Entomology. (5) III.

Lecture—3 hours; laboratory—6 hours. A basic study of insects: their biology, anatomy, classification and relation to human welfare.

Mr. Thorp

10. Natural History of Insects. (3) I, III.

Lecture—3 hours. Designed for students not specializing in entomology. Not open for credit to students who have had course 1 but students who have taken this course may take course 1 for credit. Biology, taxonomy and behavior of insects. A cultural and technical course providing an introduction to the insects.

Mr. Bacon

Upper Division Courses

101. Introduction to Structure and Function in Insects. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1. General principles of insect morphology with emphasis on the functional approach. Comparative anatomy of selected insect types.

102. Insect Physiology. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 1 or equivalent; Chemistry 8B; course 101 recommended. Vital functions of insects and related organisms.

Mr. Judson

103. Systematic Entomology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: introductory course in zoology or entomology. The principles of taxonomy in animals; speciation; introduction to classification and nomenclature.

Mr. Bohart

104. Insect Ecology. (4) II.

Lecture—4 hours. Prerequisite: upper division standing in one of the biological sciences. Principles of ecology with examples from the insects; analysis of the insect environment; population dynamics.

Mr. Cothran

105. Insect Classification. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 1. Principles and methods of classification of insects to the family level with emphasis on identification.

Messrs. Thorp, Bohart, Grigarick

*106. Field Entomology. (4) III.

Laboratory—6 hours; weekend field trips—8–10 days. Prerequisite: course 105 or consent of instructor. Collection and comparative analyses of insect faunas from selected ecological zones in California. Offered in odd-numbered years.

Mr. Thorp

*109. Field Taxonomy and Ecology. (7) (Extra Session—Summer).

Lecture—2 hours; laboratory—36 hours; five-week course. Prerequisite: an introductory course in entomology or consent of instructor. The study of insects in their natural habitats; their identification and ecology. Offered in even-numbered years.

Mr. Bohart

110. Economic Entomology. (4) I.

Lecture—2 hours; laboratory—6 hours. An introductory course dealing with the identification, biology, and control of economic insects, with emphasis on those attacking agricultural crops.

Mr. Grigarick

112. Principles of Agricultural Entomology. (4) II.

Lecture—4 hours. Prerequisite: an introductory course in entomology or consent of instructor. Principles and problems in the control of insects and mites; integrated control, residues, considerations of application equipment, philosophy of sampling.

Mr. Lange

116. Biology of Aquatic Insects. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: an introductory course in entomology or consent of instructor. A study of the life histories, ecology, and identification of insects associated with streams, ponds, and lakes.

Mr. Grigarick

*117. Chemistry of Insecticides. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B or consent of instructor. Chemical composition and reactions of insecticides; their physiological effects on plant and animal tissues.

119. Apiculture. (3) II.

Lecture—3 hours. Biology and behavior of honeybees; communication, orientation, social organization, foraging activities, honey production, pollination activities.

Mr. Laidlaw, Mr. Gary

119L. Apiculture Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 119. Biology and behavior of honeybees (especially communicative behavior); fundamentals of colony management necessary for efficient agricultural use; utilization of bees in research and teaching.

Mr. Gary, Mr. Laidlaw

121. Insect Behavior. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in one of the biological sciences or consent of instructor. Evolution of behavior, sense organs, specific types and patterns of behavior, comparative behavior, learning, and applied aspects of behavioral phenomena. Analysis of movies on behavior. Mr. Gary

***123. Classification of Immature Insects. (4) I.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: introductory course in entomology. Criteria used to identify the immature forms of the principal orders and families of insects; primary emphasis on economic groups. Offered in even-numbered years. Mr. Lange

125. Insect Vectors of Plant Pathogens. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: one course in entomology or plant pathology, or consent of instructor. The role of insects and mites in the transmission of plant pathogens with emphasis on the biological relationships between insect vectors and plant viruses they transmit. Virus transmission techniques and approaches to control. Mr. McLean

***127. Acarology. (4) II.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 103 or 110. The morphology, taxonomy, and ecology of mites, with emphasis on plant and animal parasites. Offered in odd-numbered years.

130. Biological Control of Insect and Weed Pests. (4) II.

Lecture—4 hours. Prerequisite: introductory course in entomology or consent of instructor. Theories and practices of biological control; population phenomena, and the biology of entomophagous insects. Offered in even-numbered years. Mr. Bacon

153. Medical Entomology. (3) III.

Lecture—3 hours. Prerequisite: one course in entomology or consent of instructor. The worldwide relationships of insects and other arthropods to human health. The biology and basic classification of medically important arthropods with special emphasis on the ecology of arthropod-borne diseases of man and principles of their control. Mr. McClelland

170. Insect Pest Management. (6) (Extra Session—Summer).

Lecture—60 hours total; laboratory and field trips—100 hours total. Prerequisite: upper division standing and at least one course in agricultural entomology or insect ecology. Field course in pest management principles and practices. Students participate in detection and sampling

for pest and beneficial species and evaluation of damage; and also plan and conduct experiments utilizing biological, chemical, and cultural control methods.

Messrs. Douth, Leigh, Rice, Summers

198. Directed Group Study. (1-5) I, II, III, (Summer).

Prerequisite: consent of instructor.

The Staff (Mr. Bacon in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III, (Summer).

The Staff (Mr. Bacon in charge)

Graduate Courses***202. Advanced Insect Physiology. (4) III.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 102 or Zoology 112, or consent of instructor; Biochemistry 101A or 101B recommended. Selected topics of insect physiology. Intensive study of topics of current interest, which will vary from year to year. Course may be repeated for credit. Offered in odd-number years. Mr. Judson

203. Principles of Systematic Entomology. (3) II.

Lecture—3 hours. Prerequisite: course 103. Theory and philosophy of taxonomy with emphasis on phylogeny, zoogeography, and nomenclature of insects. Offered in even-numbered years. Mr. Bohart

219. Advanced Apiculture. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 119 or consent of instructor. Advanced topics in bee biology with special consideration of morphology, genetics, caste differentiation, and artificial insemination. Offered in even-numbered years. Mr. Laidlaw

253. Advanced Medical Entomology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: one upper division course in entomology other than 153 and one course in microbiology; course 153 is recommended. A study in depth of one or more selected arthropod-borne diseases of man with emphasis on the relationship of the physiology, behavior and population dynamics of the vector to the ecology of the disease. Emphasis in the laboratory on epidemiologic techniques relating to vectors and taxonomy of a selected group. Mr. McClelland

255. Electronic Principles Related to Entomological Research. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course in college physics or chemistry. Basic electronic principles of a-c and d-c circuits discussed without mathematical emphasis. Methods of electrical measurements presented. The operation of vacuum tubes and semiconductor devices and their uses in power supplies, am-

plifiers, oscillators, and switching discussed and demonstrated. Offered in odd-numbered years.

Mr. McLean

***275. Principles and Methods of Entomological Research. (4) II.**

Lecture—2 hours; laboratory—6 hours. Techniques and purposes of the scientific method as related to the field of entomological research with emphasis on problem selection, methods of attack, and the accompanying collection, evaluation, and presentation of data. Offered in odd-numbered years.

ENVIRONMENTAL HORTICULTURE

Related Major Programs and Graduate Study.
—See pages 88, 98, and 182.

Related Courses. See Plant Science.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences 228 Mrak Hall.

Lower Division Courses

6. Introduction to Environmental Plants. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2 or Plant Science 2. Growth, form, and origin of plants used in landscape and home discussed in relation to their uses and climatic and cultural requirements. Students learn to identify environmental plants. Only 2 units of credit allowed for students having taken course 9.

Mr. Hackett

9. Environmental Plants for the Home and Community. (1) III.

Laboratory—3 hours. Identification of most common woody and herbaceous plants used in home and landscape. Brief introductory comments about plants prior to going on walking field trips.

Mr. Kofranek

10. Landscape Horticulture for the Home and Community. (3) III.

Lecture—2 hours; discussion—1 hour. Recommended for non-majors. Influences of climate, soil, and cultural practices on the growing of turf, flowers, and herbaceous and woody plants in the landscape.

Mr. Kofranek, Mr. Hackett

99. Special Study for Lower Division Students. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Kofranek in charge)

Upper Division Courses

104. Landscape Construction. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Environmental Planning and Manage-

290. Seminar. (2) I, II, III.

Seminar—2 hours.

The Staff (Mr. Cothran in charge)

291. Seminar in Medical Entomology. (2) I.

Seminar—2 hours. Prerequisite: course 153. Discussions of parasitology, ecology and epidemiology related to vectors of pathogens causing disease in man and animals.

Mr. McClland

298. Group Study. (1-5) I-II-III.

(S/U grading only.)

The Staff (Mr. Bacon in charge)

299. Research. (1-12) I, II, III. (Summer)

The Staff (Mr. McLean in charge)

ment 20, 22; Engineering 1 recommended. Analysis of the physical, mechanical, functional and aesthetic properties of materials used in landscape development with emphasis on construction techniques, methods and specifications.

Mr. Madison

105. Taxonomy and Ecology of Environmental Plants. (4) I.

Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 6 or one course in taxonomy. Taxonomy of the important plants used in the western landscape. Emphasis will be placed on the identification, nomenclature, characteristics and uses of woody plants in man's environment.

Mr. Leiser

107. Herbaceous Environmental Plants. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 6 or one course in taxonomy. Identification, ecology, and use of herbaceous environmental plants, with emphasis on floral-cultural and foliage plants, garden annuals, and perennials. Offered in even-numbered years.

Mr. Madison

***115. Advanced Taxonomy and Ecology of Environmental Plants. (4) III.**

Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 105 or consent of instructor. Identification, nomenclature and classification of plants for man's environment are studied in relation to extensive variations and ecological modification. Emphasis is placed on the use of plants in western climatic zones. Nomenclatural codes are discussed.

Mr. Leiser

125. Floriculture and Nursery Management. (4) II.

Lecture—3 hours; laboratory—3 hours; field trips. Prerequisite: Plant science 2. Practices and principles in planning, establishing, and maintaining container-grown crops with special consideration of greenhouse production.

Mr. Kofranek, Mr. Hackett

128A. Landscape Horticulture. (3) I.

Lecture—2 hours; laboratory—2 hours. Pre-

requisite: Plant Science 2 or Botany 2. Practices and principles of planting, establishing, and maintaining plantings in the landscape with emphasis on turf. Laboratory methods are used to analyze problems related to nutrition, salinity and water quality. Mr. Madison

128B. Landscape Horticulture. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2 or Botany 2. Principles and practices for the development and management of plants in urban and natural landscapes with emphasis on trees and shrubs. Mr. Harris

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. Selected problems in floriculture, nursery management, and landscape horticulture.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. The Staff (Chairman in charge)

Graduate Courses

290. Seminar. (1) I, II, III.

Seminar—1 hour. Selected topics in floriculture, nursery management, and environmental horticulture. The Staff (Chairman in charge)

298. Group Study. (1-5) I, II, III.

Group study on advanced topics in floriculture, nursery management, and environmental horticulture. The Staff (Mr. Paul in charge)

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing. Research in floriculture, nursery management, and environmental horticulture.

The Staff (Mr. Paul in charge)

ENVIRONMENTAL PLANNING AND MANAGEMENT

Major Advisers.—See *Class Schedule* listing.

Major Program.—See page 88.

Related Courses. See *Agricultural Economics 147 (Natural Resource Economics)*, *148 (Economic Planning for Regional and Resource Development)*; *Environmental Studies; Resource Sciences.*

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

1. Environmental Quality. (3) I.

Lecture—3 hours; one Saturday field trip. Components of environmental quality, significant issues, relationships and implications for planning, design, management and interpretation of urban and natural environments.

Mr. Gold

20. Introduction to Landscape Design. (3) I.

Lecture—3 hours. Recommended for non-majors. Design principles and criteria used in analyzing, evaluating, and developing the visual and functional aspects of landscaped areas.

22. Landscape Design. (3) II, III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 20; Design 21 recommended. Practice in analysis and design with reference to landscape problems.

Upper Division Courses

110. Urban and Regional Planning. (4) II.

Lecture—4 hours; one Saturday field trip. History, nature, scope, and significance of plan-

ning in America including definitions and concepts, the planning process, significant problems, policy issues and the future. Mr. Gold

116. Outdoor Recreation. (4) I.

Lecture—4 hours; one Saturday field trip. History, nature, scope, and significance of outdoor recreation in American life, with emphasis on user-resource relationships, special problems, policy issues, and innovation. Mr. Gold

122. Park Administration. (4) II.

Lecture—3 hours; discussion—1 hour; Saturday field trip. Prerequisite: course 116. Description and analysis of the nature, concepts and techniques of providing leisure opportunities with emphasis on the policies, programs, and organization of park and recreation systems.

134. Planning of Recreation Environments. (3) II.

Lecture—3 hours; one Saturday field trip. Prerequisite: course 116; course 122 recommended. Concepts, principles, techniques, and methods used in the planning, analysis and evaluation of leisure environments with emphasis on public outdoor recreation resources, landscape analysis, resource allocation, rationalization and the decision process. Mr. Gold

136. Design of Recreation Environments. (3) III.

Lecture—2 hours; laboratory—3 hours; one Saturday field trip. Prerequisite: courses 1, 20, and 22. Concepts, principles, techniques, problems, and potentials in the design, analysis and evaluation of recreation environments with emphasis on public outdoor recreation resources,

NOTE: For key to footnote symbols, see page 191.

form and function, visual quality, and the implications of design alternatives on the urban and natural landscape.

144. Park Operations. (4) III.

Lecture—3 hours; laboratory—3 hours; one all-day field trip. Prerequisite: course 116; courses 122 and Environmental Horticulture 128A or 128B recommended. Planning, execution, and supervision of field maintenance and operations with emphasis on performance budgeting, personnel practices, and scheduling. Familiarization with different areas, techniques, and technology to develop and maintain park and recreation areas. Mr. Harris

160. Environmental Interpretation. (3) III.

Lecture—2 hours; laboratory—3 hours; two field trips. Prerequisite: course I recommended. Principles and analysis of interpretative techniques, media, materials and programs of public park and recreation agencies, museums, botanical and zoological gardens, schools and organizations, including the planning, construction and use of interpretive devices and facilities.

196. Outdoor Recreation Field Studies. (1-6) (Extra Session—Summer)

Field study. Prerequisite: course 116; courses 110 and 122 recommended. Survey, analysis, and evaluation of the planning, design, management, and program of public and private recreation environments with emphasis on field observation of administrative practices, user behavior, environmental design, and program innovations. (P/NP grading only.)
The Staff (Mr. Harris in charge)

ENVIRONMENTAL STUDIES*

Leonard O. Myrup, Ph.D., *Chairman*
Division Office, 554 Hutchison Hall

Professors:

Leo K. Bustad, Ph.D. (*Radiobiology Laboratory*)
Charles R. Goldman, Ph.D.
William J. Hamilton, III, Ph.D.
Robert Sommer, Ph.D. (*Psychology*)
James W. Valentine, Ph.D. (*Geology*)

Associate Professors:

James A. Harding, Ph.D. (*Environmental Horticulture*)
James McEvoy, Ph.D.
Leonard O. Myrup, Ph.D.
Alvin D. Sokolow, Ph.D. (*Political Science*)

Assistant Professors:

Gerard C. Bond, Ph.D. (*Geology*)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Gold in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: 3 units of upper division work in park administration; consent of instructor.
The Staff (Mr. Gold in charge)

Graduate Courses

222. Recreation Policy. (3) II.

Lecture—3 hours. Prerequisite: course 122 or consent of instructor. Analysis of the development and application of public policy of recreation resource allocation, development and management. Offered in even-numbered years.

234. Planning Recreation Environments. (3) III.

Lecture—2 hours; laboratory—2 hours; weekend field trip. Prerequisite: course 134 or consent of instructor. Application of concepts, techniques, and methods to the analysis, evaluation, and planning of recreation environments. A multidisciplinary, team approach to actual situations. Offered in even-numbered years.
Mr. Gold

290. Seminar. (1-2) I, II, III.

Seminar—1-2 hours. An interdisciplinary seminar on selected current topics related to environmental planning, leisure behavior and environmental quality.

The Staff (Mr. Gold in charge)

299. Research. (1-6) I, II, III.

Research—3-18 hours.
The Staff (Mr. Gold in charge)

William G. Davis, Ph.D. (*Anthropology*)
Thomas E. Dickinson, Ph.D.
Ruth Dixon, Ph.D. (*Sociology*)
Theodore C. Foin, Jr., Ph.D.
Wilson B. Goddard, Ph.D.
Robert A. Johnston, M.S.
Jess F. Kraus, Ph.D. (*Community Health*)
Thomas M. Powell, Ph.D.
Peter J. Richerson, Ph.D.
Paul A. Sabatier, M.S. (*Acting*)
Seymour I. Schwartz, Ph.D.
Geoffrey A. Wandesforde-Smith, Ph.D.

Lecturer:

William A. Harvey, M.S.



The Intercollege Division of Environmental Studies presents undergraduate and grad-

* Intercollege division.

uate programs relating to environmental and resource management problems, including theory and principles. Opportunities to learn methods for analysis and applications for problem-solving are provided through regular courses, workshops, and directed group studies. The goals of these programs provide a concentration of broad focus courses that may be elected by students from any college or school to help establish the relevance of their discipline to environmental problems as well as a core program in environmentally oriented general studies for graduate and undergraduate students who are developing professional depth in such areas as resource sciences, ecology, environmental planning, engineering, or other fields important to environmental management.

For the latest information on current undergraduate and graduate programs in environmental studies, contact the Division of Environmental Studies.

Lower Division Courses

10. Introduction to Environmental Studies. (4) I, III.

Lecture—3 hours; discussion—1 hour. Recommended: elementary biology. Survey of the importance of ecology and systems behavior for man-environment relationships and management problems. Resources, environmental quality, urban dynamics, environmental perception, and conservation are covered. Includes several integrative case studies, and features individual reading in environmental problems. The Staff

12. Environmental Planning. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 10 or consent of instructor. Survey of basic planning concepts and application to a regional long-range planning problem. Policy formation and planning institution design seen as part of the problem solving.

Mr. Johnston

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students.

Mr. Myrup

Upper Division Courses

100. General Ecology. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology (including botanical and zoological elements); elementary calculus. Ecological principles of biological systems, emphasizing populations and ecosystems. Principles of growth, regulation, distribution, structure, energetics, and mineral cycles related to the evolution of biological systems and applications to selected human ecological problems.

Mr. Foin, Mr. Harding

101. Social Processes. (4) II.

Lecture—3 hours; discussion—1 hour. Examination of the problem of determining what are the crucial variables in the social processes that relate man to the environment. Economic theory, human ecology and general systems theory are examined to evaluate their utility in isolating strategic social variables. (Same course as Sociology 101.)

Mr. Davis, Mr. Richerson

102. Environmental Decision Making. (4) III.

Lecture—3 hours; discussion—1 hour. Survey and examination of approaches and concepts in decision making relevant to environmental problems. Discussion of collective action, problems of institutional design, the implications of public sector entrepreneurship, and the effects of technology on alternative decision structures.

Mr. Wandesforde-Smith,
Mr. Schwartz

111. Cultural Ecology. (4) III.

Lecture—3 hours; discussion—1 hour. Recommended: course 100 or equivalent. The nature and interpretation of animal social systems and their relevance to an understanding of man's social conventions and evolution. Aggression, dominance, communication, sexual behavior, cooperation and social regulation of density are considered from an evolutionary perspective.

Mr. Hamilton

111. Cultural Ecology. (4) III.

Lecture—3 hours; discussion—1 hour. Comparative survey of the interaction between diverse human cultural systems and the environment of the peoples that practice them. Primary emphasis is given to the people living in rural and relatively undeveloped environments as a basis for interpreting more complex environments.

Mr. Richerson

112. Environmental Law. (4) II.

Lecture—4 hours; discussion—1 hour. Introduction for non-Law School students to principle theories and concepts of environmental law and to development of judicial institutions for environmental management and policy making. Analysis of selected federal and state legislation and its effectiveness in problem solving.

116. The Oceans. (3) II.

Lecture—3 hours. Prerequisite: upper division standing or consent of instructor. Introductory survey of the marine environment. Oceanic physical phenomena, chemical constituents, geological history, and the sea's biota; man's utilization of marine resources. (Same course as Geology 116.)

Mr. Powell, Mr. Valentine

131. Environmental Health. (4) II.

Lecture—3 hours; discussion—1 hour. Contemporary problems in environmentally de-

NOTE: For key to footnote symbols, see page 191.

pendent aspects of individual and public health. Diseases associated with pollution of air, water, soil and food; infectious diseases such as malaria and encephalitis and stress phenomena related to urban crowding, noise and occupation will be considered. Mr. Kraus

133. Population Analysis. (4) III.

Lecture—3 hours; laboratory—3 hours. A comparative and historical examination of interrelations between population dynamics and social organization, technology, and the environment; statistical analysis of the relation of demographic processes of fertility, mortality, and migration to variations and changes in human population size, composition, and distribution. Ms. Dixon

140. Limnology. (4) III.

Lecture—3 hours; special project. Prerequisite: junior standing; Biological Sciences 1. The biology and productivity of inland waters with emphasis on the physical and chemical environment. Mr. Goldman

140L. Limnology Laboratory. (3) III.

Laboratory—6 hours. Prerequisite: course 140 (may be taken concurrently). Limnological studies of lakes, streams, and reservoirs with interpretation of aquatic ecology. Mr. Goldman

150A. Physical and Chemical Oceanography. (3) I.

Lecture—3 hours. Prerequisite: course 116 (or Geology 116), Physics 4B, Mathematics 22C, Chemistry 1C; or upper division standing in a natural science, and consent of instructor. Physical and chemical properties of seawater, fluid dynamics, air-sea interaction, atmosphere-coupling, currents, waves, tides, mixing, sea ice, major oceanic geochemical cycles. (Same course as Geology 150A.) Mr. Powell

150B. Geology of the Oceans. (3) II.

Lecture—3 hours. Prerequisite: Geology 60, 60L, or consent of instructor. Introduction to the origin and geologic evolution of ocean basins. Topics include composition and structure of oceanic crust, marine volcanism, and deposition of marine sediments. Special emphasis on applying sea floor spreading theory to interpreting geologic history of the ocean floor. (Same course as Geology 150B.) Mr. Bond, Mr. Moores

150C. Biological Oceanography. (3) III.

Lecture—3 hours. Prerequisite: Biological Sciences 1 and a course in general ecology, or consent of instructor. Survey of the ecology of major marine habitats including intertidal, shelf benthic, deep-sea and plankton communities. Existing knowledge and contemporary issues in research. Portion of course will be devoted to man's use of and impact on the ocean. (Same course as Geology 150C.) Mr. Valentine, Mr. Richerson

160. Public Mechanisms for Controlling Land Use.

(4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: an introductory course in planning. Politics and administration of zoning, subdivision and building regulation and open space preservation, constitutional and legal bases for controls; community and political factors influencing legislation and administration of controls; and the relative effectiveness of specific controls in channeling urban growth. Mr. Johnston

162. Planning and Decision Making in Small Urban Communities. (4) III.

Lecture-discussion—4 hours. Examination of urban processes in small U.S. communities, with particular attention to how local governments respond in their structures and programs to community growth, or non-growth, and development. The political consequences of excessive subdivision development, overburdened utility plants, and alternative taxation strategies. Mr. Sokolow

166. Case Studies in Institutional Failure and Reform. (4) I.

Lecture-discussion—4 hours. Selected case studies demonstrating the institutional constraints faced in environmental problem-solving in the public sector. Cases of legislative regulatory, and administrative-management agencies covering national, international and subnational problems in environmental management will be discussed. Mr. Wandesforde-Smith

168. Environmental Problems and Market Failure. (4) III.

Lecture-discussion—3 hours; term paper. Prerequisite: course 102 or one course in microeconomic theory and political science. Analyses of environmental problems as examples of market failure. The application of political and economic theories to external costs and irreversibilities in problems such as urban sprawl, depletion and pollution. Mr. Dickinson, Mr. Schwartz

170. Environmental Awareness. (4) III.

Lecture—3 hours; discussion—1 hour. Interactions of people with man-made environments. Research methods for evaluating designed environments and reviews of current research in environmental psychology. Illustrations include the connection between the design of schools, parks, hospitals, and dormitories on the behavior of occupants. (Same course as Psychology 170.) Mr. Sommer

180. Bioenvironmental Consequences of Nuclear Technology. (3) III.

Lecture—1½ hours; discussion—½ hour; field trip to Nuclear Power Station; term paper. Prerequisite: Biological Sciences 1 and Physics 2A

or their equivalents; consent of instructor. Discussion of biospheric implications of radionuclide and thermal effluents generated by nuclear technology. Hazards evaluation based on the predictions of the response of the most sensitive physiological systems. (Same course as Physiological Sciences 180.)

Mr. Bustad, Mr. Goldman

185. Methods for Analysis of Complex Systems.

(4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: elementary programming, calculus, and statistics. The strategy and tactics of ecosystem analysis is combined with analytical and simulation procedures to explore the problem-solving capability of mathematical model build-up for complex environmental problems. Students will be exposed to simulation languages and will be expected to apply their training in individual projects.

Mr. Schwartz

186. Population Dynamics and Simulation. (4) II.

Lecture—2 hours; laboratory—4 hours. Prerequisite: elementary calculus, statistics, and Fortran programming; elementary ecology; or consent of instructor. The dynamics of population systems and the use of simulation to attack theoretical problems treated through several case studies and individual/team projects. Different types of mathematical modeling compared.

Mr. Foin

190. Workshops on Environmental Problems. (1-8)

I, II, III.

Laboratory—2-16 hours. Prerequisite: con-

sent of instructor. Workshops featuring empirical analyses of contemporary environmental problems by multidisciplinary student teams. Guided by faculty and lay professionals, the teams seek to develop an integrated view of a problem and outline a series of alternative solutions. Open to all upper division and graduate students on application.

Mr. Myrup in charge

192. Internships in Environmental Management.

(2-4) I, II, III.

Prerequisite: consent of instructor. Supervised program of student internships with public agencies having responsibility for environmental control. Deals with the application and evaluation of theoretical concepts through work experience and systematic observation.

Mr. Dickinson

198. Directed Group Study. (1-5) I, II, III.

Mr. Myrup in charge

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor. Directed study of a topic selected by the student and an instructor.

Mr. Myrup in charge

Graduate Courses

298. Directed Group Study. (1-5) I, II, III.

Mr. Myrup in charge

299. Research. (1-12) I, II, III.

Prerequisite: graduate standing. (S/U grading only.)

Mr. Myrup in charge

ENVIRONMENTAL TOXICOLOGY

Related Undergraduate Majors.—See pages 84 and 88.

Related Courses. See *Atmospheric Science 131 (Air Pollution Meteorology)*; *Environmental Studies 10 (Introduction to Environmental Studies)*, *131 (Environmental Health)*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

10. Protecting the Quality of the Environment.

(3) III.

Lecture—3 hours. Prerequisite: open to science and nonscience majors. Discussion of man-made hazards in the world around us, including how they might be minimized. Topics to be covered: air, water and soil pollution; food safety, waste disposal. Included are household, domestic and agricultural chemicals and industrial toxicants.

Mr. Kilgore, Mr. Krieger

99. Special Study for Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Kilgore in charge)

Upper Division Courses

110. Air Pollutants. (3) II.

Lecture—3 hours. Prerequisite: Chemistry 1A, 1B, 1C; Biological Sciences 1 or 10. Toxicological aspects of major contaminants of the ambient air, with emphasis on their environmental fate and biological functions. Factors governing air quality criteria and standards. Alternatives in air pollution abatement.

Mr. Hsieh

180. Principles of Environmental Toxicology. (3) I.

Lecture—3 hours. Prerequisite: Chemistry 8B or 128C (or equivalent); Biochemistry 101A recommended. A unified introduction to principles underlying the use and environmental consequences of pesticides, food additives, and other chemicals; their regulation; and their health significance.

Mr. Seiber

NOTE: For key to footnote symbols, see page 191.

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Kilgore in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Mr. Kilgore in charge)

Graduate Courses**203. Environmental Toxicants. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 128C (or equivalent), or Chemistry 8B and consent of instructor. Toxic chemicals: selected topics illustrating their occurrence, structure, and the reactions underlying detection, toxicity, fate, and ecological importance. Mr. Crosby

214. Mechanisms of Toxic Action. (3) II.

Lecture—3 hours. Prerequisite: Biochemistry 101A, 101B and consent of instructor. Biochemical and physiological mechanisms underlying toxicity and detoxification. Mr. Kilgore

220. Analysis of Toxicants. (3) III.

Lecture—3 hours. Prerequisite: course 180 and consent of instructor; course 203 recom-

mended. Principles of the microanalysis of toxicants. Theoretical considerations regarding separation, detection, and quantitative determination of toxicants using chemical and instrumental techniques. Mr. Seiber

220L. Analysis of Toxicants Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 220 (may be taken concurrently) and consent of instructor. Laboratory techniques for microanalysis of toxicants. Separation, detection, and quantitative determination of toxicants using chemical and instrumental methods. Mr. Seiber

290. Seminar. (1) I, II, III.

Seminar—1 hour. Current topics in environmental toxicology. (S/U grading only.)
The Staff (Mr. Kilgore in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Topics such as trace analysis of toxicants, natural toxicants, and new pesticides.

The Staff (Mr. Kilgore in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Kilgore in charge)

EPIDEMIOLOGY AND PREVENTIVE MEDICINE

Walter W. Sadler, D.V.M., M.P.H., *Chairman of the Department*
Department Office, 2075 Haring Hall

Professors:

Henry E. Adler, D.V.M., Ph.D.
Ralph J. Audy, M.B., Ph.D. (*San Francisco Campus*)
Raymond A. Bankowski, D.V.M., Ph.D.
Nemat O. Borhani, M.D., M.P.H. (*Internal Medicine and Community Health*)
Jack A. Howarth, D.V.M., Ph.D.
Stewart H. Madin, D.V.M., Ph.D. (*Berkeley Campus*)
Margaret E. Meyer, Ph.D.
Nicholas L. Petrakis, M.D. (*San Francisco Campus*)
Livio G. Raggi, D.V.M., Ph.D.
Hans P. Riemann, D.V.M., Ph.D.
Walter W. Sadler, D.V.M., M.P.H.
Calvin W. Schwabe, D.V.M., M.P.H., Sc.D.
Richard Yamamoto, Ph.D.

Associate Professors:

¹Charles E. Franti, Ph.D.
Constantin Genigeorgis, D.V.M., M.S., Ph.D. (*In Residence*)

Assistant Professors:

Joseph W. Adams, D.V.M., M.P.H.
Alvin D. Wiggins, Ph.D.

Lecturers:

Robert B. Bushnell, D.V.M.
Fred N. Cooper, B.S.P.H.
Fredric L. Frye, D.V.M.
Murray B. Gardner, M.D.
George L. Humphrey, D.V.M., M.P.H.
Winifred E. Kistler, M.L.S.
Ming-Yu Li, Ph.D., M.L.S.
Bryan Mayeda, D.V.M.
R. H. McCapes, D.V.M.
Marjan Merala, M.S., Ldo. Vet.
Lloyd J. Neurauter, D.V.M., M.P.H.
Arnold S. Rosenwald, D.V.M., Ph.D.
John C. Sawyer, D.V.M., M.P.V.M.
Robert Schneider, D.V.M.
Patton L. Smith, D.V.M., M.P.V.M.
Manuel J. Torres, D.V.M., M.P.H.
James H. Wommack, D.V.M.
George K. York, Ph.D.

**Upper Division Courses****101. Perspectives in Veterinary Medicine. (2) I.**

Lecture—2 hours. Consideration of the present-day scope of veterinary medicine and of the role of the veterinary profession in modern society. (P/NP grading only.) Mr. Schwabe

102. Biomedical Information Retrieval. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: enrollment in the School of Veterinary Medicine or consent of instructor. The use of bibliographic tools in the biomedical sciences; the use and availability of demographic data; the application of manual and machine systems for storage and retrieval of data; and consideration of computerized systems in literature retrieval and clinical data processing.

Mrs. Kistler, Messrs. Li, Merala, Franti

103A. Medical Statistics. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 13 and consent of instructor. Use of statistics in clinical, laboratory and population medicine; graphical and tabular presentation; biomedical statistical laboratory to accompany introductory course in statistics.

Mr. Franti, Mr. Wiggins

103B. Medical Statistics. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103A or consent of instructor. Regression, correlation, analysis of variance in biomedical sciences; time-dependent variation and trends; bioassay; introduction to mathematical epidemiology; non-parametric methods.

Mr. Franti, Mr. Wiggins

103C. Medical Statistics. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103B or consent of instructor. Continuation of course 103B; additional topics in bioassay; life tables and cohort studies; clinical trials; problems in sampling and surveys.

Mr. Franti, Mr. Wiggins

111. Animal Hygiene. (3) III.

Lecture—3 hours. Prerequisite: Biological Sciences I or consent of instructor. Causes, prevention, and control of animal diseases important in economic agriculture and in public health, with emphasis upon animal management factors in disease.

Mr. Adler

140. Principles of Epidemiology. (2) II.

Lecture—1 hour; case study—2 hours. Prerequisite: sophomore standing in the School of Veterinary Medicine or consent of instructor. Introduction to medical ecology with special consideration given to modes of disease transmission and to interrelationships between those host, agent, and environmental factors which are responsible for the distributional patterns of diseases in space and time.

Mr. Schwabe

150. Food-borne Infections and Intoxications. (4) II.

Lecture—4 hours. Prerequisite: Bacteriology 2. Prevalence and characteristics of those diseases of man which are derived from food or food sources; access of disease agents to and dis-

tribution in food and food sources; exposure of man to those agents; prevention of food-borne diseases. Messrs. Genigeorgis, Riemann, York

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

201. Diseases of Laboratory Animals. (3) II.

Lecture—3 hours. Prerequisite: senior standing in veterinary medicine or consent of instructor. Study of infectious and noninfectious diseases of laboratory animals, including diagnostic procedures and treatment.

Mr. Adler

208. Avian Medicine. (3) II.

Lecture—3 hours. Prerequisite: junior standing in the School of Veterinary Medicine or consent of instructor. Etiology, pathology, diagnosis, epidemiology, prevention and control of diseases of poultry, including those important to public health.

Messrs. Adler (in charge), Bankowski, Raggi, Yamamoto

210A. Advanced Epidemiology. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: a doctoral degree (or equivalent) in veterinary, human or dental medicine, or consent of instructor. Methods for the study of diseases in populations both of lower animals and of man, with critical discussions of illustrative case examples of "classical" and contemporary epidemiological research.

Mr. Schwabe, Mr. Riemann

210B. Advanced Epidemiology. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 210A. Continuation of course 210A with emphasis on use of epidemiological and statistical methods in problem solving approach to study of diseases.

Messrs. Schwabe, Riemann, Franti, Wiggins

212. Epidemiology of the Zoonoses. (3) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 210B or consent of instructor. The epidemiological features of infections and infestations shared by man and other animals with particular attention to those perpetuated in nature by wildlife and those which are of greater public health and economic significance.

214. Comparative Epidemiology of Noninfectious Diseases. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 210B or consent of instructor. Study of the environmental and host factors which are associated with the occurrence of diseases of noninfectious or unknown etiology. Emphasis will be placed on the comparison of the epidemiologic features of these diseases in man and lower animals.

216. Mass Screening for Diseases in Populations.

(3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 210B or consent of instructor; *Veterinary Microbiology 270* recommended. Consideration of immunodiagnostic, biochemical, and other techniques for mass screening of human and animal populations for abnormalities and disease; evaluation of their usefulness to study incidence and/or prevalence of such conditions and for application in programs of prevention and control. Mr. Yamamoto, Mr. Adler

218. Disease Control and Eradication. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 216 or consent of instructor. Studies of various approaches used to control diseases in lower animals and man. Discussions will be concerned with past successes and failures and emphasis placed on future prospects and limitations of these methods. Mr. Bankowski

240. Public Health. (3) III.

Lecture—3 hours. Prerequisite: junior standing in the School of Veterinary Medicine or consent of instructor. Introduction to public health and to the responsibilities of the veterinarian; consideration of the roles of lower animals in the causation and perpetuation of human diseases; consideration of occupational health hazards associated with the practice of veterinary medicine.

250. Veterinary Food Hygiene. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: junior standing in the School of Vet-

erinary Medicine or consent of instructor. Discussion of public health importance of diseases transmitted to man through meat, poultry, and milk; the means and likelihood of preventing their transmission; and the role and responsibility of the veterinary practitioner in preventing human illness from this cause.

Messrs. Sadler, Riemann, Genigeorgis

252. Principles and Practice of Meat and Milk Hygiene. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: senior standing in the veterinary curriculum or consent of instructor. Principles and practice of inspection and sanitary control of meat of mammalian origin and of milk.

Mr. Sadler, Mr. Genigeorgis

254. Public Health Aspects of Meat and Meat Products Technology. (2) III.

Lecture—2 hours. Prerequisite: consent of instructor. Study of the influence of techniques and procedures for processing meats and meat products upon their wholesomeness as food.

Mr. Riemann, Mr. Genigeorgis

290. Seminar in Epidemiology and Preventive Medicine. (1) I, II, III.

Seminar—2 hours. (S/U grading only.)

The Staff (Chairman in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-9) I, II, III.

The Staff (Chairman in charge)

FOODS

Major Advisers.—See *Class Schedule* listing under *Consumer Food Science*.

Major Program and Graduate Study.—See pages 83 and 182.

Related Courses. See *Consumer Science, Food Science and Technology, Institution Management, Nutrition, Viticulture and Enology 3 (Introduction to Wine Making)*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses**47. Food Product Development Field Study. (1) III.**

Discussion—three 2-hour sessions; field trip—2 days. To observe commercial aspects of the large-scale development, distribution and evaluation of food products intended for human consumption. (P/NP grading only.) Mr. Schutz

99. Special Study for Undergraduate Students.

(1-5) I, II, III. The Staff (Mr. Russell in charge)

Upper Division Courses**100A. Principles of Food Composition and Preparation. (3) I.**

Lecture—3 hours. Prerequisite: Chemistry 8B; one course in physics; Bacteriology 2 (may be taken concurrently). Science, sensory aspects and aesthetics of food preparation with emphasis on the chemical and physical properties of food products. Characteristics and functions of colloids, carbohydrates, lipids, and proteins in food combinations. Mr. Russell

100B. Principles of Food Composition and Preparation. (3) II.

Lecture—3 hours. Prerequisite: course 100A. Chemical, physical, microbiological, and sensory aspects relating to food. Edible plant tissues, protein foods, pigments, food preservation, packaging and marketing, food regulatory agencies, science and aesthetics of food combinations, food habits, world food problems.

Mr. Russell

101A. Principles of Food Composition and Preparation Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: course 100A (should be taken concurrently). Studies of the chemical, physical and sensory properties of foods. Characteristics and functions of basic constituents and of food systems—solutions, colloidal dispersions, gel structures, emulsions and foams. Ms. Bruhn

101B. Principles of Food Composition and Preparation Laboratory. (2) II.

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 100B, should be taken concurrently. Studies of the chemical, physical, microbiological and sensory aspects relating to foods. Plant, meat and flour systems, science and aesthetics of food combinations. Ms. Bruhn

120. Comparative Aspects of Food Habits and Culture. (3) I.

Lecture—3 hours. Prerequisite: Food Science and Technology 1 or Anthropology 2; consent of instructor. Intercomparison of cultural, geographical, socioeconomic; religious and psychological influences on development and maintenance of food habits. Past and present sub-cultural groups in the United States and other countries, with emphasis on the role of food within the total pattern of living of the social units. Ms. Pangborn

134. Concepts of Food Acceptance. (3) I.

Lecture—3 hours. Recommended: introductory course in psychology and foods or food science. Contribution of physical and psychological factors to food acceptance. Role of flavor,

appearance, texture; effects of monotony, food classes, combinations, background characteristics, and environment. Problems and methods of changing food habits. Mr. Schutz

135. Principles of Product Development. (3) II.

Lecture—3 hours. Recommended: one course in introductory foods or food science. Presents basic concepts of product research and development. Organization, activities, new product development, project management. Role of food regulations, consumerism, marketing, advertising, consumer research. Mr. Schutz

197. Introduction to Research in Foods. (4) III.

Lecture—1 hour; laboratory—9 hours. Prerequisite: majors of senior standing. Senior thesis on independent problems.

Mr. Russell in charge

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Russell in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Russell in charge)

Graduate Courses**290. Seminar. (1) III.**

Seminar—1 hour.

The Staff (Mr. Russell in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Schutz in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Schutz in charge)

FOOD SCIENCE AND TECHNOLOGY

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 92 and 182.

Related Courses. See *Biochemistry, Consumer Science, Foods, Nutrition, Viticulture and Enology; Engineering 110 (Introduction to Engineering Principles); Environmental Toxicology 180 (Principles of Environmental Toxicology); Epidemiology and Preventive Medicine 150 (Food-borne Infections and Intoxications); Plant Science 112 and 112L (Post-harvest Physiology and Handling of Horticultural Commodities).*

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses**1. Introduction to Food Science. (3) I, II, III.**

Lecture—3 hours. Open to nonmajors. Development and maintenance of an adequate

food supply; food quality and its measurement; scientific and technological aspects of converting raw animal and plant products into a large variety of processed and preserved foods; maintenance and improvement of the acceptability and nutritional value of foods.

Messrs. Amerine, Stewart, Schweigert

49. Processing Plant Studies. (1) I.

Prerequisite: course 1. Field trips to observe processing, distribution, quality control and regulatory control of foods and related materials. Mr. Leonard

99. Special Study for Undergraduates. (1-5) I, II, III.

The Staff (Mr. Schweigert in charge)

Upper Division Courses**101. Biochemistry and Food Science. (3) III.**

Lecture—3 hours. Prerequisite: Biochemistry 101B. Topics on enzymes, proteins, lipids and

NOTE: For key to footnote symbols, see page 191.

vitamins. Biochemical principles related to food composition, preservation and processing.

Mr. Tappel

102. Malting and Brewing Technology. (3) I.

Lecture—3 hours; field trips and pilot-scale brewing by arrangement. Prerequisite: Biochemistry 101A. Technology of the malting, brewing, and fermentation processes is integrated with the chemistry, biochemistry, and microbiology that determines industrial practices and product quality.

Mr. Lewis

103. Physical and Chemical Methods for Food Analysis. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biochemistry 101B; Chemistry 5; Chemistry 8B (may be taken concurrently). Theory and application of physical and chemical methods for analyzing foods.

Mr. Whitaker, Mr. Bernhard

104. Food Microbiology. (3) II.

Lecture—3 hours. Prerequisite: Bacteriology 2; Chemistry 8A; or equivalent courses. Taxonomy, physiology, ecology, and control of beneficial microorganisms important in the manufacture and ripening of foods, undesirable microorganisms that produce defects and spoil foods, and harmful microorganisms associated with food-borne infections and intoxications.

Mr. Collins

104L. Food Microbiology Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: Bacteriology 3 or equivalent; course 104 (should be taken concurrently). Laboratory exercises illustrate selected subject matter discussed in course 104. Microbiological techniques used in studying the characteristics of beneficial, harmful, and undesirable microorganisms associated with foods.

Messrs. Crisan, Collins, Vaughn

105. Microbiological Analysis of Foods. (3) III.

Lecture—1 hour; laboratory—5 hours. Prerequisite: courses 104, 104L. Cultural and morphological characteristics of specific groups of bacteria and fungi involved in production or deterioration of foods. Analyses of microbiological quality of foods and food products.

Mr. Crisan, Mr. Vaughn

106. Industrial Fermentations. (3) I.

Lecture—3 hours. Prerequisite: Bacteriology 2. Microorganisms and their activity in relation to industrial processes such as baking, brewing, and the production of industrial solvents, vitamins, enzymes, drugs, and other chemicals. For laboratory experience in this field, students may register in course 106L.

Messrs. Lewis, Phaff, Kunkee

106L. Food and Industrial Microbiology Laboratory. (3) (Summer).

Laboratory—90 hours total. Prerequisite: a course in industrial fermentation. Microorgan-

isms and their activities in relation to industrial processes such as baking; brewing; production of industrial alcohol, yeasts, solvents, vitamins, enzymes, antibiotics, and other drugs.

Mr. Lewis

107A. Analysis of Variance as Applied to Sensory Evaluation Problems. (1) II.

Lecture, discussion and laboratory—2 hours. Prerequisite: Mathematics 13 or its equivalent. Intensive review of hypothesis testing and the analysis of variance.

Ms. Pangborn

107B. Principles of Sensory Evaluation of Foods. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 107A or the ability to use analysis of variance. Nature of sensory response with emphasis on taste and smell as related to foods; design and methodology of small panel and consumer panel testing; and application of appropriate mathematical procedures.

Mr. Amerine, Ms. Pangborn, Mr. Schutz

108A. Food Plant Sanitation. (2) I.

Lecture—2 hours. Prerequisite: Chemistry 1A. Principles of water conditioning and water treatment, chemical sanitizing agents, metallic corrosion, fundamental concepts in the disposal of wastes, and discussion of other factors relating to food plant sanitation.

Mr. Lewis

108B. Food Plant Sanitation. (2) II.

Lecture—2 hours. Prerequisite: Chemistry 8B. Principles of hard-surface detergency; detergent classification and formulations, soil and substrate considerations, energy relationships in detergency, and theories and mechanisms of detergency.

Mr. Jennings

110A. Physical Principles in Food Processing. (4) I.

Lecture—3 hours; discussion—2 hours. Prerequisite: Physics 2A and 2B or equivalent; calculus recommended. Not open for credit to students enrolled in College of Engineering. Applications of the conservation of mass and energy to food processing. Elements of engineering thermodynamics, fluid mechanics, heat and mass transfer, and problem solving.

Mr. Merson

110B. Heat Transfer in Food Processing. (2) II.

Lecture—2 hours. Prerequisite: course 110A or equivalent. Conduction, convection, radiation, principles of refrigeration, heat exchangers.

Mr. Henderson

111. Introduction to Food Processing. (4) I.

Lecture—3 hours; discussion-demonstration—2 hours. Prerequisite: Bacteriology 2, Chemistry 8A-8B, and Physics 2A-2B, or their equivalents. Food processing from farm to package. Characteristics of raw materials, fresh produce handling, overview of food processing and processing unit operations, chemical additives. Demonstration and field trips.

Mr. Miller, Mr. Nickerson

113. Structure of Food Materials. (3) I.

Lecture—3 hours. Anatomical features and structural properties of foods; histochemical tests of food tissues; rheological characteristics; food texture. Mr. Sterling

119. Principles of Dairy Processing. (3) III.

Lecture—3 hours. Prerequisite: Bacteriology 2; Chemistry 8B. Technical principles related to the commercial processing of milk and its products including ice cream, butter and cheese; theory and practical applications.

Mr. Nickerson, Mr. Dunkley

120. Muscle as Food. (2) III.

Lecture—2 hours; demonstrations (occasional). Prerequisite: Biochemistry 101B and Bacteriology 2 or equivalent. Biochemical, physiological, microbiological, psychophysical and engineering principles underlying the conversion of muscle to meat, man's most expensive food. Includes processing, preservation, brining, smoking and curing of meat, poultry, marine foods, and sausages. Mr. Peterson and staff

121. Birds and Their Eggs as Food. (3) I.

Lecture—3 hours; demonstrations. Prerequisite: consent of instructor; Biochemistry 101B recommended. Avian products as food considered from the physical, chemical and nutritional aspects. Factors affecting processing, preservation and quality. Mr. Peterson, Mr. Brant

125. Metals and Metal Complexes in Foods. (4) II.

Lecture—4 hours. Prerequisite: Biochemistry 101B; Chemistry 107B. Structure, reactions, and physical properties of metal complexes, particularly those of importance to food science. The biochemistry of metal ions in foods. Mr. Gruenwedel

130. Chemistry of Milk and Dairy Products. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry 101A. The chemistry of milk constituents; physical and chemical properties of milk; and the changes that occur during the processing and storage of dairy products, with emphasis on quality. Mr. Nickerson, Mr. Smith

131. Packaging Processed Foods. (3) III.

Lecture—3 hours. Prerequisite: course 1; open to nonmajors. Technical aspects of packaging processed foods. Definitions and functions of packages for food. Packaging materials and properties. Public health problems associated with packaging. Food-packaging interactions for major commodities and their control. Design criteria, construction technology and performance testing of food packages. Mr. Stewart, Mr. Winter

190. Recent Advances in Food Technology. (1) I.

Lecture—1 hour. Prerequisite: two courses in Food Science and Technology. Assigned topics,

reports, and discussions concerning recent advances in food technology.

Mr. Schweigert, Mr. Nickerson

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Schweigert in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Schweigert in charge)

Graduate Courses**210. Proteins: Functional Activities and Interactions. (3) II.**

Lecture—3 hours. Prerequisite: Biochemistry 101B. The relationships of structure of proteins to their biological functions. Structural proteins, complexing proteins, and catalytic proteins in plant and animal materials and products.

Mr. Feeney

211. Chemistry of the Food Lipids. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry 101A. Chemical constitution, molecular structure, and stereo chemistry of the fats, phospholipids, and related compounds. Methods of isolation, characterization, and synthesis. Relation of molecular structure to physical properties.

Mr. Smith

213. Macromolecular Gels. (2) I.

Lecture—2 hours. Prerequisite: Biochemistry 101A. Structural interrelationship of water with typical biological polymers in gels; aerogels and xerogels; gel properties and methods of study. Offered in odd-numbered years. Mr. Sterling

235. Mycology of Food and Food Products. (2) III.

Lecture—2 hours. Prerequisite: courses 104, 104L, or their equivalents; concurrent enrollment in course 235L recommended. Fungi involved in the production, destruction and quality of food. Fungi as food; deterioration and spoilage; toxins; fungal food fermentations.

Mr. Crisan

235L. Mycology of Food and Food Products Laboratory. (2) III.

Lecture—1 hour; laboratory—2 hours; term paper preparation. Prerequisite: course 104, 104L, or their equivalents; concurrent enrollment in course 235. Techniques for isolating and identifying important fungi; morphology, physiology, and ecology of representative groups of food related fungi. Mr. Crisan

250A-250B. Isolation and Characterization of Trace Volatiles. (2) I-II.

Lecture—2 hours. Prerequisite: consent of instructor. Preparation of volatile concentrates suitable for gas chromatographic separations; influence of the design and type of chromatograph on the efficiency of separation; techniques

NOTE: For key to footnote symbols, see page 191.

of trapping and reinjecting chromatographic fractions; and spectrometric characterization of the separated compounds. Mr. Jennings

250C. Advanced Characterization and Quantitation of Trace Volatiles. (2) III.

Lecture—2 hours. Prerequisite: knowledge equivalent to that contained in course 250A–250B and introductory computer programming. Theory and application of mass and nmr spectroscopy in the characterization of trace volatiles, quantitative aspects of gas chromatography, data treatment and analysis by computer processing. Mr. Russell, Mr. Jennings

251A–251B. Isolation and Identification of Trace Volatiles. (1) I–II.

Laboratory—3 hours. Prerequisite: course 250A–250B must be taken concurrently. Preparation of volatile concentrates for gas chromatographic separations; construction of gas chromatographic columns and determination of their efficiencies; trapping techniques; infrared

and mass spectrometric characterization of isolated compounds. Mr. Jennings

251C. Advanced Characterization and Quantitation of Trace Volatiles—Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 250C must be taken concurrently. Laboratory exercises involving gas chromatographic purifications, mass and nmr spectroscopy on isolated samples, quantitative treatment of GC data, and computerized data processing. Mr. Russell, Mr. Jennings

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)

Mr. Olcott

298. Group Study. (1–5) I, II, III.

Directed study on food chemistry, food microbiology, food processing or sensory evaluation.

The Staff (Mr. Schweigert in charge)

299. Research. (1–12) I, II, III.

Prerequisite: graduate standing.

The Staff (Mr. Schweigert in charge)

FOREIGN LITERATURE IN TRANSLATION

The following courses are open to students throughout the campus. The readings can be in English. Refer to departmental listing for the course description.

Classics

*139B. Greek Literature in Translation.

141. Greek and Roman Comedy.

Comparative Literature

40A–H. Introduction to Comparative Literature.

49. Freshman Seminar.

50. Intermediate Seminar: Myths and Motifs.

51. Intermediate Seminar: Genres and Literary Judgment.

140A–G. Themes and Structures in Literature.

141. Theories of Literature and the Techniques of Literary Criticism.

*142. Critical Reading and Analysis.

*159. Special Topics in Comparative Literature.

161A–C. Varieties of Authorial Vision.

*162A–F. The Theory and Practice of Literary Translation.

163A–C. Intercultural Literary Colloquium: Literature and the Other Arts.

*164A–C. Intercultural Literary Colloquium: The Great Periods of International Culture.

*165. Intercultural Literary Colloquium: Studies in Fantastic Reality.

*166A. Modalities of Modern Literature: The Novel.

*166B. Modalities of Modern Literature: The Drama.

*167. Intercultural Literary Colloquium: Comparative Study of Major Authors.

168A–E. Intercultural Literary Colloquium: Modern Literary Movements and Styles.

*169A–D. Intercultural Literary Colloquium: The Avant Garde.

Dramatic Art

20. Introduction to Dramatic Art.

156. European Theatre and Drama: Greek to Renaissance.

157. European Theatre and Drama: Renaissance to Romantic.

158. European and American Theatre and Drama: Romantic to the Present.

159. Contemporary Experimental Theatre and Drama.

English

170A. The Epic.

*170B. European Influences on the English and American Novel.

171. English Bible as Literature.

*185. Intercultural Literary Colloquium.

French

*39A. French Literature in English Translation: to the End of the Eighteenth Century.

- *39B. French Literature in English Translation: to the Nineteenth Century.
- 39C. French Literature in English Translation: the Contemporary Period.
- *141. Twentieth-Century Novel.
- 142. Twentieth-Century Novel.
- 150. Masterpieces of French Literature.
- 151. The French Novel.

German

- 15. The Development of German Literature.
- 49. Freshman Seminar.
- 110. Masterpieces of German Prose from Goethe to Kafka.
- 111. Masterpieces of German Drama from Lessing to Brecht.
- 112. Masterpieces of German Poetry from Walther von der Vogelweide to Rilke.
- 113. Hermann Hesse.
- 114. Goethe's Faust.
- 115. German Literature of the Twentieth Century Up to the Second World War.
- 116. German Literature of the Twentieth Century since the Second World War.
- 117. Kafka.
- 118. Brecht.
- 121. Germanic Mythology.
- 126. German Romantic Mythology.
- 127. Literary Aspects of Schopenhauer and Nietzsche.
- 185. Intercultural Literary Colloquium.

Italian

- 139A. Italian Literature in English: Early Italian Literature and Dante Alighieri.

- 139B. Italian Literature in English: Boccaccio, Petrarch and the Renaissance.
- 139C. Italian Literature in English: Modern Italian Literature.

Oriental Languages

- 35A-35B. Great Books of Eastern Asia.
- 132A-132B. History of Japanese Literature.

Russian

- 30. Great Russian Writers.
- 40. Survey of Russian Literature to 1800.
- 41. Survey of Russian Literature: Nineteenth Century.
- 42. Survey of Russian Literature: Twentieth Century.
- 121. The Nineteenth-Century Russian Novel.
- 123. The Twentieth-Century Russian Novel.
- 128. Modern Russian Poets.
- 140. Dostoevsky.
- 141. Tolstoy.
- 150. Russian Culture.
- 185. Intercultural Literary Colloquium.

Spanish

- 34. Mexico in its Literature.
- 35. Survey of Mexican Culture.
- 50A. Hispanic Literary Heritage.
- 50B. Hispanic Literary Heritage.
- 149. Order and Chaos: Latin-American Literature in Translation.
- 150. Masterpieces of Spanish Literature.

FRENCH

Max Bach, Ph.D., *Chairman of the Department*
Department Office, 515 Sproul Hall

Professors:

- Max Bach, Ph.D.
- Marshall Lindsay, Ph.D.
- *Nicole A. D. Marzac, Docteur ès Lettres

Associate Professor:

- Jean Marc Blanchard, Agrégé de Lettres
(*Visiting*)

Assistant Professors:

- Edward M. Bloomberg, Ph.D.
- Gerald Herman, Ph.D.

- Larry H. Hillman Ph.D.
- Jurate Izokaitis, Ph.D.
- Manfred Kusch, M.A. (*Acting*)

Lecturers:

- Margo R. Kaufman, M.A.
- Ruth B. York, Ph.D.



The Major Program

Lower Division Courses.—Required: French 1, 2, 3, 4, and 6 or their equivalents; French 30A, 30B. Recommended: courses 109A, 109B,

NOTE: For key to footnote symbols, see page 191.

and 109C; one year of college Latin or the equivalent.

Upper Division Courses.—Required: at least 36 units including one quarter of course 110, one of the following: 130, 131, 132, and at least one separate course in four out of five of the following periods: Medieval Literature, Sixteenth Century, Seventeenth Century, Eighteenth Century, and Nineteenth Century. Recommended: Classics 40, 41.

Courses 107A, 107B, 160 and either course 104 or 105 are required for the General Secondary Teaching Credential in French.

Honors and Honors Programs (see page 157). The honors program comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination.

Graduate Study.—The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in French. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of French and Italian.

Teaching Minor.—A minimum of 30 units in French including courses 30A, 30B, 104, 105, and 107A–107B. Recommended: courses 109A, 109B, 109C.

Lower Division Courses

A course may not ordinarily be taken for credit if it is a prerequisite to a course already completed. Students offering high school language preparation as a prerequisite must take a placement test.

Course Placement.—Students with two years of high school French normally take French 2, those with three years take French 3 and those with four years take French 4.

1. Elementary French. (6) I, II, III.

Discussion—5 hours; laboratory—two ½-hour sessions. The Staff

*1G. French for Graduate Students. (No Credit) III.

Recitation—3 hours. Course designed to prepare students for the graduate reading examination. Mr. Herman

*1R. Elementary French—Reading. (4) I.

Lecture—3 hours; laboratory—1 hour. Elementary French with emphasis on reading. The Staff

2. Elementary French. (6) I, II, III.

Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 1 or equivalent. Continuation of course 1. The Staff

*2R. Elementary French—Reading. (4) II.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 1R or equivalent. Elementary French with emphasis on reading. The Staff

3. Intermediate French. (6) I, II, III.

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2 or equivalent. Continuation of course 2. The Staff

3R. Intermediate French: Reading. (4) I.

Lecture—3 hours. Prerequisite: course 2R or equivalent. Intermediate French with emphasis on reading. Miss York

4. Intermediate French. (5) I, II, III.

Discussion—5 hours. Prerequisite: course 3. The Staff

4R. Intermediate French: Reading. (4) I, II.

Laboratory—2 hours; recitation—3 hours. Prerequisite: course 3R or equivalent. This variant of course 4 places greater emphasis on reading than the regular course. The Staff

*5R. Intermediate French: Reading. (4) II.

Laboratory—2 hours; recitation—4 hours. Prerequisite: course 4R or equivalent. This variant of course 5 places greater emphasis on reading than the regular course. The Staff

6. Reading and Conversation. (4) I, II, III.

Recitation—4 hours. Prerequisite: course 4 or equivalent. Class discussion; reading of selected works; oral reports; analysis of texts. The Staff

8A. French Conversation. (2) I, II, III.

Lecture—2 hours. Prerequisite: course 3. Course designed to offer practice in speaking French. May be repeated for credit on P/NP grading only, with consent of instructor. The Staff

8B. French Conversation. (2) I, II, III.

Lecture—2 hours. Prerequisite: course 8A or 4, or equivalent. Course designed to offer practice in speaking French. Continuation of course 8A. The Staff

8C. French Conversation. (2) I, II, III.

Lecture—2 hours. Prerequisite: course 8B or 6, or the equivalent. Continuation of course 8B. Course designed to offer practice in speaking French. May be repeated for credit on P/NP grading only, with consent of instructor. The Staff

30A. Grammar, Composition, and Conversation.

(4) I, II, III.

Lecture—3 hours. Prerequisite: course 6. The Staff

30B. Grammar, Composition, and Conversation.

(4) I, II, III.

Lecture—3 hours. Prerequisite: course 30A. The Staff

*39A. French Literature in English Translation: to the End of the Eighteenth Century. (4) I.

Lecture—3 hours. Introduction to French literature for non-French majors. Knowledge of French not required. The Staff

***39B. French Literature in English Translation: the Nineteenth Century. (4) II.**

Lecture—3 hours. Introduction to French literature for non-French majors. Knowledge of French not required. The Staff

39C. French Literature in English Translation: the Contemporary Period. (4) I.

Lecture—3 hours. Introduction to French literature for non-French majors. Knowledge of French not required. Miss Izokaitis

99. Special Study for Undergraduates. (1-5)

I, II, III. The Staff (Chairman in charge)

Upper Division Courses**104. Advanced Grammar and Composition. (4) I.**

Lecture—3 hours; essays and compositions. Prerequisite: course 30B. Mr. Bach

105. Advanced Grammar and Composition. (4) II.

Lecture—3 hours; essays and compositions. Prerequisite: course 104. Mr. Bach

107A. Survey of French Culture and Institutions. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 6. From the origins of French civilization through the seventeenth century. Mrs. Kaufman

107B. Survey of French Culture and Institutions. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 6. From the eighteenth century to the present. Mrs. Kaufman

***109A. Survey of French Literature: Middle Ages and Renaissance. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 6. Readings from major works; discussion of literary history and theory. The Staff

***109B. Survey of French Literature from 1600 to 1800. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 6. Readings from major works; discussion of literary history and theory. The Staff

109C. Survey of French Literature from 1800 to the Present. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 6. Readings from major works; discussion of literary history and criticism. Miss York

110. Advanced Composition and Translation. (2) III.

Lecture—2 hours. Prerequisite: course 30B. May be repeated for credit. The Staff

115A. Medieval Literature: Epic and Romance. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 6. *La Chanson de Roland*, *Tristan et Iseut*, and selected works of Chrétien de Troyes. Texts to be read in modern French. Mr. Herman

***115B. Medieval Literature: Poetry, Drama, and Satire. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 6. Selected readings from the *Trouvères*, *fabliaux*, *Roman de Renart*, and *Roman de la Rose*. Texts to be read in modern French. Mr. Herman

116A. Literature of the Sixteenth Century. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 6. Study of the lyric poetry of the sixteenth century from Marot to d'Aubigné, with emphasis on the Pléiade. Mrs. Marzac

116B. Literature of the Sixteenth Century. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 6. Rabelais and Montaigne. Critical study of the works in relationship to the period. Mrs. Marzac

117A. Theater of the Seventeenth Century. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 6. Mr. Bloomberg

***117B. Moralists of the Seventeenth Century. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 6. Mr. Bloomberg

117C. Poetry and the Novel in the Seventeenth Century. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 6. Miss Izokaitis

118A. Les Philosophes. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 6. Readings from Montesquieu, Voltaire, Diderot, Rousseau and the *Encyclopédie*. The Staff

***118B. The Novel in the Eighteenth Century. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 6. Novels of Lesage, Prévost, Diderot, Rousseau, Laclos, Sade. Mr. Kusch

***118C. The Theater in the Eighteenth Century. (4) I.**

Lecture—3 hours; term paper. Prerequisite: course 6. Plays of Marivaux and Beaumarchais. Mr. Kusch

***119A. The Nineteenth Century. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 6. Romanticism in the drama and novel. Mr. Bach

119B. The Nineteenth Century. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 6. Realism and naturalism: Balzac, Flaubert, Maupassant, Zola. The Staff

NOTE: For key to footnote symbols, see page 191.

***119C. The Nineteenth Century. (4) I.**

Lecture—3 hours; term paper. Prerequisite: course 6. Symbolism: the poetry and poetics of Baudelaire, Mallarmé, Verlaine, Rimbaud, Corbière, Laforgue, and Lautréamont. Mr. Lindsay

***120A. Twentieth Century Drama. (4) I.**

Lecture—3 hours. Prerequisite: course 6. Representative plays from Jarry to Giraudoux. Miss York

***120B. Twentieth Century Drama. (4) II.**

Lecture—3 hours. Prerequisite: course 6. Representative plays from Anouilh to Ionesco. Miss York

130. Critical Reading of Poetry. (4) I.

Lecture—3 hours. Prerequisite: course 6 or its equivalent. Analysis and evaluation of works representing main types of French poetry. Study of poetic conventions and versification.

Mr. Lindsay

***131. Critical Reading of Fiction. (4) II.**

Lecture—3 hours. Prerequisite: course 6 or its equivalent. Analysis and evaluation of short stories and novels representing the main types of French fiction, with emphasis on narrative structure and techniques.

Mr. Kusch

132. Critical Reading of Drama. (4) III.

Lecture—3 hours. Prerequisite: course 6 or its equivalent. Analysis and evaluation of plays representing main types of French drama, with emphasis on dramatic structure and techniques.

Miss York

138A. French Poetry from the Pre-Romantics to**Baudelaire. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 6 or equivalent. Offered in even-numbered years.

Miss Izokaitis

138B. French Poetry from Baudelaire to the**Surrealists. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 6 or equivalent. Offered in even-numbered years.

Miss Izokaitis

***140. Study of a Major Writer. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 6. May be repeated for credit with consent of instructor.

Miss York

***141. Twentieth-Century Novel. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 6 for those reading in French. Gide and Proust. Lectures and discussion in English; readings in French or English.

Mr. Lindsay

142. Twentieth-Century Novel. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 6 for those reading in French. From Malraux to the Nouveau Roman. Lectures and discussion in English; readings in French or English.

Mr. Lindsay

***145. Reading of Philosophical Texts. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 6. Style and content of representative texts from the Renaissance to the present.

Mr. Bloomberg

150. Masterpieces of French Literature. (4) I.

Lecture—3 hours; term paper. Prerequisite: English 1. Reading, lectures, and discussion in English. May not be counted as part of the major in French. Offered in even-numbered years.

Mr. Lindsay

151. The French Novel. (4) I.

Lecture—3 hours; term paper. Reading, lectures, and discussion in English. May not be counted as part of major in French.

Mr. Lindsay

160. Structure of the French Language. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor. Linguistic analysis of modern French.

Mr. Hillman

161A-C. Varieties of Authorial Vision. (4) I, II, III.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Study of representative examples of imaginative literature from antiquity to the present. Content will alternate among the following segments: A. The Tragic Vision; B. The Comic Vision; C. The Tragicomic Vision. May be repeated for credit in different subject area. (Same course as Classics, Comparative Literature, English, German, and Russian 161A-C.)

The Staff

162A-F. The Theory and Practice of Literary*Translation. (4) II.**

Lecture—2 hours; discussion—1 hour; term translation project. Prerequisite: competence in "source" language and consent of instructor. Theories and problems of rendering texts in foreign languages into English; imaginative equivalence and re-creative adaptation demonstrated in terms of various models; comparison of student translation projects. Content will alternate among the following segments: A. French to English; B. German to English; C. Greek/Latin to English; D. Italian to English; E. Russian to English; F. Spanish to English. May be repeated for credit in different subject area. (Same course as Classics, Comparative Literature, English, German, and Russian 162A-F.)

The Staff

163A-C. Intercultural Literary Colloquium:**Literature and the Other Arts. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. The encounter of literature with other art forms; structural and thematic elements of music and the fine arts reflected as subject matter or compositional principles in literature; contrast and similarity in the creative process of the several media. Content will alternate among the follow-

ing segments: A. Music and the Artist-Hero; B. Pictorial Arts and Visual Media; C. Theater, Opera and Dramatic Forms. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, German, and Russian 163A-C.) The Staff

***164A-C. Intercultural Literary Colloquium: The Great Periods of International Culture. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in the literary crosscurrents, accommodation and dominance that have characterized the literatures of a common Western culture. Content will alternate among the following segments: A. The Middle Ages; B. The Renaissance; C. Rationalism and the Enlightenment. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, German, and Russian 164A-C.) The Staff

***165. Intercultural Literary Colloquium: Studies in Fantastic Reality. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. The literary experience of mystery, the fantastic, and the demonic in Western tradition, including works by such writers as Borges, Dostoevski, and Kafka. (Same course as Comparative Literature, English, German and Russian 165.) The Staff

***166A. Modalities of Modern Literature: The Novel. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Intercultural literary colloquium on the transformations of self, nature, and community in novels by such writers as Dostoevski, Svevo, Kafka, Faulkner, and Robbe-Grillet. (Same course as Comparative Literature, English, German, and Russian 166A.) The Staff

***167. Intercultural Literary Colloquium: Comparative Study of Major Authors. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Pivotal works of artists in the Western mainstream, such as Dante, Shakespeare, Cervantes, Goethe, Tolstoi, Proust, and Joyce. (Same course as Comparative Literature, English, German, and Russian 167.) The Staff

168A-E. Intercultural Literary Colloquium: Modern Literary Movements and Styles. (4) I.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in popular taste, messianic vision, and elitist polarities. Content will alternate among the following segments: A. Romanticism; B. Symbolist Poetry and Poetics; C. Naturalism and Expressionism; D. Utopianism and Authoritarian

Structures; E. Quests of Mystery and Science Fiction. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, German, and Russian 168A-E.) The Staff

***169A-D. Intercultural Literary Colloquium: The Avant Garde. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Literary innovation and rebellion in Western Culture since World War I. Content will alternate among the following segments: A. Dada and Surrealism; B. The Absurdist Tradition; C. The "New Novel"; D. Proletarian and Epic Theater. May be repeated for credit in different subject area. (Same course as Comparative Literature, Dramatic Art, English, German, and Russian 169A-D.) The Staff

194H. Special Study for Honors Students.

(5) I, II, III.

Prerequisite: open only to honors students. Guided research leading to an honors paper. The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

***200. Seminar in French Linguistics. (4) III.**

Seminar—3 hours. Prerequisite: graduate standing and consent of instructor. Study of substrata influences, dialect geography, homonymic conflict, jargons and argots, and French contributions to linguistic theory. The Staff

201A. History of the French Language. (4) II.

Seminar—3 hours. Mr. Hillman

201B. History of the French Language. (4) III.

Seminar—3 hours. Prerequisite: course 201A. Mr. Hillman

202. Medieval French Literature. (4) III.

Seminar—3 hours. May be repeated for credit with consent of instructor. Mr. Herman

203. Reading of Old French Texts. (4) III.

Seminar—3 hours. Prerequisite: course 201A-201B or equivalent. Mr. Hillman

204. Fifteenth-Century French Literature. (4)

I, II, III.

Seminar—3 hours. Prerequisite: graduate standing in French. May be repeated for credit with consent of instructor. Mrs. Marzac

205. Sixteenth Century French Literature. (4) II, III.

Seminar—3 hours. Prerequisite: graduate standing in French. May be repeated for credit with consent of instructor. Mrs. Marzac

NOTE: For key to footnote symbols, see page 191.

206. Seventeenth-Century French Literature.

(4) II, III.

Seminar—3 hours. May be repeated for credit with consent of instructor.

Miss Izokaitis

208. Eighteenth-Century French Literature.

(4) I.

Seminar—3 hours. May be repeated for credit with consent of instructor.

Mr. Blanchard

215. Nineteenth-Century French Literature.

(4) III.

Seminar—3 hours. May be repeated for credit with consent of instructor.

The Staff

220. Twentieth-Century French Literature.

(4) I, II, III.

Seminar—3 hours. May be repeated for credit with consent of instructor.

Mr. Lindsay, Miss York

225. Problems in French Criticism. (4-4) II-III.

Seminar—3-3 hours. Selected topics in criticism for intensive investigation. May be repeated for credit with consent of instructor. (Deferred grading only, pending completion of the sequence.)

The Staff

***230. Old Provençal. (4) III.**

Seminar—3 hours. Prerequisite: courses 201A, 201B or equivalent. An introduction to Old Provençal phonology and morphology, with reading and interpretation of texts.

Mr. Hillman

***235. Explication de Textes. (4) III.**Seminar—3 hours. Prerequisite: graduate standing in French. Theory of the *explication de textes* method and exercises according to this method.

Mr. Bloomberg

GENETICS

Major Advisers.—See *Class Schedule* listing.
Major Program and Graduate Study.—See pages 94 and 182.

Questions pertaining to the following courses should be directed to the instructor or the Division of Biological Sciences, 150 Mrak Hall.

Note:—Genetics courses concerning applied genetics follow this listing (see page 322).

Lower Division Courses**10. Heredity and Evolution for the People. (4) I, II.**

Lecture—3 hours; discussion—1 hour. Course intended for liberal arts students. Examine principles and recent developments in genetics and evolution in a context of their social implications. I. ———; II. Mr. Gottlieb

238. Problems in French Composition and Syntax.

(4) I.

Seminar—3 hours. Prerequisite: graduate standing. Problems and techniques of English-French translation: morphological, syntactical, and stylistic.

Mrs. Marzac

297. Individual Research. (1-5) I, II, III.

(S/U grading only.)

The Staff

298. Group Study. (1-4) I, II, III.

Seminar—1-3 hours. May be repeated for credit with consent of instructor.

The Staff (Chairman in charge)

299. Research. (2-5) I, II, III.

The Staff (Chairman in charge)

299D. Individual Study. (1-6) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

Professional Courses**300. Teaching of a Modern Foreign Language.**

(3) III.

Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in a modern foreign language.

Mrs. Kaufman

300A. Teaching of French in College. (1) I.

Lecture-discussion—1 hour. Prerequisite: graduate standing. Designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower-division classes at the University. (S/U grading only.)

Mrs. Kaufman

300B. Teaching of French in College. (1) II.

Lecture-discussion—1 hour. Prerequisite: graduate standing. Designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the University. (S/U grading only.)

Mrs. Kaufman

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor. Individual study for undergraduates.

The Staff (——— in charge)

Upper Division Courses**100A. Principles of Genetics. (3) I, II.**

Autotutorial—2 hours; general assembly—1 hour. Prerequisite: introductory course in general biology, botany, microbiology, or zoology. Sufficient background may also be obtained by independent study of any general biology textbook. An introduction to genetics, covering the areas of molecular and biochemical, developmental, and classical genetics.

I. Mr. Snow; II. Mr. Kado

100B. Principles of Genetics. (3) II, III.

Lectures or autotutorial—3 hours. Prerequisite: course 100A; a knowledge of basic statistics recommended. Continuation of course 100A, covering topics of cytogenetics, quantitative, population, and evolutionary genetics.

II. Mr. Bringham; III. Mr. Abplanalp

100L. Principles of Genetics Laboratory. (1) II, III.

Laboratory—3 hours. Prerequisite: course 100A. Laboratory work in basic genetics to supplement courses 100A, 100B, and 115.

Mr. Green

101. Cytogenetics. (3) III.

Lecture—3 hours. Prerequisite: course 100B or 115. Gross and fine structure of chromosomes and associated cell organelles; chromosome reproduction; behavior of chromosomes as related to genetics and evolution in polyploids, aneuploids, and structural heterozygotes.

Mr. Snow, Mr. Rick

101L. Cytogenetics Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 101 (may be taken concurrently). Laboratory study of chromosome structure and behavior.

Mr. Snow, Mr. Rick

102. Molecular and Biochemical Genetics. (3) I.

Lecture—3 hours. Prerequisite: course 100A, Biochemistry 101B. Study of gene structure, mutation and the biochemical basis of gene function.

Mr. Edlin

103. Organic Evolution. (3) III.

Lecture—3 hours. Prerequisite: course 100B or 115. Evolutionary processes in higher organisms.

Mr. Ayala

104. Developmental Genetics. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100A or 115; Biochemistry 101B; Zoology 100 recommended. Modern concepts of the development and differentiation of vertebrates and other higher organisms. Emphasis is placed on genetic and biochemical approaches to the study of control mechanisms operative at the various levels of gene action.

Mr. Boyd, Mrs. Abbott

105. Population Genetics. (3) I.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 100B or 115; Mathematics 13, 16B recommended. An introductory course in the analysis and interpretation of quantitative genetic systems.

Mr. Allard

115. Human Genetics. (5) I.

Lecture—4 hours; discussion—1 hour. Prerequisite: introductory course in zoology, botany, or biology; Mathematics 13, or equivalent; upper division standing; not open for credit to students who have received credit in courses

100A–100B. Introduction to genetics with special emphasis on man. Course will fulfill the needs of preprofessional students and those in other areas of human biology.

Mr. Green

197T. Tutoring in Genetics. (1–5) I, II, III.

Prerequisite: upper division standing with major in genetics and consent of Department Chairman. Conducting of discussion groups affiliated with one of the department's regular courses.

The Staff (Chairman in charge)

198. Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor. Directed group study of special topics in genetics. (P/NP grading only.)

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

Prerequisite: consent of instructor based on adequate preparation of the student in allied fields.

The Staff (Chairman in charge)

Graduate Courses***203. Advanced Evolution. (3) III.**

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 103 and 105 or consent of instructor. Analysis of the process of speciation in plants and animals. Offered in odd-numbered years.

Mr. Gottlieb

***205. Advanced Population Genetics. (3) I.**

Lecture—3 hours. Prerequisite: course 105, Mathematics 130A or 131A. Analysis of the genetic structure and evolution of populations. Offered in even-numbered years.

Mr. Hansche

206. Current Topics in Genetics. (3) III.

Lecture—2 hours; laboratory or discussion—2 hours. Prerequisite: course 100B or 115 or consent of instructor. Selected topics of current interest in advanced genetics. May be repeated for credit.

Mr. Dobzhansky, Mr. Ayala

291. Seminar in History of Genetics. (2) II.

Seminar—2 hours. Prerequisite: course 100B or 115. The development of modern genetic theories beginning with Mendel. (S/U grading only.)

Mr. Laidlaw

***292. Seminar in Gene Structure and Action. (1–3) III.**

Seminar—1–3 hours. Prerequisite: course 102 or consent of instructor. Topics of current interest related to the structure of genes, mutation, and the mechanisms of gene action. Offered in odd-numbered years. (S/U grading only.)

The Staff

NOTE: For key to footnote symbols, see page 191.

293. Seminar in Cytogenetics and Evolution. (1-3) I.

Seminar—1-3 hours. Prerequisite: course 101 or consent of instructor. Topics of current interest related to chromosomal changes, mutation, and other genetic changes in natural populations, and the application of genetics to study of organic evolution. Offered in odd-numbered years. (S/U grading only.) Mr. Wolfe

294. Seminar in Populational, Ecological, and Behavioral Genetics. (1-3) I.

Seminar—1-3 hours. Prerequisite: courses 103 and 105 or consent of instructor. Topics of current interest relating genetics to problems of populations, ecology, and behavior. Offered in odd-numbered years. (S/U grading only.) Mr. Ayala, Mr. Dobzhansky

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Directed group study of special topics in genetics. (S/U grading only.) The Staff (Chairman in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.) The Staff (Chairman in charge)

APPLIED GENETICS

Related Courses. See Agronomy and Range Science 221 (Advanced Plant Breeding), 222 (Quantitative Genetics and Plant Improvement), 223 (Selection Theory in Plant Breeding); Plant Pathology 215 (Genetics of Plant Pathogens); Plant Science 113 (Plant Breeding); Vegetable Crops 220 (Vegetable Genetics and Improvement).

107. Animal Breeding and Genetics. (3) I.

Lecture—3 hours. Prerequisite: course 100B; Mathematics 13. Qualitative and quantitative inheritance in relation to animal breeding; review of selection and breeding experiments with reference to livestock and poultry improvement. Mr. Bradford

107A. Mammalian Genetics Laboratory. (2) I.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100B or 115; Mathematics 13 recommended. Experiments in qualitative and quantitative genetics using the laboratory mouse.

Segregation; linkage; evaluation of effects of inbreeding, selection and maternal influence on different kinds of traits. Mr. Bradford

107B. Animal Breeding Laboratory. (2) II.

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 107. Laboratory exercises in quantitative genetics using computer generated herd records. Selection progeny testing, and inbreeding experiments with statistical analyses using collected data. Evaluation of environmental effects. Mr. Laben

107C. Discussion of Animal Breeding Experiments and Methods. (1) III.

Discussion—1 hour. Prerequisite: course 107. Review of literature and discussion relating to animal breeding experiments and programs. Emphasis on cattle, sheep and swine. Mr. Rollins

108. Methods in Quantitative Animal Breeding. (3) II.

Lecture—3 hours. Prerequisite: course 107. Principles, methods and procedures in quantitative animal breeding; heritability, intra- and inter-population selection methods, including selection index, family, pedigree and progeny selection; genetic correlation; relationship and inbreeding. Mr. Rollins

131. Genetics of Animal Adaptation. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100B (may be taken concurrently). Genetic principles applied to natural populations; species as plastic elements subject to genetic change through environmental influences and interaction with other species; the role of adaptation in population ecology and development. Mr. Gall

207. Quantitative Genetics and Animal Breeding. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 105B; Mathematics 16A recommended. The genetic theory of selection, population structure, and induced variation, and its implications in the design of animal breeding experiments. Mr. Abplanalp

299. Research in Animal Genetics. (1-12) I, II, III.

The Staff (Mr. Bradford in charge)

GEOGRAPHY

Howard F. Gregor, Ph.D., *Chairman of the Department*

Department Office, 280 Academic Office Building III

Professors:

Howard F. Gregor, Ph.D.

Herbert B. Schultz, Ph.D. (*Geography and Agricultural Engineering*)

Frederick J. Simoons, Ph.D.

Kenneth Thompson, Ph.D.

Associate Professor:

Stephen C. Jett, Ph.D.

Assistant Professors:

William E. Derrenbacher, M.A. (*Acting*)
 Dennis J. Dingemans, M.A. (*Acting*)
 David S. McArthur, Ph.D.

Lecturer:

Michael Bonine, M.A.



Departmental Major Advisers.—Mr. Bonine, Mr. Derrenbacher.

Graduate Adviser: Mr. Thompson.

The Major Program

Lower Division Courses.—Required: Geography 1, 2, 3, 5; Anthropology 2.

Upper Division Courses.—Required: 36 upper division units in geography. Each program should include Geography 105 and 151.

Students who wish to prepare for further training or employment in the field of Urban and Regional Planning may do so by completing certain additional courses, while fulfilling the requirements for the major, in consultation with the departmental adviser.

Teaching Major.—Requirements for the teaching major are the same as for the undergraduate major for degree, with the addition of Geography 300.

Teaching Minor.—A minimum of 30 quarter units in Geography, including course 300.

Subject Representative: Mr. Bonine.

Graduate Study.—The department offers programs of graduate study leading to the M.A. and Ph.D. degrees. Information concerning these programs may be obtained from the Graduate Adviser, Department of Geography.

Lower Division Courses

1. Physical Geography. (4) I, III.

Lecture—4 hours. Basic physical elements of the human habitat, especially climate, landforms, soils, and natural vegetation.

Mr. McArthur

2. Man in the Habitat: An Introduction to Cultural Geography. (4) I, II, III.

Lecture—4 hours. Major systems of habitat use: their characteristics, origins, spread, ecology, and environmental impact. Principal themes in cultural geography. Emphasis on the non-industrial world.

Messrs. Derrenbacher, Simoons, Jett

3. Climate and Weather. (3) II.

Lecture—3 hours. Composition and structure of atmosphere, weather elements, pressure, wind, temperature, moisture, fog, and clouds; weather maps; regional climates and world climate classification; instruments for obtaining

climatological data; installation and maintenance of weather stations; evaluation of recordings. Mr. Schultz

4. Introduction to Maps. (3) I.

Lecture—3 hours. History and principles of cartography; great map-makers; national surveys; modern trends in mapping. Mr. Bonine

5. Man and Resource Development: An Introduction to Economic Geography. (4) I, II.

Lecture—4 hours. Principal ways in which man has developed natural and human resources to meet his needs, and their spatial and morphological expression in the economic landscape.

Mr. Dingemans, Mr. Bonine

6. Man's Role in Changing the Face of the Earth. (4) II.

Lecture—4 hours. Human influence on world geography and ecology. Mr. Thompson

7. Problems in Regional Ecology. (4) III.

Lecture—4 hours. Selected historical and contemporary ecological problems from various parts of the world. Emphasis on interaction between cultural and physical environments. Regions selected from areas of faculty specialization.

Mr. Derrenbacher

11. Cultural Geography of Black America. (4) II.

Lecture—4 hours. Geographic origins, dispersals, and adaptations of blacks in the New World.

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; primarily for lower division students.

The Staff (Chairman in charge)

99. Independent Study. (1-5) I, II, III.

The Staff (Chairman in charge)

Upper Division Courses

***102. Field Course in Physical Geography. (4) III.**

Lecture and field trip—one day per week. Prerequisite: courses 1 and 2 and consent of instructor. Research methodology and field study. Systematic mapping and analysis of elements of the natural landscape.

Mr. Derrenbacher

103. Field Course in Human Geography. (4) III.

Lecture and field trip—one day per week. Prerequisite: courses 1 and 2 and consent of instructor. Research methodology and field study. Systematic mapping and analysis of elements of the cultural landscape.

Mr. Derrenbacher

NOTE: For key to footnote symbols, see page 191.

104. Field Course in Urban Geography. (4) III.

Lecture—1 hour; four 2-day field trips. Field analysis of selected urban problems in northern California. Special attention to regional interrelationships, functional structure, and land use changes as specifically related to the core of the city, changing residential and retail patterns, and urban encroachment on agricultural lands.

Mr. Dingemans

105. Cartography. (4) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 4 or consent of instructor. Theory and construction of map projections; interpretation of maps; compilation and generalization of base-map data; symbolization and processing of map data; cartographic designing and lettering techniques; map reproduction.

Mr. Bonine

106. Interpretation of Aerial Photographs. (4) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 1 or consent of instructor. Analysis of landscape from aerial photographs: land forms; vegetation; land use; settlements; transport and communications. Preparation of contour and planimetric maps, and construction of aerial photo mosaics.

***107. Advanced Cartography. (4) III.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 105. Advanced cartographic representation of statistical and field data. New and innovative techniques in mapping systems.

Mr. Bonine

108. Analysis of Landforms. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Origin of land forms. Review of varied interpretations of processes involved, with emphasis on recent views.

Mr. McArthur

***110. Statistical Methods in Geographical Research. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 13 or equivalent. Principles of statistical reasoning illustrated with examples from the field of geography. Critical review of current applications of statistical methods in geographical research. Mr. McArthur

111. Alluvial Morphology. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 108 or consent of instructor. The origin and genesis of alluvial landforms, especially those of Quaternary age. Analysis of gradational processes giving rise to alluvial landforms, including tectonism, eustasy, and climatic change. Techniques of paleo-landscape, identification: soil stratigraphy, paleohydrology, and radiometric dating. Offered in odd-numbered years.

Mr. McArthur

112. Coastal Morphology. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 108 or consent of instructor. Advanced treatment of coastal landforms and the processes that produce them. Offered in even-numbered years.

Mr. McArthur

119. Arid Lands. (4) II.

Lecture—4 hours. Prerequisite: course 1 or consent of instructor. Physical characteristics and human utilization of rainfall-deficient regions.

Mr. Jett

121. North America. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Natural and economic regions of the United States and Canada.

Mr. Gregor

122A. Middle America. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy from Mexico to Panama and in the Caribbean.

122B. South America. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy in the South American countries.

123A. Western Europe. (4) II.

Lecture—3 hours; term paper. Prerequisite: courses 1 and 2 or consent of instructor. Geographic conditions and their relation to the economic, social and political problems of the countries of Western Europe.

Mr. Thompson

***123B. Eastern Europe. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Geographic conditions and their relation to the economic, social and political problems of the countries of Eastern Europe.

124. The Soviet Union. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Physical landscapes and cultural regions of the U.S.S.R.

Mr. Dingemans

125A. North Africa and the Near East. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Physical, cultural, and historical geography of the Arab World and its neighbors.

Mr. Bonine

125B. Sub-Saharan Africa. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Physical, cultural, and historical geography of Africa south of the Sahara. Mr. Simoons

***126. Southern Asia. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2, or consent of instructor. Physical, cultural, and historical geography of Southern Asia. Mr. Simoons

131. California. (4) I, III.

Lecture—3 hours; discussion—1 hour. Regions of California: landforms, climate, and other physical characteristics; agricultural, mineral, and other resources; and patterns of settlement, population, transportation, and economy. Mr. Derrenbacher, Mr. Gregor

***141A. Economic Geography. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Factors in economic regionalism. Analysis of major agricultural regions of the earth.

Mr. Gregor

***141B. Economic Geography. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Factors in economic regionalism. Analysis of major industrial regions of the earth.

***142. Geography of Agriculture. (4) II.**

Lecture—4 hours. Prerequisite: course 5 or consent of instructor. Spatial analysis of the world agricultural area: inner and outer limits, functional and morphological variations, and contributing physical and human forces. Regional typologies. (Offered in odd-numbered years.) Mr. Gregor

143. Political Geography. (4) III.

Lecture—3 hours; term paper. Areal differentiation of major natural and cultural phenomena affecting the world's political organization. Mr. Thompson

151. History of Geographic Thought. (4) I.

Lecture—3 hours; term paper. Prerequisite: three upper division courses in geography. The literature of geography: objectives, subdivisions, and development of the subject. Mr. Thompson

152. Geographical Discovery and Exploration. (4) I.

Lecture—3 hours; term paper. Expansion of western world's geographical horizons from ancient through modern times. Mr. Thompson

154. Settlement Geography. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Settlement features of the rural landscape: origins, morphology, function, and distribution.

Mr. Bonine

155. Urban Geography. (4) I.

Lecture—3 hours; term paper. The geography of urban land use: the study of the economic, physical, political, and social forces responsible

for the origin and development of urban and metropolitan-area land use patterns; theories of urban growth and structure. Emphasis is on American cities. Offered in odd-numbered years.

Mr. Dingemans

156. The Urban Region. (4) II.

Lecture—3 hours; term paper. Urban-regional and inter-urban relationships: the urban economic base; the Central Place Theory; the functional classification of American cities and the spatial distribution of the functional classes. Offered in even-numbered years. Mr. Dingemans

161. Conservation of Resources and Environment. (4) III.

Lecture—4 hours. Principles of natural-resource and environmental-quality conservation. Land use conflicts between forestry, agricultural, mining, municipal, and recreational interests. Roles of industry, government, and society in creating and resolving resource and environmental problems. Mr. Jett

162. Geography of Water Resources. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Geographical survey of water on the land; needs and opportunities for water-resource development and conservation. Historical solutions to water needs of specific areas, and geographical problems associated with current and future water requirements. Mr. McArthur

170. Cultural Ecology. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or Anthropology 2. Theories of environment-man relations. Ecologic relations of gatherers, fishermen, hunters, swidden cultivators, peasants; their impact on environment; their domestic plants and animals. Mr. Jett

171. Cultural Geography. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Consideration of the principal approaches to cultural geography in modern times, including environmental determinism and possibilism, regional geography, cultural history, cultural ecology, and environmental perception. Mr. Simoons

172. Geography of Domesticated Animals. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 2, Anthropology 2, or consent of instructor. Theories of animal domestication; spread of domesticated animals in Old and New Worlds; contrasting roles of domesticated animals in human ecology through time; pastoral nomadism and other animal-based economies. Mr. Simoons

173. Plants and Culture History. (4) II.

Lecture—4 hours. Prerequisite: course 1 or 2, or consent of instructor. The cultural proc-

NOTE: For key to footnote symbols, see page 191.

esses of adaptation, innovations, and diffusion in relation to plants and plant complexes in various geographic settings. Perception of the plant realm and the assignment of value and symbolic significance to plants.

Mr. Derrenbacher

198. Directed Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

201. Sources and General Literature of Geography. (4) I, II, III.

Discussion—3 hours. Prerequisite: graduate status in geography. Designed for students preparing for higher degrees in geography. May be repeated for credit in one or more of the following subfields: physical, cultural, economic, urban, historical, political, conservation, and regional geography.

The Staff

***250. Theory and Method in Geography. (4) III.**

Lecture—2 hours; discussion—1 hour.

***256. Regional Economic Organization. (4) III.**

Seminar—3 hours. Analysis of theories of spatial organization and examination of their applicability to selected examples of regional economic development.

***290. Seminar: Selected Regions. (4) III.**

Seminar—3 hours. Region to be announced annually.

The Staff

291. Seminar in Cultural Geography. (4) I, III.

Seminar—3 hours. Mr. Jett, Mr. Simoons

***292. Seminar in Landform Analysis. (4) I.**

Seminar—3 hours. Mr. McArthur

***293. Seminar in Political Geography. (4) I.**

Seminar—3 hours.

294. Seminar in Climatology. (4) II.

Seminar—3 hours. Mr. Schultz

***295. Seminar in Urban Geography. (4) II.**

Seminar—3 hours.

***296. Seminar in Agricultural Geography. (4) I.**

Seminar—3 hours. Mr. Gregor

***297. Seminar in Industrial Geography. (4) II.**

Seminar—3 hours.

298. Group Study. (2-5) I, II, III.

Prerequisite: consent of instructor. The Staff

299. Research. (2-9) I, II, III.

The Staff (Chairman in charge)

Professional Course

300. Problems in Teaching Geography. (2) III.

Lecture—2 hours. Prerequisite: course 1 or 2. Establishing, organizing, and conducting courses in geography and regional study. Designed primarily for prospective elementary and secondary school teachers of the social sciences. (P/NP grading only for undergraduates and S/U for graduate students.)

The Staff (Chairman in charge)

GEOLOGY

*Jere H. Lipps, Ph.D., *Chairman of the Department*

Department Office, 175 Physics-Geology Building

Professors:

- Cordell Durrell, Ph.D.
- Charles G. Higgins, Ph.D.
- Ian D. MacGregor, Ph.D.
- James W. Valentine, Ph.D.

Associate Professors:

- *Jere H. Lipps, Ph.D.
- Eldridge M. Moores, Ph.D.

Assistant Professors:

- Gerard C. Bond, Ph.D.
- *Richard Cowen, Ph.D.
- Harry W. Green, II, Ph.D.
- Robert J. Twiss, Ph.D.

Lecturers:

- Robert A. Matthews, A.B.
- Priscilla C. Perkins, Ph.D.



Departmental Major Advisers.—B.S. Degree: Mr. Cowen, Mr. Durrell. A.B. Degree: Mr. Higgins.

The Major Programs

Students interested in becoming professional geologists and continuing their geological studies at the graduate level should elect the program leading to the Bachelor of Science degree. Students desiring a less intensive program in geology as part of their general education or as preparation for nonprofessional careers in geology should elect the program leading to the Bachelor of Arts degree. High school students should note that the preparation for either degree is simplified if their high school programs include chemistry and four years of mathematics.

Bachelor of Science Major Program

Lower Division Courses.—Chemistry 1A–1B–1C or preferably 4A–4B–4C, Geology 60–60L; Mathematics 11, 21A–21B–21C; Physics 4A–4B. In addition, for emphasis in physical geology, Biological Sciences 1 or 10, Mathematics 22A or 22B or 22C and Physics 4C; for emphasis in paleobiology, Biological Sciences 1, Mathematics 15 and Zoology 2. Recommended: Geology 1, 1L, 2, 2L, 3, 3L.

Upper Division Courses.—At least 36 units, including Geology 102, 103–103L, 105–105L, 106–106L, 107–107L, 118, and 190 repeated at least once. Additional courses in cognate sciences, mathematics, and geology required for specialization within physical geology or paleobiology must be selected in consultation with the major adviser.

Bachelor of Arts Major Program

Lower Division Courses.—Biological Sciences 1 or 10; Chemistry 1A–1B or 4A–4B; Geology 60–60L; Physics 2A, 3A, 2B, 3B. Recommended: Chemistry 1C or 4C; Geology 1, 1L, 2, 2L, 3, 3L; Mathematics 13, 15, 16A, 16B.

Upper Division Courses.—Geology 102, 103–103L, 105–105L, 106–106L, 107–107L, and other upper division courses in geology and related fields to total not less than 36 units selected in accordance with a plan approved by the major adviser.

Graduate Study.—The Department of Geology offers a program of study and research leading to the M.S. and Ph.D. degrees. For information regarding graduate study in geology, address the Graduate Adviser, Department of Geology.

Teaching Major.—Requirements for the teaching major are the same as for undergraduate major for degree (A.B. or B.S.).

Teaching Minor.—Thirty units (quarter units) including Geology 60, 103, 105, 106, and 107 to be selected with the advice of the subject representative. Eighteen of the 30 units must be at the upper division or graduate level.

Subject Representative: Mr. Higgins

Lower Division Courses**1. Evolution of the Earth. (3) I.**

Lecture—3 hours. Prerequisite: high school science. Origin and physical development of the Earth through geologic time, and the processes and materials that formed it. Mr. Lipps

1L. Evolution of the Earth Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: course 1 (concurrently). The materials (rocks and minerals), structures (faults and folds), and processes (sea floor spreading and continental drift) that formed the Earth, illustrated by specimens, maps, experiments, and field trips. Mr. Lipps

2. Landforms (3) III.

Lecture—3 hours. Recommended: course 1. Physical geology and geomorphology: the Earth as a planet; processes which affect its erosional and depositional landforms. Mr. Higgins

2L. Landforms Laboratory. (1) III.

Laboratory—3 hours. Recommended: course 2 (concurrently). Introduction to landforms and geologic features as depicted on topographic and geologic maps, structure sections, and aerial photographs. Mr. Higgins

3. History of Life. (3) II.

Lecture—3 hours. Recommended: course 1. The history of life during the three billion years from its origin to the present day. Origin of life and processes of evolution; how to visualize and understand living organisms from their fossil remains. Mr. Cowen

3L. History of Life Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 3 (concurrently); course 25 recommended. Exercises in understanding fossils as the clues to interpreting ancient life, including their functional morphology, paleoecology, and evolution. Mr. Cowen

16. The Physical Earth and Man. (3) III.

Lecture—2½ hours; discussion—½ hour. The problem of non-renewable natural resources. Their role in technology and society; their availability, rates of depletion, and the probable impact on society of their exhaustion.

Mr. Durrell

17. Earthquake and Other Earth Hazards. (2) II.

Lecture—2 hours; field trip—1 day. The impact of earthquakes and other geologic hazards on Man, his structures, and his environment. Discussion of the causes, prediction, and solution of geologic problems in rural and urban settings. Ms. Perkins

20. Geology of California. (2) III.

Lecture—2 hours; demonstration—1 hour. Recommended: course 25. The geologic history of California, the origin of rocks and the environments in which they were formed, the structure of the rocks and the interpretation of their structural history, mineral resources, and appreciation of the California landscape. Ms. Perkins

25. Geologic Excursions. (2) I.

Lecture—1 hour; in the field—several Saturdays, 8–5. Prerequisite: course 1. Study areas of geologic interest in the Sierra Nevada (gold-bearing gravels, glacial terrane, volcanic rocks) and Coast Ranges (old sea floor, folded sedimentary rocks, San Andreas fault) and appraisal of man's impact on the natural environment. Ms. Perkins

NOTE: For key to footnote symbols, see page 191.

60. Materials of the Earth. (3) I.

Lecture—3 hours. Recommended: elementary chemistry. Introduction to the composition, texture and classification of rocks, with emphasis on their processes of formation. Mr. Green

60L. Materials of the Earth Laboratory. (2) I.

Laboratory—6 hours; two one-day field problems. Prerequisite: course 60 (preferably taken concurrently). Introduction to crystallography and the common rock-forming minerals. Mr. Green

Upper Division Courses**102. Field Geology. (4) III.**

Laboratory—3 hours; Saturday field work—8 hours. Prerequisite: courses 60, 60L, 105, 105L, 106, 106L; or consent of instructor. Laboratory study of topographic and geologic maps. Field geologic study of selected areas. Preparation of field reports for application to geologic, engineering, agricultural, and environmental uses. Mr. Higgins, Ms. Perkins

103. General Petrology. (3) II.

Lecture—3 hours. Prerequisite: course 60. Origin, nature, and classification of the principal rocks that comprise the crust of the Earth. Mr. Durrell

103L. General Petrology Laboratory. (2) II.

Laboratory—6 hours. Prerequisite: courses 60, 60L, and 103 (preferably taken concurrently). Laboratory study of the principal rocks that comprise the crust of the Earth by methods applicable in the field. Mr. Durrell

105. Structure of the Earth. (3) I.

Lecture—3 hours. Prerequisite: course 60 or 1. Types and significance of deformation of earth materials; interpretation of folds, faults, and other rock structures; introduction to regional structural geology, plate tectonics, continental drift, and structure of the earth's interior. Mr. Twiss

105L. Structure of the Earth Laboratory. (3) I.

Lecture—2 hours; laboratory—4 hours; two one-day field trips. Prerequisite: course 105 (may be taken concurrently) or consent of instructor. Introduction to stress, strain, and the application of mechanics to problems in structural geology. Introduction to geologic maps, structure sections, and field techniques; graphic solutions to structural problems; structural analysis. Mr. Twiss

106. Ancient Environments. (3) II.

Lecture—3 hours. Prerequisite: course 1 or 60. Study of modern and ancient environments; processes and geologic records of mountains, plains, coasts, shallow seas, and deep oceans. Ecology and the fossil record as a key to past environments; introduction to stratigraphic principles and methods. Mr. Bond

106L. Ancient Environments Laboratory. (2) II.

Laboratory—6 hours; two or three one-day field trips. Prerequisite: course 106 (concurrently). Introduction to stratigraphic procedures, identification of environmentally diagnostic rocks and fossils, problems of making geologic maps, recognition of ancient environments in the field. Mr. Bond

107. Principles of Paleobiology. (3) III.

Lecture—3 hours. Prerequisite: Biological Sciences 1. Evolution and ecological structure of the biosphere from the origin of life to the present, with special emphasis on the oceanic environment during the last 600 million years. Mr. Valentine

107L. Principles of Paleobiology Laboratory. (2) III.

Laboratory—6 hours; two all-day field trips. Prerequisite: Biological Sciences 1; course 107 (concurrently). Exercises in determining the ecological functions and evolution of individuals, populations, and communities of fossil organisms in field and laboratory. Mr. Valentine

111A. Paleobiology of Invertebrata. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of the major phyla of invertebrates. Mr. Cowen

111B. Paleobiology of Protista. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of single-celled organisms. Mr. Lipps

113. The Solar System. (3) II.

Lecture—3 hours. Prerequisite: one course in physical science. Evolution of stars and their bearing on the origin of elements. Origin and early history of the solar system and of the terrestrial planets and their satellites. Mr. MacGregor

115. Geochemistry. (3) II.

Lecture—3 hours. Prerequisite: Chemistry 1A (may be taken concurrently). Application of principles of solution, physical, structural, colloidal, and isotopic chemistry to geologic problems. Formation of carbonate rocks and other chemical sediments, rock weathering, and clay mineral formation. Magmatic, metamorphic, and hydrothermal processes and radiometric dating techniques. Mr. Bond, Mr. MacGregor

116. The Oceans. (3) II.

Lecture—3 hours. Prerequisite: upper division standing or consent of instructor. Introductory survey of the marine environment. Oceanic physical phenomena, chemical constituents, geological history, and the sea's biota; man's utilization of marine resources. (Same course as Environmental Studies 116.) Mr. Powell, Mr. Valentine

117. Physics of the Earth. (3) II.

Lecture—3 hours. Prerequisite: course 105, Mathematics 21C, Physics 4B; Mathematics 22B and Physics 4C recommended. Introduction to the study of deep earth structure and processes: seismology, heat flow, geomagnetism, paleomagnetism, and gravity. Mr. Twiss

118. Summer Field Geology. (8) (Summer).

Six weeks in field. Prerequisite: course 102. Preparation of a geologic map and report on a selected field area. The Staff

124. Optical Mineralogy. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: courses 60, 60L. Optical properties of minerals and applications to the study of rocks in the petrographic microscope. Mr. Green

125. Igneous Petrology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 60, 60L, 124; or consent of instructor. Origin and characteristics of igneous rocks and processes of the earth, moon, and terrestrial planets. Laboratory study of representative rock suites in hand specimen and thin section. Mr. MacGregor

126. Sedimentation and Sedimentary Petrology.**(4) III.**

Lecture—2 hours; laboratory—6 hours; two 1-day field trips. Prerequisite: courses 60, 60L, 124. Survey of sedimentary rocks, including weathering processes, mechanics of sediment transport and deposition, and diagenesis and lithification. Identification of sediments and textures in hand specimen and thin section. Environmental significance of sedimentary suites. Mr. Bond

128. Metamorphic Petrology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 60, 60L, 124; or consent of instructor. Origin and characteristics of metamorphic rocks and processes. Laboratory study of representative rock suites in hand specimen and thin section. Mr. Twiss

130. Non-renewable Natural Resources. (3) I.

Lecture—3 hours. Prerequisite: course 1 or 16. Origin, occurrence, and distribution of non-renewable resources, including metallic, non-metallic, and energy-producing materials. Problems of discovery, production, and management. Estimations and limitations of reserves, and their sociological, political, and economic effects. Mr. Matthews

134. Environmental Geology and Land Use Planning.**(3) II.**

Lecture—3 hours. Geologic aspects of land use and development planning. Problems concerning waste disposal, land stability, earth-

quake prediction. Analytic techniques, presentation of reports, and legal aspects of selected case studies. Mr. Matthews

140. Paleobotany. (5) III.

Lecture—2 hours; laboratory—6 hours; two all-day field trips and one three-day field trip. Prerequisite: senior standing. Guiding principles underlying an analysis of successive floral assemblages in Cenozoic and Cretaceous rocks. Development of modern vegetation, with emphasis on centers of origin and radiation, rates of evolution, and community evolution. (Same course as Botany 140.) Mr. Axelrod

***142. Evolution of Plant Ecosystems. (4) I.**

Lecture—2 hours; five or more all-day Saturday field trips. Prerequisite: upper division standing; Botany 117 or 140 or 141 strongly recommended. Development of mixed mesophytic forest, conifer-hardwood forest, taiga, mediterranean and desert ecosystems. (Same course as Botany 142.) Mr. Axelrod

150A. Physical and Chemical Oceanography. (3) I.

Lecture—3 hours. Prerequisite: Environmental Studies 144; Physics 4B; Mathematics 22C; Chemistry 1C; or upper division standing in a natural science and consent of instructor. Physical and chemical properties of seawater, fluid dynamics, air-sea interaction, atmosphere-coupling, currents, waves, tides, mixing, sea ice, major oceanic geochemical cycles. (Same course as Environmental Studies 150A.) Mr. Powell

150B. Geology of the Oceans. (3) II.

Lecture—3 hours. Prerequisite: courses 60, 60L, or consent of instructor. Introduction to the origin and geologic evolution of ocean basins. Topics include composition and structure of oceanic crust, marine volcanisms, and deposition of marine sediments. Special emphasis on applying sea floor spreading theory to interpreting geologic history of the ocean floor. (Same course as Environmental Studies 150B.) Mr. Bond, Mr. Moores

150C. Biological Oceanography. (3) III.

Lecture—3 hours. Prerequisite: Biological Science 1 and a course in general ecology or consent of instructor. Survey of the ecology of major marine habitats including intertidal, shelf benthic, deep-sea, and plankton communities. Existing knowledge and contemporary issues in research will be equally stressed. A portion of the course will be devoted to man's use of and impact on the ocean. (Same course as Environmental Studies 150C.) Mr. Valentine, Mr. Richerson

152A. Introduction to Aerial Photographs. (2) I.

Lecture—1 hour; laboratory—3 hours. Prerequisite: stereoscopic vision; courses 2 and 2L or 1 recommended. What you need to know to

NOTE: For key to footnote symbols, see page 191.

use aerial photographs in the field: types and availability; stereoscopic viewing; basic geometry and photogrammetry. Practice in planimetric plotting, data-transfer, and quantitative measurements from photographs. Mr. Higgins

152B. Photogeology. (3) II.

Lecture—1 hour; discussion—1 hour; laboratory—5 hours. Prerequisite: stereoscopic vision and one course in Geology or Geography I; courses 60L, 102, 105, and 152A or Geography 106 recommended. Photogeologic interpretation and introduction to remote sensing. Practice in interpretation of geologic structures, rock types and regional geologic history through analysis of features visible on aerial photographs. (P/NP grading only.) Mr. Higgins

*153. Studies in Geomorphology. (3) I.

Lecture—3 hours. Prerequisite: course 2. Recommended: course 2L and Geography 108. Methods of analysis of geomorphic problems. Mr. Higgins

160. Global Tectonics. (3) I.

Lecture—3 hours. Prerequisite: course 2. Recommended: course 2L and Geography 108. Methods of analysis of geomorphic problems. Mr. Higgins

160. Global Tectonics. (3) II.

Lecture—3 hours. Prerequisite: course 105 or consent of instructor. Major tectonic features of the earth. Causes, processes, and consequences of plate motions through geologic time; plate tectonic model of orogenesis. Mr. Moores

162. Stress and Deformation. (4) III.

Lecture—3 hours; discussion—2 hours. Prerequisite: Mathematics 21C and Physics 4B; Mathematics 22A, 22C, and Physics 4C recommended. Introduction to tensor analysis: tensor notation transformations, representation quadratic, Mohr-circle construction; stress; strain; strain-rates, elasticity. Solution of general, three-dimensional problems with geological application. Mr. Green

175. Introduction to Geological Engineering. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: junior standing. Introduction to the principles of geology, and study of geologic features that affect engineering structures. Discussion of geological aspects of engineering construction problems by means of case history studies. (Same course as Civil Engineering 175.) Mr. Shen, Mr. Matthews

180. The Use of X-rays in Instrumental Analysis.

(5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: elementary chemistry and elementary physics. Theory of the generation and detection of x-rays as applied to the determination of crystal structures and the analytical chemistry of rocks, minerals, and other compounds. Lab-

oratory sessions will be given on use of the x-ray diffractometer and electron microprobe both as a scanning electron microscope and analytical tool. Mr. MacGregor

190. Seminar in Geology. (1) I, II, III.

Lecture-discussion—2 hours; term paper. Seminar on current topics in geology. (P/NP grading only.) The Staff

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: senior standing in geology or consent of instructor.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-4) I, II, III. The Staff (Chairman in charge)

Graduate Courses

201A. Ecological Theory. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: a course in ecology, e.g., Environmental Studies 100, and graduate standing. Course will focus on the ecologic community as a unit. The major generalizations concerning the structure and functioning of the community will be examined together with the generalization relating both structure and function to the abiotic environment and its fluctuations. (Same course as Botany, Ecology and Zoology 201A.) Messrs. Salt, Major, Valentine

201B. Analysis of a Selected Ecosystem. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing; course 201A or consent of instructor. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a particular ecosystem. Recent advances in theory, technique, and basic information are emphasized. Lectures will be given by specialists from several fields. May be repeated for credit. (Same course as Botany, Ecology and Zoology 201B.)

The Staff (Mr. Goddard in charge)

201C. The Changing Biosphere. (3) III.

Lecture—2 hours; assigned problem. Prerequisite: graduate standing; courses 201A, 201B, or consent of instructor. Course deals with changing gas balance and weather in the biosphere and effects on plants and animals, the effects of structural, chemical, and physical changes on living systems, changes in species diversity, effects of human population increase, and related topics. (Same course as Botany, Ecology and Zoology 201C.)

The Staff (Mr. Richerson in charge)

213. Geomorphology. (3) I.

Seminar—3 hours. Prerequisite: course 153 or Geography 108. Selected geomorphic studies of surficial processes and the evolution of landforms. Mr. Higgins

216. Tectonics. (3) III.

Seminar—3 hours. Prerequisite: course 105. Tectonic features of the Earth; structural histories of selected deformed belts in relation to

theories of orogenesis. Offered in odd-numbered years.

Mr. Moores

***218. Advanced Structural Analysis. (3) II.**

Lecture—2 hours; seminar—1 hour. Prerequisite: course 105. Analysis of stress and strain. Theoretical and experimental investigations of rock deformation. Principles of fracture, folding, and flow of rocks and their application to field occurrences. Offered in even-numbered years.

Mr. Green

236. Physical Geology of California. (2) I, II, III.

Seminar—2 hours.

Mr. Durrell

***254. Phase Equilibria. (3) I.**

Seminar—3 hours. Prerequisite: Chemistry 1C and Mathematics 22A; physical chemistry recommended. Physicochemical aspects of the phase relations in silicate systems and their application to the petrogenesis of igneous and metamorphic rocks.

Mr. MacGregor

255. Genesis of Metamorphic Rocks. (3) II.

Seminar—3 hours. Prerequisite: course 124; courses 125, 254 recommended. Physicochemical principles of metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks. Offered in even-numbered years.

Ms. Perkins

***257. Sedimentary Petrology: Terrigenous Rocks.**

(4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 126. Origin of land-derived non-carbonate clastic rocks. Textural and compositional analyses in thin section. Offered in odd-numbered years.

***258. Sedimentary Petrology: Carbonate Rocks.**

(4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 126. Origin of biological, biochemical, and chemical sedimentary carbonate rocks. Textural and compositional analyses in thin section. Offered in even-numbered years.

260. Paleontology. (3) III.

Seminar—3 hours. Prerequisite: course 111A or 111B, or graduate standing in a biological science. Selected problems in paleontology. Subject to be studied will be decided at an organizational meeting.

Messrs. Cowen, Lipps, Valentine

***261. Paleocoenology. (3) II.**

Lecture—2 hours; seminar—1 hour. Prerequisite: course 107 and Mathematics 15. Recommended: Mathematics 13. Theoretical and operational analyses of the structure and evolution of ancient and modern biotic associations, chiefly marine. Offered in odd-numbered years.

Mr. Valentine

***262. Paleosystematics. (3) II.**

Lecture—1 hour; seminar—2 hours. Prerequisite: course 107, Mathematics 15. Recommended: Genetics 100B, Mathematics 13. Principles and methods of taxonomy of fossil organisms. Offered in even-numbered years.

Mr. Valentine

263. Functional Morphology of Fossil Invertebrates. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 111A or Zoology 112. Principles and methods of functional analysis of fossils, with special reference to selected problems in invertebrate phyla.

Mr. Cowen

***269. Evolutionary Biology of Protista. (3) III.**

Seminar—3 hours. Prerequisite: course 111B or Zoology 110 or Bacteriology 150. Analysis and discussion of selected topics on the evolution of single-celled organisms with emphasis on their fossil record and biology. Offered in odd-numbered years.

Mr. Lipps

280. Igneous Petrology. (3) I.

Seminar—2 hours; laboratory—3 hours. Prerequisite: course 124. Integrated laboratory, field study, and seminar on igneous processes and products.

Mr. MacGregor

290. Seminar in Geology. (1) I, II, III.

Seminar—1 hour; discussion—1 hour. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. (S/U grading only.)

The Staff

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-6) I, II, III.

The Staff (Chairman in charge)

GERMAN

Clifford A. Bernd, Ph.D., *Chairman of the Department*

Department Office, 416 Sproul Hall

Professors:

Clifford A. Bernd, Ph.D.

Wolfgang W. Moelleken, Ph.D.

Associate Professors:

John F. Fetzer, Ph.D.

Roland W. Hoermann, Ph.D.

H. Guenther Nerjes, Ph.D.

NOTE: For key to footnote symbols, see page 191.

Assistant Professors:

Wilbur A. Benware, Ph.D.
Karl R. Menges, Ph.D.
Fritz Sammern-Frankeneegg, Ph.D.

Lecturer:

William M. Estabrook, Ph.D.



Departmental Major Adviser.—Mr. Estabrook.

Graduate Advisers.—Mr. Nerjes, Mr. Menges.

The Major Program

Lower Division Courses.—German 1, 2, 3, 4, or 6A–6B.

Upper Division Courses.—36 units in upper division courses, including German 101, 102, 103; 119A and 119B. Majors can take not more than two courses in translation for credit.

Honors and Honors Program (see page 157).—The honors programs comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination.

The Master of Arts Degree

The Department offers programs of study leading to the M.A. degree. A minimum of 36 units is required. In addition, candidates for the M.A. will be expected to acquire a reading knowledge of French. Further information may be obtained by writing to the Graduate Adviser.

The Degree of Doctor of Philosophy

The Department offers programs of study and research leading to the Ph.D. degree. Detailed information may be obtained by writing to the Graduate Adviser.

Teaching Major.—Requirements are the same as for the departmental major.

Teaching Minor.—A minimum of 30 units in German, including 101, 102, 103.

Subject Representative: Mr. Estabrook.

Lower Division Courses

Course Placement.—Students with two years of high school German normally continue in German 2; those with three years, German 3; those with four years, German 4 or 6A–6B.

1. Elementary German. (6) I, II, III.

Discussion—5 hours; laboratory—two ¼ hour sessions. Mr. Estabrook

2. Elementary German. (6) I, II, III.

Discussion—5 hours; laboratory—two ¼ hour sessions. Prerequisite: course 1. Mr. Estabrook

2X. Intensive Elementary German. (12) II.

Discussion—10 hours; laboratory—2 hours. Prerequisite: course 1. A special double-credit

course, combining courses 2 and 3. Designed to confer greater oral-aural proficiency than the normal sequence and to permit selected students to satisfy the college language requirement at an earlier date. Prepares student for courses 4, 6A, 6B. Mr. Benware

3. Intermediate German. (6) I, II, III.

Discussion—5 hours; laboratory—two ¼ hour sessions. Prerequisite: course 2. Class discussions of events and life in Germany—present and past. Reading of modern short stories with inductive review of grammar. Mr. Estabrook

4. Intermediate German. (4) I, II, III.

Recitation—3 hours. Prerequisite: course 3. (Course 4 may be taken concurrently with 6A and/or 6B.) Review of grammatical principles by means of written exercises; expanding of vocabulary through readings of modern texts. The Staff

6A. Spoken German. (2) I, II, III.

Discussion—2 hours. Prerequisite: course 3. (Course 6A may be taken concurrently with 4 and/or 6B.) Conversational practice based on everyday vocabulary of modern spoken German. (P/NP grading only.) The Staff

6B. Spoken German. (2) I, II, III.

Discussion—2 hours. Prerequisite: course 3. (Course 6B may be taken concurrently with 4 and/or 6A.) Conversational practice based on everyday vocabulary of modern spoken German. Topics vary from course 6A. (P/NP grading only.) The Staff

10. Basic Reading German. (6) II.

Lecture—3 hours; discussion—2 hours; laboratory; outside reading projects. Prerequisite: sophomore standing. Intensive course for non-majors to furnish students with sufficient grasp of reading grammar and vocabulary to permit comprehension of intermediate-level texts of general cultural value. Intended as common core of techniques supplemented by specialization in courses 11H, 11N, 11S. Completion of courses 10 and one from 11H, 11N, 11S satisfies the College foreign language requirement. (P/NP grading only.) The Staff

11H. Reading German for the Arts and Humanities. (6) II.

Lecture—3 hours; discussion—2 hours; laboratory—1 hour. Prerequisite: course 10 or equivalent. Continuation of course 10, with specialized focus for upper-division and graduate students in arts and humanities. Reading selections will be appropriately representative. (P/NP grading only.) The Staff

11N. Reading German for the Natural Sciences. (6) II.

Lecture—3 hours; discussion—2 hours; laboratory—1 hour. Prerequisite: course 10 or

equivalent. Continuation of course 10, with specialized focus for upper-division and graduate students in the natural sciences. Reading selections will be appropriately representative. (P/NP grading only.) The Staff

11S. Reading German for Social Sciences. (6) II.

Lecture—3 hours; discussion—2 hours; laboratory—1 hour. Prerequisite: course 10 or equivalent. Continuation of course 10, with specialized focus for upper-division and graduate students in the social sciences. Reading selections will be appropriately representative. (P/NP grading only.) The Staff

15. The Development of German Literature. (4) I, II, III.

Lecture—3 hours. Characteristic themes, problems, and genres in the mainstream of German literature, from medieval epics and love poetry to the modern period. Study of masterworks in English translation demonstrating problem continuity and relevance to contemporary values within the total intellectual framework. The Staff

49. Freshman Seminar. (2) II.

Discussion—2 hours. Prerequisite: knowledge of German not required. Inquiry into the intellectual roots of problems confronting today's students, particularly as illustrated in translation by such modern German literary figures as Nietzsche, Kafka, Hesse, Brecht, and Günter Grass. Enrollment limited. (P/NP grading only.) The Staff

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students.

The Staff (Chairman in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

The Staff (Chairman in Charge)

Upper Division Courses

101. Composition and Conversation. (4) I, II, III.

Discussion—3 hours; instructor-student critical evaluation of additional composition. Prerequisite: course 4 or its equivalent. Practice in short essay writing. Discussion based on readings from a variety of German texts. The Staff

102. Composition and Conversation. (4) I, II, III.

Discussion—3 hours; instructor-student critical evaluation of additional composition. Prerequisite: course 101 or consent of instructor. Practice in short essay writing with an aim toward refinement and expansion of vocabulary. Discussions based on readings in a variety of German texts. The Staff

103. Advanced Composition and Conversation.

(4) I, II, III.

Discussion—3 hours. Prerequisite: course 102 or consent of instructor. Advanced essay writing and discussion of selected texts. The Staff

104. German Grammar and Stylistics. (4) II.

Lecture—2 hours; discussion—1 hour; instructor-student evaluation of readings through written reports. Prerequisite: course 103 or consent of instructor. The grammar and stylistics of modern written usage. Mr. Menges

105. History of the German Language. (4) I.

Lecture—3 hours. Prerequisite: course 102. Survey of the linguistic development from the Germanic and Old High German sound shifts; Middle High diphthongization and monophthongization, Ablaut and Umlaut phenomena; "Kanzleisprache" and Luther; origins of modern comparative philology with the Grimms; elementary phonetics. Mr. Benware

106. Linguistic Structure of German. (4) I.

Lecture—3 hours. Linguistic analysis of modern standard German including phonetics, phonemics, morphology and syntax.

Mr. Benware

108. Contrastive Structures of English and German. (4) III.

Lecture—3 hours; assigned problem sets. A contrastive study of the linguistic structures of English and German. Mr. Benware

109. Survey of German Culture. (4) II.

Lecture—2 hours; discussion—1 hour; instructor-student evaluation of readings through written reports—1 hour. Prerequisite: course 4 or its equivalent. Major developments in such areas of German life as the arts, philosophical thought, social institutions, and political history. Mr. Fetzer

110. Masterpieces of German Prose from Goethe to Kafka. (4) I.

Lecture—3 hours. Study in translation of works which have helped shape the European tradition in the novel and short story or were crucial in the development of German literature. Knowledge of German not required; may not be counted as part of the major in German. Mr. Fetzer

111. Masterpieces of German Drama from Lessing to Brecht. (4) II.

Lecture—3 hours. Study in translation of works which have helped shape the European drama or were crucial in the development of German literature. Knowledge of German not required; may not be counted as part of the major in German. Mr. Menges

NOTE: For key to footnote symbols, see page 191.

112. Masterpieces of German Poetry from Walther von der Vogelweide to Rilke. (4) III.

Lecture—3 hours. Study in translation of the German Lyric genius from medieval love poetry through the classicism of Goethe and Hölderlin to the mysticism of Rilke. Knowledge of German not required; may not be counted as part of the major in German. Mr. Menges

113. Hermann Hesse. (4) III.

Lecture—3 hours; additional readings and written reports. Knowledge of German not required. A study of the main ideas and issues of the principal novels, with emphasis on man's dualism and his search for self-knowledge and self-fulfillment. Discussion of such works as *Siddhartha*, *Steppenwolf*, *Narcissus*, and *Goldmund*, et al. Mr. Nerjes

114. Goethe's Faust. (4) II.

Lecture—3 hours. A detailed analysis and aesthetic critique in English of both "Parts," together with the first-draft *Urfaust*. Knowledge of German not required; German majors fulfill readings in German. Mr. Nerjes

115. German Literature of the Twentieth Century Up to the Second World War. (4) I.

Lecture—3 hours. Knowledge of German not required. The sublimation of tradition and the exploration of new forms from Nietzsche's death until the Second World War, including readings in translation from Hofmannsthal, Hesse, Rilke, Kafka and Thomas Mann. Mr. Hoermann

116. German Literature of the Twentieth Century Since the Second World War. (4) II.

Lecture—3 hours. Knowledge of German not required. The period of reawakening since 1945, the search for identity and meaning within the European community East and West, and the German political-moral dilemma as reflected in translated works by Brecht, Frisch, Dürrenmatt, Grass, and other "Gruppe 47" writers. Mr. Hoermann

117. Kafka. (4) I.

Lecture—3 hours; written reports. Knowledge of German not required. Problems of truth, justice, art, and being as reflected primarily in *The Judgment*, *Metamorphosis*, *Hunger Artist*, *Josephine*, *Investigations of a Dog*, and *The Burrow*. Mr. Hoermann

118. Brecht. (4) III.

Lecture—3 hours. Knowledge of German not required. A study of Brecht's Epic Theater and his doctrine of aesthetic alienation. Mr. Menges

119A. Survey of German Literature from the Beginnings through Classicism. (4) I.

Lecture—3 hours; instructor-student evaluation of readings through written reports. Pre-

requisite: course 4 or course 6A and 6B, or their equivalents. An integrated view of the philosophical, historical, and stylistic components in the development of German literary tradition up to Romanticism. Mr. Bernd

119B. Survey of German Literature from Romanticism to the Present. (4) II.

Lecture—3 hours; instructor-student evaluation of readings through written reports. Prerequisite: course 119A. Continuation of course 119A. Mr. Bernd

119C. Literary Interpretation. (4) III.

Lecture—2 hours; discussion—1 hour; instructor-student evaluation of readings through written reports. Prerequisite: courses 6A and 6B or course 4; courses 119A and 119B recommended. Guided discussion of major German literary works and demonstrations of the technique of analysis. Intended for students who wish to learn how to read and interpret literature. Mr. Bernd

120. The Medieval Period in German Literature. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 119A or equivalent. The literary-philosophical profile of the "Mittelhochdeutsche Blütezeit" in terms of the significant courtly and folk epics and the "Minnesang." Readings in modern German translation. Mr. Moelleken

121. Germanic Mythology. (4) I.

Lecture—3 hours; written reports. Knowledge of German not required. Germanic myth, legend, and saga from Old Norse and Eddic poetry down to nineteenth century versions by the Grimms and Richard Wagner, and terminating in the ideological adaptations under National Socialism. Mr. Hoermann

122. The Enlightenment. (4) I.

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently with consent of instructor). Intellectual trends of the Age of Reason from Descartes to Leibniz, and the concepts of humanism and tolerance in Lessing's plays *Minna von Barnhelm*, *Emilia Galotti* and *Nathan der Weise*. Mr. Nerjes

123. Goethe. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently with consent of instructor). Goethe's lyrics *Werther*, *Götz* and the masterwork of his classical period such as *Iphigenie*, *Tasso* and *Faust*. Mr. Nerjes

124. Schiller. (4) I.

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently with consent of instructor). Poetry and dramas of the rebellious young Schiller as exemplified

by *Die Räuber* and *Kabale und Liebe* and a critical assessment of his classical plays: *Wallenstein*, *Maria Stuart*, and *Die Jungfrau von Orléans*.

Mr. Nerjes

125. Romanticism. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 119B (may be taken concurrently) or equivalent, or consent of instructor. The Napoleonic era from the Jena school of the Schlegels and Novalis, through the Arnim-Brentano group in Heidelberg, to the Berlin circle including Tieck, Eichendorff, and Hoffmann.

Mr. Fetzer

126. German Romantic Mythology. (4) II.

Lecture—3 hours; written reports. Knowledge of German not required. Inquiry into the impact of "oriental" and golden-age motifs on Romantic nature-mythology and the literary "fairy" tale, culminating in the *Gesamtkunstwerk* conceptions of Wagner.

Mr. Fetzer

127. Literary Aspects of Schopenhauer and Nietzsche. (4) III.

Lecture—3 hours; written reports. Knowledge of German not required. Extension and transformation of the Romantic theories of art and the artist and the influence of Schopenhauer and Nietzsche on twentieth century literary phenomena, such as expressionism, and on writers such as Wedekind, Rilke, and Thomas Mann.

Mr. Menges

128. Early Nineteenth-Century German Realism. (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119B (may be taken concurrently) or equivalent, or consent of instructor. Examination of the work of such important literary figures as Kleist, Hebbel, Büchner and Grillparzer.

Mr. Bernd

129. Naturalism to Neo-Classicism in German Literature. (4) I.

Lecture—3 hours; written reports. Prerequisite: course 119B (may be taken concurrently) or equivalent, or consent of instructor. From Hauptmann and the social protest of north-German naturalism, through the Viennese psychological impressionism of Schnitzler and the neo-romanticism of Hofmannsthal and Hesse, to Rilke and the collective mysticism of the "George-Kreis."

Mr. Nerjes

130. The Modern Period from Expressionism to the Present. (4) III.

Lecture—3 hours; written reports. Prerequisite: course 119B (may be taken concurrently) or equivalent, or consent of instructor. The moral and existential quandary from Nietzsche,

Wedekind, and the wartime generation of dramatists, through the poetry of Trakl, Loerke, and Benn; novelistic mastery in Thomas Mann and Kafka, and the new theater of Brecht, Frisch, and Dürrenmatt.

Mr. Menges

132. The German "Novelle." (4) II.

Lecture—3 hours; written reports. Prerequisite: course 119B (may be taken concurrently) or equivalent, or consent of instructor. Inquiry into the art of the "Novelle" through analysis of the materials and formal devices of representative authors from Goethe to Kafka.

Mr. Nerjes

134. German Poetry. (4) III.

Lecture—3 hours; language laboratory. Prerequisite: courses 101, 102; or consent of instructor. Analysis and study of representative lyric modes as deduced from the master specimens of verse throughout German literature.

Mr. Menges

161A-C. Varieties of Authorial Vision. (4) I, II, III.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Study of representative examples of imaginative literature from antiquity to the present. Content will alternate among the following segments: A. The Tragic Vision; B. The Comic Vision; C. The Tragicomic Vision. May be repeated for credit in different subject area. (Same course as Classics, Comparative Literature, English, French, and Russian 161A-C.)

The Staff

*162A-F. The Theory and Practice of Literary Translation. (4) II.

Lecture—2 hours; discussion—1 hour; term translation project. Prerequisite: competence in "source" language and consent of instructor. Theories and problems of rendering texts in foreign languages into English; imaginative equivalence and re-creative adaptation demonstrated in terms of various models; comparison of student translation projects. Content will alternate among the following segments: A. French to English; B. German to English; C. Greek/Latin to English; D. Italian to English; E. Russian to English; F. Spanish to English. May be repeated for credit in different subject area. (Same course as Classics, Comparative Literature, English, French, and Russian 162A-F.)

The Staff

163A-C. Intercultural Literary Colloquium: Literature and the Other Arts. (4) II.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. The encounter of literature with other art forms; structural and thematic elements of music and the fine arts reflected as subject matter or compositional principles in literature; contrast and similarity in the creative process of the several

NOTE: For key to footnote symbols, see page 191.

media. Content will alternate among the following segments: A. Music and the Artist-Hero; B. Pictorial Arts and Visual Media; C. Theater, Opera and Dramatic Forms. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, French, and Russian 163A-C.)
The Staff

***164A-C. Intercultural Literary Colloquium: The Great Periods of International Culture. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in the literary crosscurrents, accommodation and dominance that have characterized the literatures of a common Western culture. Content will alternate among the following segments: A. The Middle Ages; B. The Renaissance; C. Rationalism and the Enlightenment. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, French, and Russian 164A-C.)
The Staff

***165. Intercultural Literary Colloquium: Studies in Fantastic Reality. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. The literary experience of mystery, the fantastic, and the demonic in Western tradition, including works by such writers as Borges, Dostoevski, and Kafka. (Same course as Comparative Literature, English, French and Russian 165.)
The Staff

***166A. Modalities of Modern Literature: The Novel. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Intercultural literary colloquium on the transformations of self, nature, and community in novels by such writers as Dostoevski, Svevo, Kafka, Faulkner, and Robbe-Grillet. (Same course as Comparative Literature, English, French, and Russian 166A.)
The Staff

***167. Intercultural Literary Colloquium: Comparative Study of Major Authors. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Pivotal works of artists in the Western mainstream, such as Dante, Shakespeare, Cervantes, Goethe, Tolstoi, Proust, and Joyce. (Same course as Comparative Literature, English, French, and Russian 167.)
The Staff

168A-E. Intercultural Literary Colloquium: Modern Literary Movements and Styles. (4) I.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in popular taste, messianic vision, and elitist polarities. Content will alternate among the following segments: A. Romanticism; B. Symbolist Poetry and Poetics; C. Naturalism and Expressionism; D. Utopianism and Authoritarian Struc-

tures; E. Quests of Mystery and Science Fiction. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, French, and Russian 168A-E.)

The Staff

***169A-D. Intercultural Literary Colloquium: The Avant Garde. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Literary innovation and rebellion in Western Culture since World War I. Content will alternate among the following segments: A. Dada and Surrealism; B. The Absurdist Tradition; C. The "New Novel"; D. Proletarian and Epic Theater. May be repeated for credit in different subject area. (Same course as Comparative Literature, Dramatic Art, English, French, and Russian 169A-D.)
The Staff

185. Intercultural Literary Colloquium. (4) II.

Lecture—2 hours; discussion—1 hour; term paper; readings in English or German. Prerequisite: consent of instructor. Interdepartmental inquiry into such European and American themes as the anti-hero, guilt and judgment, escape, and utopia. Specific topics to be chosen by instructors. Limited enrollment. (To be given jointly with Russian 185.)
Mr. Hoermann

194H. Special Study for Honors Students.

(5) I, II, III.

Prerequisite: open only to honors students. Guided research leading to an honors paper.

The Staff

197T. Tutoring in German. (2-4) III.

Seminar—1-2 hours; laboratory—1-2 hours. Tutoring in undergraduate courses including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit up to 6 units. Mr. Hoermann

198. Directed Group Study. (1-5) I, II, III.

(P/NP grading only.)

The Staff (Mr. Bernd in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Bernd in charge)

Graduate Courses

200. Gothic. (4) I.

Seminar—3 hours. Phonology, grammar and reading of Gothic texts. Special topics including the relationship of Gothic to Indo-European and to the other Germanic languages. Knowledge of Modern German not required.

Mr. Benware

201. Old High German. (4) II.

Seminar—3 hours. Study of the beginnings of German as a written language through the reading of selected texts from the eighth through the eleventh centuries. A linguistic analysis of the dialects.

Mr. Benware

202. Middle High German. (4) III.

Seminar—3 hours. Outline of grammar; selections from Middle High German epic and lyric poetry.
Mr. Moelleken

203. Old Saxon. (4) III.

Seminar—3 hours. Study of the linguistic structure and the literary significance of the language of the Old Saxon *Heliand*. Knowledge of Modern German not required.
Mr. Moelleken

205. History of the German Language. (4) I.

Seminar—3 hours. Development of the German language with emphasis on the early periods, from Indo-European to Middle High German.
Mr. Benware

210. Techniques of Literary Scholarship. (4) I.

Seminar—3 hours. The bibliographical, organizational, and methodological tools and resources for advanced, independent research.
Mr. Fetzer

211. The Rise of German Literary Criticism. (4) I.

Seminar—3 hours. The history of criticism in Germany, with some attention to classical sources. Course proceeds chronologically until the modern period, then by a study of special topics broadens to a consideration of recent approaches to German literature. Mr. Bernd

240. Forms of German Verse. (4) II.

Seminar—3 hours. The development of German verse from the Middle Ages to Gottfried Benn, with special emphasis on different techniques of text analysis and interpretation. May be repeated for credit with consent of instructor.
Mr. Sammern-Frankeneegg

241. The German Drama. (4) III.

Seminar—3 hours. The major forms of German drama from the origins to the middle of the twentieth century. May be repeated for credit with consent of instructor. Mr. Menges

242. The German "Novelle." (4) III.

Seminar—3 hours. The major German *Novellen*, with particular emphasis on the flowering of this genre in the nineteenth century. May be repeated for credit with consent of instructor.
Mr. Sammern-Frankeneegg

249. Medieval Epic Literature. (4) II.

Seminar—3 hours. Prerequisite: courses 202 and 285, or consent of instructor. A critical analysis of selected epic poetry of the "Staufzeit," such as *Parzival*, *Tristan und Isolde*, and the *Nibelungenlied*. All texts are read in Middle High German.
Mr. Moelleken

250. Medieval Lyric Literature. (4) III.

Seminar—3 hours. Prerequisite: courses 202 and 285, or consent of instructor. A critical study

of the great lyric poets of medieval Germany, such as Walther von der Vogelweide, Heinrich von Morungen, and Reinmar von Hagenau. All texts read in Middle High German.
Mr. Moelleken

251. Studies in the Works of Andreas Gryphius. (4) II.

Seminar—3 hours. A study of Gryphius' literary legacy, his lyrics, his tragedies and his comedies, with the purpose of showing his place in the world of seventeenth-century thought, artistic, religious and humanistic. Mr. Bernd

252. The Writings of Lessing. (4) I.

Seminar—3 hours. Study of Lessing's theory of literature with particular emphasis upon his critical attacks on French drama.
Mr. Sammern-Frankeneegg

253. Goethe. (4) II.

Seminar—3 hours. Study of the origins of Goethe's thought in German pietism, and his principal artistic autobiographical, scientific, and philosophical works. Mr. Nerjes

254. Schiller. (4) I.

Seminar—3 hours. A critical analysis of Schiller's major works and his impact on the intellectual climate in Germany during the late eighteenth and early nineteenth centuries.
Mr. Nerjes

257. Heinrich von Kleist. (4) III.

Seminar—3 hours. Kleist's important dramatic and prosaic works; special attention will be given to the peculiar hermeneutic problems in modern German, French and Anglo-American Kleist criticism. Mr. Bernd

258. The Novels of Thomas Mann. (4) II.

Seminar—3 hours. Reading of selected novels with emphasis on aesthetic techniques, originality, ethical and political views, and influence on the contemporary literary scene in Germany. Mr. Menges

259. Studies in Kafka. (4) I.

Seminar—3 hours. Study of Kafka's nuclear fables. Mr. Hoermann

260. The Poetry of Rilke. (4) I.

Seminar—3 hours. Study of the principal motifs, myths, images and problems in the poetry of Rainer Maria Rilke. Mr. Menges

261. Brecht and the Epic Theater. (4) III.

Seminar—3 hours. A reading of all works with emphasis on the ideas which impelled the development of new literary forms and concepts. Mr. Menges

NOTE: For key to footnote symbols, see page 191.

285. Middle High German Literature. (4) II.

Seminar—3 hours. An extensive reading of Middle High German texts with emphasis upon belletristic and cultural values; also examines linguistic problems. May be repeated for credit with consent of instructor. Mr. Moelleken

288. The Renaissance and Reformation in German Literature. (4) I.

Seminar—3 hours. The parabolic and didactic style in Germany's literature during the sixteenth century. May be repeated for credit with consent of instructor. Mr. Bernd

289. German Literature of the Baroque. (4) III.

Seminar—3 hours. The "Elegantiadeal" and the varying methods used to portray it in seventeenth-century German literature. May be repeated for credit with consent of instructor. Mr. Bernd

290. The Enlightenment in German Literature. (4) II.

Seminar—3 hours. The revolt against the excesses of the "Elegantiadeal," and the evolution of a new literature based on reason and wit. May be repeated for credit with consent of instructor. Mr. Nerjes

291. Rococo in German Literature. (4) II.

Seminar—3 hours. The essential novels of Christoph Martin Wieland and those contemporaries of his whose literary style mirrors the euphony that is characteristic of Mozart's music. May be repeated for credit with consent of instructor. Mr. Nerjes

292. Sentimentality and "Sturm und Drang" in German Literature. (4) III.

Seminar—3 hours. The German liberal authors of the eighteenth century, such as Johann Georg Hamann and Johann Gottfried Herder, who lived in complete disagreement with the rationalistic tenets of their age. May be repeated for credit with consent of instructor. Mr. Nerjes

293. The Classical Age of German Literature. (4) I.

Seminar—3 hours. Inquiry into the aesthetic and humanistic qualities of Germany's greatest literary epoch. May be repeated for credit with consent of instructor. Mr. Nerjes

294. The Romantic Period in German Literature. (4) III.

Seminar—3 hours. Survey of the works of early nineteenth-century authors in reaction against the age of classicism. May be repeated for credit with consent of instructor. Mr. Fetzer

295. Poetic Realism in German Literature. (4) I.

Seminar—3 hours. Outstanding figures in German literature between 1840 and 1890. Important phases in their developments will be treated. May be repeated for credit with consent of instructor. Mr. Bernd

296. Twentieth Century German Literature. (4) II.

Seminar—3 hours. Considers the revolt of the Hauptmann generation, symbolism, expressionism, and the chief currents of the contemporary scene. May be repeated for credit with consent of instructor. Mr. Menges

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Bernd in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Bernd in charge)

299D. Individual Study. (1-9) I, II, III.

Discussion; directed reading. (S/U grading only.) The Staff (Graduate Adviser in charge)

Professional Courses**390. The Teaching of German. (3) I.**

Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Intended primarily for graduate teaching assistants. Mr. Estabrook

400. Tutorial and Instructional Internship. (3) I, II, III.

Lecture—3 hours. Prerequisite: graduate standing. Apprentice training in ongoing undergraduate literature courses taught by regular staff, with supplementary weekly critique sessions; intern leadership of discussion sections under staff supervision. May be repeated for credit. The Staff (Mr. Bernd in charge)

GREEK—See Classics

HEBREW—See Oriental Languages

HISTORY

Walter L. Woodfill, Ph.D., *Chairman of the Department*
Department Office, 176 Voorhies Hall

Professors:

William M. Bowsky, Ph.D.
David Brody, Ph.D.
Daniel Calhoun, Ph.D.
Paul Goodman, Ph.D.
W. Turrentine Jackson, Ph.D.
David L. Jacobson, Ph.D.
José R. Juárez, Ph.D.
Kwang-Ching Liu, Ph.D.
Jung-Pang Lo, Ph.D. (*Emeritus*)
C. Bickford O'Brien, Ph.D.
Rollie E. Poppino, Ph.D.
Richard N. Schwab, Ph.D.
James H. Shideler, Ph.D.
Wilson Smith, Ph.D.
Donald C. Swain, Ph.D.
F. Roy Willis, Ph.D.
Walter L. Woodfill, Ph.D.

Associate Professors:

Daniel Brower, Ph.D.
Manfred P. Fleischer, Ph.D.
¹C. Roland Marchand, Ph.D.
Richard J. Miller, Ph.D.
Morgan B. Sherwood, Ph.D.
⁴Stylianios Spyridakis, Ph.D.

Assistant Professors:

Arnold J. Bauer, Ph.D.
Peter K. Cline, Ph.D.
James A. Fisher, Ph.D.
¹William W. Hagen, Ph.D.
²Eugene Lunn, Ph.D.
^{3,4}Ted W. Margadant, Ph.D.
Don C. Price, Ph.D.
Cynthia B. Smith, M.A. (*Acting*)

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Departmental Advisers.—Mr. Bauer, Mr. Cline, Mr. Fisher, Mr. Fleischer, Mr. Jacobson, Mr. Lunn, Mr. Marchand, Mr. Margadant, Mr. Schwab, Mr. Sherwood, Mr. Smith, Mr. Spyridakis.

Graduate Advisers.—Mr. Bowsky, Mr. Brower, Mr. Goodman, Mr. Hagen, Mr. Liu, Mr. Miller, Mr. Poppino, Mr. Shideler, Mr. Willis.

Introductory Courses.—Courses 3, 4A, 4B, 4C, 9A, 9B, 17A, 17B, 21A, 21B, 22, 27A, 27B, 51, 61, 72A, 72B, 76, 85, and 90 are open to all students.

The American History and Institutions requirement may be satisfied by any one of the

following courses: History 17A, 17B, 21A, 21B, 27A, 27B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 176A, 176B, 178A, 178B, 179A, 179B, 183A, 183B. Upper division courses may be taken with consent of instructor. (See also page 38.)

The Major Program

Lower Division Courses.—Required: Students majoring in history must complete five lower division history courses, including two courses in each of two of the following categories:

- a) history of Western Civilization,
- b) history of Asian Civilization,
- c) history of the United States.

It is recommended that history majors take all three of the courses in the history of Western Civilization. It is also recommended that students, in consultation with their advisers, take one or two courses (normally a two-quarter sequence of courses) in one of the following fields: classics, cultural anthropology, cultural geography, principles of economics, English literature, literature of the United States, philosophy, political science, psychology, sociology, or statistics. Foreign language study is recommended for all history majors, and especially for those who intend to undertake graduate study in history.

Upper Division Courses.—Required: Students majoring in history must complete at least 36 upper division units in history, including:

- a) a minimum of 3 courses (including a two-quarter sequence of courses) in a field of concentration (for "field" see below);
- b) a minimum of two courses each in two other fields of history. (The fields referred to are Ancient History, Medieval Europe, Modern Europe, Great Britain, Russia, East Asia, Latin America and the United States.)

Honors and Honors Program (see page 157).—A student may become eligible for graduation with high honors or highest honors in history by completing the Department's honors program. The program consists of the following work (along with normal major requirements): History 101 usually taken during the junior year; at least one undergraduate proseminar (History 102 or equivalent); an honors essay, to be written in 6 to 10 units of History 199, and completed during the two quarters before the beginning of the student's last quarter as an undergraduate. Any history major who has a departmental grade-point average of 3.2 in a total of at least 20 units of history may enter the program by registering in the departmental office.

NOTE: For key to footnote symbols, see page 191.

Those with special interests or qualifications may apply through their advisers.

Graduate Study.—The Department of History offers programs of study and research leading to the M.A. and Ph.D. degrees in history. Detailed information may be obtained by writing to the Graduate Adviser, Department of History.

Teaching Major.—Requirements are the same as for the departmental major plus course 300.

Teaching Minor.—Thirty-two units of history, including 4A–4B–4C, 17A–17B, and 12 units of upper division course work. The 12 units of upper division work should include a two-quarter sequence.

Subject Representative: Mr. Jacobson

Lower Division Courses

3. Cities: A Survey of Western Civilization. (4) II.

Lecture—3 hours; discussion—1 hour. A survey of western civilization focusing on ten cities, each at the height of its creativity: Athens, Rome, Constantinople, Paris, Florence, Amsterdam, Vienna, London, Moscow, and New York. Slides, music, and literature including political theory. Reading in original sources. Mr. Willis

4A. History of Western Civilization. (4) I.

Lecture—3 hours; discussion—1 hour. The growth of western civilization from ancient times through the middle ages. The Staff

4B. History of Western Civilization. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Development of western civilization from the Renaissance through 1815. The Staff

4C. History of Western Civilization. (4) II, III.

Lecture—3 hours; discussion—1 hour. The development of western civilization in the nineteenth and twentieth centuries. The Staff

9A. History of Asian Civilizations. (4) I.

Lecture—3 hours; discussion—1 hour. The history of the major civilizations of Asia (Chinese, Japanese, Hindu, and Islamic) to the end of the eighteenth century. Emphasis will be put on the general features of the society and government, the economy, religion, philosophy, and the arts. Mr. Miller

9B. History of Asian Civilizations. (4) II.

Lecture—3 hours; discussion—1 hour. Introduction to the great changes in the major Asian countries in the past two centuries. Emphasis will be placed on the impact of the West, the search for a new culture, and the background of contemporary social and political problems. Mr. Miller

17A. History of the United States. (4) I, II.

Lecture—3 hours; discussion—1 hour. The growth of the American people from colonial times through the Civil War. The Staff

17B. History of the United States. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. The American people from Reconstruction to the present. The Staff

*21A. Race and Nationality in American History.

(4) II.

Lecture — 3 hours; discussion — 1 hour. Sources of American nationality and its relationship to ethnical, racial, and religious minorities, 1607–1865. Experiences of groups including American Indians, Orientals, Blacks, Catholics, Jews, Irish and Germans. Tensions between majorities and minorities in the American past. Mr. Goodman

*21B. Race and Nationality in American History.

(4) III.

Lecture — 3 hours; discussion — 1 hour. Sources of American nationality and its relationship to ethnical, racial, and religious minorities, 1865 to present. Experiences of groups including American Indians, Orientals, Blacks, Catholics, Jews, Irish and Germans. Tensions between majorities and minorities in the American past. Mr. Goodman

22. Violence and Law in America. (4) III.

Lecture—2 hours; discussion—2 hours. Movements of protest or social control from the revolutionary period to the present. Mr. Calhoun

27A. Afro-American History. (4) I.

Lecture—3 hours; discussion—1 hour. The history of black people in the United States from the African background to Reconstruction. Mr. Fisher

27B. Afro-American History. (4) II.

Lecture—3 hours; discussion—1 hour. The history of black people in the United States from Reconstruction to the present. Mr. Fisher

49. Freshman Seminar. (2) I, II, III.

Seminar—2 hours. Prerequisite: consent of instructor. Reports, discussion and elementary research in the several fields of history designed for the beginning student. The Staff

*51. Imperialism in British Popular Culture. (4) III.

Seminar—4 hours; term paper. Investigation of the popular culture which broadly involved people in the British imperial cause and inspired them to support it. Reading and discussion of relevant, chiefly contemporary, printed materials. No final examination. Limited enrollment. Mr. Cline

61. Discovery and Settlement of Spanish America.

(4) III.

Seminar—4 hours. Some knowledge of Spanish recommended. Examination of the laws, customs, and activities of pre-Colombian and colonial Spanish-American society through reading and discussion of contemporary letters, reports,

and other sources in transcription or translation. Each student to keep a journal of his studies. No final examination. Limited enrollment.

Mr. Poppino

72A. Movements for Women's Rights and Status in Nineteenth-Century America. (4) I.

Lecture—3 hours; discussion—1 hour. Focusing on the history of women in the United States since the end of the eighteenth century; course will also consider counterpart movements in Europe. Topics include revolutions of suffrage, kitchen, manners, jobs, and motherhood; women and the law, marriage, divorce, and property.

Ms. Smith

72B. Women in Twentieth-Century America. (4) II.

Lecture—3 hours; discussion—1 hour. Recommended: course 72A. Continuation of course 72A into twentieth century.

Ms. Smith

***76. The Great Depression. (4) I.**

Discussion—4 hours; term paper. The social impact of the great depression of the 1930s upon the ideas, values and conditions of various segments of American society. Emphasis will be placed on development of skills in research methods, writing style and interpretive analysis. Limited enrollment.

Mr. Marchand

85. Nature, Man and the Machine in America. (4) I.

Seminar—4 hours; term paper. Prerequisite: consent of instructor. History of the attitudes and behavior of Americans toward their natural environment and their technology, from colonial times to the present. No final examination. Limited enrollment.

Mr. Sherwood

90. Modernization of China and Japan. (4) III.

Discussion—4 hours; term paper. Prerequisite: consent of instructor; courses 9A or 9B recommended. Reading and discussion on salient aspects of the modern history of China and Japan. Designed for freshmen and sophomores. Background of the contemporary scene is stressed. No final examination. Limited enrollment.

Mr. Liu, Mr. Miller

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students.

The Staff (Mr. Woodfill in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

The Staff (Chairman in charge)

Upper Division Courses

101. Introduction to Historical Thought and Writing. (5) I.

Lecture-discussion—4 hours; term paper. Prerequisite: consent of instructor. Study of the history of historical thought and writing, analy-

sis of critical and speculative philosophies of history and evaluation of modes of organization, interpretation and style in historical writing.

Mr. Margadant

102. Undergraduate Proseminar in History.

(5) I, II, III.

Seminar—3 hours; term paper. Prerequisite: consent of instructor. Designed primarily for history majors. Intensive reading, discussion, research and writing in selected topics in the various fields of history: A. Ancient; B. Medieval; C. Renaissance and Reformation; D. Modern Europe to 1815; E. Europe since 1815; F. Russia; G. China to 1600; H. China since 1600; I. Britain; J. Latin America since 1810; K. American History to 1787; L. United States, 1787-1896; M. United States since 1896; N. Japan. May be repeated for credit. Limited enrollment.

The Staff

111A. Ancient History. (4) I.

Lecture—3 hours. History of the ancient empires of the Near East and of the Greek city-states to the fifth century B.C.

Mr. Spyridakis

111B. Ancient History. (4) I.

Lecture—3 hours. History of Greece, the Hellenistic kingdoms, and Rome from the fifth century B.C. to the Punic Wars.

Mr. Spyridakis

111C. Ancient History. (4) II.

Lecture—3 hours. History of Rome and its empire from the Punic Wars to Constantine.

Mr. Spyridakis

115A. History of West Africa. (4) I.

Lecture—3 hours; written reports. Recommended: courses 4A, 4B, 4C. Introductory survey of the history of West Africa and the Congo region from the earliest times to the present.

Ms. Smith

115B. History of East, South and Central Africa.

(4) II.

Lecture—3 hours. Introductory survey of the history of East, South and Central Africa from the earliest times to the present.

Ms. Smith

116. African History: Special Themes. (4) III.

Lecture—3 hours; term paper. Recommended: courses 115A and 115B. Themes of African history, such as African states and empires, slave trade, relationship of Egypt to rest of Africa, Bantu origins and migrations, and French policy of Assimilation and Association.

Ms. Smith

121A. Medieval History. (5) II.

Lecture-discussion and panel presentations—3 hours. European history from "the fall of the Roman Empire" to the eighth century.

Mr. Bowsky

121B. Medieval History. (5) II.

Lecture-discussion and panel presentations—3 hours. European history from Charlemagne to the twelfth century.

Mr. Bowsky

***121C. Medieval History. (5) III.**

Lecture-discussion and panel presentations—3 hours. European history from the Crusades to the Renaissance.

Mr. Bowsky

131A. Early Modern European History. (4) I.

Lecture—3 hours. Recommended: courses 4A, 4B. Western European history from about 1350 to about 1500.

Mr. Fleischer

131B. Early Modern European History. (4) II.

Lecture—3 hours. Recommended: courses 4A, 4B, 131A. Western European history from about 1500 to about 1650.

Mr. Fleischer

131C. Early Modern European History. (4) III.

Lecture—3 hours. Recommended: courses 4A, 4B, 131B. Western European history from about 1650 to about 1789.

Mr. Fleischer

133. The Age of Ideas. (4) I.

Lecture—3 hours. The Enlightenment and its background in the seventeenth century.

Mr. Schwab

134A. The Age of Revolution. (4) II.

Lecture—3 hours. Ideas and institutions during the French Revolution and the Napoleonic era.

Mr. Schwab

134B. The Age of Revolution. (4) III.

Lecture—3 hours. Ideas and revolution after 1815. Offered in odd-numbered years.

Mr. Schwab

137A. Russian History: Kievan and Muscovite Russia. (4) I.

Lecture—3 hours. Russian civilization from earliest times to the reign of Peter the Great.

Mr. O'Brien

137B. Russian History: The Empire to 1856. (4) II.

Lecture—3 hours. Russian civilization from the Age of Peter the Great through the Crimean War.

Mr. O'Brien

137C. Russian History: The Empire, 1856–1917. (4) II.

Lecture—3 hours. Russian civilization from the Crimean War to the Revolution of 1917.

Mr. Brower

137D. Russian History: Soviet Russia. (4) III.

Lecture—3 hours; term paper. Russia from the Revolution of 1917 to the present.

Mr. Brower

141. France since 1815. (4) I.

Lecture—3 hours; term paper.

Mr. Margadant, Mr. Willis

***143A. History of Eastern Europe. (4) I**

Lecture—3 hours; term paper. History, mid-eighteenth to late nineteenth century, of the subject nationalities of the Habsburg, Ottoman and Russian Empires (Czechs, Poles, Hungarians, Balkan, and Baltic peoples). Focus on their socioeconomic developments and movements towards cultural and political independence.

Mr. Hagen

***143B. History of Eastern Europe. (4) II.**

Lecture—3 hours; term paper. Geographic focus as in course 143A. Concentration, late nineteenth century to the present, on the socio-economic problems of rural society, industrialization and middle-class development; and the political problems of imperialism, nation-state formation and social revolution.

Mr. Hagen

144A. History of Germany to 1815. (4) II.

Lecture—3 hours; discussion—1 hour; student presentations. Selected aspects of earlier German history, particularly since the Reformation, with a stress on social and cultural movements.

Mr. Hagen

144B. History of Germany since 1815. (4) III.

Lecture—3 hours; term paper; optional discussion section—1 hour. Modern German history, emphasizing social and economic changes and their connections with such major political developments as the revolutions of 1848, German unification, the world wars and Nazism, and the consolidation of the two German states since 1945.

Mr. Hagen

***145A. Europe in the Nineteenth Century. (4) I.**

Lecture—3 hours. Survey of the history of Europe from 1815 to 1870.

Mr. Margadant

***145B. Europe in the Nineteenth Century. (4) II.**

Lecture—3 hours. A survey of the history of Europe from 1870 to 1918.

Mr. Margadant

146A. Europe in the Twentieth Century. (4) I.

Lecture—3 hours; term paper. Survey of the history of Europe from 1919 to 1939.

Mr. Willis

146B. Europe in the Twentieth Century. (4) III.

Lecture—3 hours; term paper. Survey of the history of Europe since 1939.

Mr. Willis

***147A. European Intellectual History in the Nineteenth Century. (4) I.**

Lecture—3 hours; term paper. Recommended: course 4C. Study of major currents of European thought in the nineteenth century viewed within the context of important social and political developments. Emphasis will be placed upon the emergence of the socialist and aesthetic critiques of nineteenth-century industrial civilization.

Mr. Lunn

147B. European Intellectual History in the Twentieth Century. (4) II.

Lecture—3 hours; term paper. Recommended: courses 4C and 147A. European thought since 1890 viewed within the context of major social and political developments. Topics will include: the development of modern sociological and psychological thought; divergent forms of twentieth-century Marxism; the politics of literary intellectuals; French Existentialism. Mr. Lunn

148. Culture and Society in Russia and Germany, 1914-39. (4) III.

Lecture—3 hours; written reports. Recommended: course 146A. Study of Russian and German cultural history in the inter-war years, concentrating on the relation between literature, art, and particularly cinema, and the socio-political crises of the period. Materials will include a number of selected films. Mr. Lunn

151A. History of England. (4) I.

Lecture—3 hours. Recommended: course 4A. Survey of English history to the latter part of the fifteenth century. Mr. Woodfill

151B. History of England. (4) II.

Lecture—3 hours. Recommended: courses 4A, 4B, and 151A. Survey of English history from the latter part of the fifteenth century to the latter part of the eighteenth century. Mr. Woodfill

151C. History of England. (4) III.

Lecture—3 hours. Recommended: courses 4B, 4C, 151A, and 151B. Survey of English history from the latter part of the eighteenth century to the present. Mr. Cline

***152A. English Constitutional History. (4) II.**

Lecture—2 hours; discussion—2 hours. Recommended: course 151A. From Anglo-Saxon times to the reign of Edward IV. Mr. Woodfill

***152B. English Constitutional History. (4) III.**

Lecture—2 hours; discussion—2 hours. Recommended: courses 151B or 154, 151C, and 152A. From the reign of Edward IV to the present. Mr. Woodfill

154. Tudor and Stuart England. (5) III.

Seminar—3 hours; reports and research paper. Prerequisite: courses 151A, 151B and/or consent of instructor. Intensive investigation of selected aspects of Tudor and Stuart history; emphasis on social problems and the arts and learning. Mr. Woodfill

***156. Social and Economic History of Great Britain since 1760. (5) III.**

Lecture—2 hours; discussion—2 hours; re-

search paper. Recommended: course 151C. Integration of the history of industrial, commercial, and agricultural development with the nature and course of change in demography, social organization, and urbanization from pre-industrial to post industrial Britain. Mr. Cline

161A. Latin American History. (4) I.

Lecture—3 hours. Colonial history of Latin America. Mr. Bauer

161B. Latin American History. (4) II.

Lecture—3 hours. The national period of Latin American history. Mr. Bauer

***162. History of the Andean Region. (4) III.**

Lecture-discussion—3 hours; term paper. History of the Andean region, the area that now comprises modern Peru, Bolivia, and Chile, from the beginning of human settlement to the present. Mr. Bauer

163A. History of Brazil. (4) I.

Lecture—3 hours; written reports. The history of colonial and imperial Brazil from 1500 to 1889. Offered in odd-numbered years. Mr. Poppino

163B. History of Brazil. (4) II.

Lecture—3 hours; written reports. The history of the Brazilian republic from 1889 to the present. Offered in even-numbered years. Mr. Poppino

164. History of Argentina. (4) III.

Lecture—3 hours. Prerequisite: courses 161A and 161B or consent of instructor. The history of Argentina from about 1800 to the present, stressing the contributions of the colonial heritage and nineteenth-century political, economic, and social developments to the rise of Argentine nationalism. Offered in even-numbered years. Mr. Bauer

165. Latin American Social Revolutions. (4) III.

Lecture—3 hours; written reports. Major social upheavals since 1900 in Mexico, Argentina, Brazil, Bolivia, and Cuba, examined as to similarities and differences in causes, course, and consequences. Mr. Poppino

***166A. History of Mexico to 1848. (4) I.**

Lecture—3 hours; term paper. The political, economic and social development of pre-Colombian, colonial and national Mexico to 1848. Offered in odd-numbered years. Mr. Juárez

166B. History of Mexico Since 1848. (4) I.

Lecture—3 hours; term paper. The history of Mexico from 1848 to the present. Offered in even-numbered years. Mr. Juárez

168. History of Inter-American Relations. (4) II.

Lecture—3 hours; written reports. Diplomatic

NOTE: For key to footnote symbols, see page 191.

history of Latin America since independence, intra-Latin American relations, relations with the United States, participation in international organizations, and communism in Latin America. Mr. Poppino

169A. Mexican-American History. (4) I.

Lecture-discussion—3 hours; term paper. The origins and evolution of the Spanish-speaking population of the Southwest to 1848, with emphasis on native American cultures, Spanish conquest and settlement of Mexico, frontier conditions, missionary efforts, economical, cultural, and social developments in the Spanish Borderlands. Mr. Juárez

169B. Mexican-American History. (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course 169A or consent of instructor. The Spanish-speaking peoples of the American Southwest from 1848 to 1910, with emphasis on the impact of occupation and rule by Anglo-Americans, the Spanish heritage, the clash of cultures, and the role of Mexican-Americans in the mining, pastoral, and agricultural economies. Mr. Juárez

169C. Mexican-American History. (4) III.

Lecture-discussion—3 hours; term paper. Prerequisite: course 169B or consent of instructor. The Spanish-speaking peoples in the American Southwest since 1910, with emphasis upon the heavy immigration from Mexico following the Mexican Revolution, the "Mexican problem," the bracero program, and the role of Spanish-speaking citizens in the society of the American Southwest. Mr. Juárez

170A. Colonial America. (4) I.

Lecture—3 hours; term paper. Colonial society from 1607 to the American Revolution, with emphasis on European expansion, political, social, and economic foundations, colonial thought and culture, and imperial rivalry. Mr. Jacobson

170B. The American Revolution. (4) I.

Lecture—3 hours. An analysis of the Revolutionary epoch with emphasis on the structure of British colonial policy, the rise of revolutionary movements, the War for Independence and its consequences, and the Confederation period. Mr. Jacobson, Mr. Goodman

*170C. The Early National Period, 1789-1815.

(4) III.

Lecture—3 hours. The political and social history of the American republic from the adoption of the Constitution through the War of 1812 and its consequences. Mr. Goodman

171A. The Jacksonian Era. (4) I.

Lecture—3 hours. The political and social history of the American republic from the end of the War of 1812 to the Compromise of 1850. Mr. Calhoun

171B. American Civil War. (4) II.

Lecture—3 hours. Major developments in American history from 1848 to 1865: slavery and antislavery, immigration, sectional conflict, emergence of the Republican party, the Civil War. Mr. Calhoun

171C. The Emergence of Modern America. (4) I.

Lecture—3 hours. From Reconstruction to the twentieth century, including political and intellectual change, the advent of big business, the rise of organized labor, ethnic adjustments, urbanization, and movements of social unrest. Mr. Brody

174A. Recent History of the United States. (4) I.

Lecture—3 hours; discussion—1 hour. Study of political, economic, and cultural aspects of American democracy from 1900 to 1930s. Mr. Shideler, Mr. Swain

174B. Recent History of the United States. (4) II.

Lecture—3 hours; discussion—1 hour. Study of political, economic, and cultural aspects of American democracy from the 1930s to the present. Mr. Brody, Mr. Swain

174C. Selected Themes in Twentieth Century American History. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 174A or 174B, or consent of instructor. Selected topical themes of the period from the 1890s to the present. Emphasis will be on analysis, synthesis and interpretive overview rather than a chronological narrative of events. Messrs. Brody, Shideler, Swain

175A. Intellectual History of the United States.

(4) I.

Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: course 17A or equivalent; or course in philosophy since the Renaissance, political theory, American literature, or sociological theory. American thought from the Puritans through the era of the American Enlightenment. Mr. Smith

175B. Intellectual History of the United States.

(4) II.

Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: courses 17A and 17B or equivalent; or course in philosophy since the Renaissance, political theory, American literature, or sociological theory. Nineteenth-century American thought from the 1820s to about 1900, emphasizing Transcendentalism, Jacksonian democratic thought, the impact of Darwinism, and pragmatism. Mr. Smith

175C. Intellectual History of the United States.

(4) III.

Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: course 17A or equivalent; or course in philosophy since the Renaissance, political theory, American literature, or sociological theory. American thought from the Puritans through the era of the American Enlightenment. Mr. Smith

quisite: courses 17A and 17B or equivalent; or a course in modern political theory, philosophy, American literature, or sociological theory. Twentieth-century American thought from about 1900 to the 1960s, emphasizing pragmatic liberalism, naturalism in law and literature, protestant liberalism and neo-orthodoxy, Freudian currents in social thought and social criticism of the 1960s. Mr. Smith

***176A. Social and Cultural History of the United States. (5) I.**

Lecture—4 hours; term paper. Study of social and cultural forces in American society from colonial times through the Civil War with emphasis on social structure, religious movements, labor systems, racial and national groups, social reform movements and changes in social values. Mr. Marchand

***176B. Social and Cultural History of the United States. (5) III.**

Lecture—4 hours; term paper. A study of social and cultural forces in American society since the Civil War and with emphasis on social structure, religious movements, labor systems, racial and national groups, social reform movements, problems of urbanization, and changes in social values. Mr. Marchand

***177. Black History Since 1900. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 17A, 17B, 27A, 27B strongly recommended. Examination of the political, economic, social, and intellectual history of black people in the United States from 1900 to the present. Mr. Fisher

***178A. Great Issues in United States History: Ideas and Interpretations. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: junior standing or consent of instructor. Selected topics in the political, economic, social and intellectual history of the United States. A study in historical thought and interpretation concerning the main currents of national development to 1865. Mr. Jackson

***178B. Great Issues in United States History: Ideas and Interpretations. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: junior standing or consent of instructor. Selected topics in the political, economic, social and intellectual history of the United States. A study in historical thought and interpretation concerning the main currents of national development since 1865. Mr. Jackson

***179A. Economic Growth of the United States. (4) II.**

Lecture—3 hours. Development of the Ameri-

can economy from colonial agriculture and mercantilism to the emergence of industrial capitalism.

***179B. Economic Growth of the United States. (4) III.**

Lecture—3 hours. The changing nature of industrial capitalism and its effects on agriculture, labor, business, and government in the late nineteenth and twentieth centuries. Mr. Brody

180A. The Growth of American Politics. (4) II.

Lecture—3 hours; extensive reading and supervised writing. Study of the growth of American politics from the colonial period to about 1865 which focuses on the distribution of power, its change over time, and the ways power has been used. Examines political party development and the social and ideological dimensions of political behavior. Mr. Goodman

180B. The Growth of American Politics. (4) III.

Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180A: study of the growth of American politics from about 1865 to the present which focuses on the distribution of power, its change over time, and the ways power has been used. Examines political party development and the social and ideological dimensions of political behavior. Mr. Goodman

183A. The Frontier Experience: Trans-Mississippi West. (4) I.

Lecture—3 hours; discussion—1 hour. The fur trade, western exploration and transportation, the Oregon Country, the Greater Southwest and the Mexican War, the Mormons, mining discovery, and the West during the Civil War. Mr. Jackson

183B. The Frontier Experience: Trans-Mississippi West. (4) II.

Lecture—3 hours; discussion—1 hour. Spread of the mining kingdom, the range cattle industry, Indian-military affairs, settlement of the Great Plains and Rocky Mountain Regions and political organization of the West. Mr. Jackson

185A. History of Science and Technology in America. (4) II.

Lecture—3 hours. Study of science and technology in America, emphasizing the development of scientific ideas and institutions to 1890. Mr. Sherwood, Mr. Swain

185B. History of Science and Technology in America. (4) III.

Lecture—3 hours. Study of science and technology in America, emphasizing the development of scientific ideas and institutions since 1890. Mr. Sherwood, Mr. Swain

NOTE: For key to footnote symbols, see page 191.

***187. Issues in American Educational History.**

(4) III.

Lecture—3 hours; discussion—1 hour. Exploration of the patterns by which educational institutions have developed, with emphasis on the ways in which Americans have used the transmission of culture between generations as a focus for general social criticism. Offered in odd-numbered years.

Mr. Calhoun

***188A. History of Agriculture in the United States. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: junior or senior standing. History of agricultural development to 1900 with emphasis on social and economic institutions. Mr. Shideler

***188B. History of Agriculture in the United States. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: junior or senior standing. History of agricultural changes from 1900 to the present with emphasis on the background and evolution of government policy.

Mr. Shideler

189A. History of California. (4) I.

Lecture—3 hours; discussion—1 hour. History of California to 1865.

Mr. Jackson

189B. History of California. (4) II.

Lecture—3 hours; discussion—1 hour. History of California since 1865.

Mr. Jackson

191A. The Formation of Imperial China. (4) I.

Lecture—3 hours; term paper. Historical analysis of the formative elements in Chinese state and culture, from the beginnings to the seventeenth century.

Mr. Price

191B. Late Imperial China. (4) II.

Lecture—3 hours; term paper. The Ch'ing Dynasty, the apex of imperial China and its collapse under the impact of the modern West, from the seventeenth century to 1911.

Mr. Price

191C. Twentieth-Century China. (4) III.

Lecture—3 hours; term paper. Investigation of the origins and triumph of the Communist movement in China, with a review of its performance since 1949.

Mr. Price

192A. Modern China and the West. (4) I.

Lecture—3 hours. Survey of China's relations with the West since 1800, with emphasis on the impact of imperialism, the profound effects of Western technology and ideas, and the changes in the Chinese worldview and foreign policy.

Mr. Liu

192B. Modern China and the West. (4) II.

Lecture—1 hour; discussion—2 hours. Prerequisite: course 192A or consent of instructor.

Intensive study of topics in the history of China's relations with the West.

Mr. Liu

***193. China's Relations with Southeast Asia. (4) I.**

Lecture—3 hours; discussion—1 hour. China's historical relations with Southeast Asia—military, political, cultural, and economic. Offered in odd numbered years.

194A. History of Japan, I. (4) II.

Lecture—3 hours. Survey of Japanese history to the end of the Tokugawa period.

Mr. Miller

194B. History of Japan, II. (4) III.

Lecture—3 hours. Prerequisite: course 194A or consent of instructor. Survey of Japanese history from the late Tokugawa period to the present.

Mr. Miller

197T. Tutoring in History. (2) I, II, III.

Discussion—1 hour; laboratory—3 hours. Prerequisite: enrolled as a history major with senior standing and consent of Department Chairman. Tutoring of students in lower division courses. Weekly meeting with instructors in charge of courses. Written reports on methods and materials required. May be repeated once for credit. No final examination. (P/NP grading only.)

The Staff (Mr. Woodfill in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; upper division standing.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

Graduate Courses**201. Sources and General Literature of History.**

(4) I, II, III.

Seminar—3 hours. Designed primarily for students preparing for higher degrees in history. A. Ancient; B. Medieval; C. Renaissance and Reformation; D. Modern Europe to 1815; E. Europe since 1815; F. Russia; G. China to 1600; H. China since 1600; I. Britain; J. Latin America since 1810; K. American history to 1787; L. United States, 1787-1896; M. United States since 1896; N. Japan.

The Staff

***202. Social Science in Historical Practices. (4) III.**

Seminar—4 hours. Explores sociological and economic ideas that have actually been used by working historians, especially in United States history, and develops ways to evaluate and plan such efforts.

Mr. Calhoun

211. Ancient History. (4) II.

Seminar—3 hours. Prerequisite: courses 111A, 111B, 111C. A seminar dealing with the

various aspects of Near Eastern and Greco-Roman civilization. Mr. Spyridakis

221. Medieval History. (4) I.

Seminar—3 hours. Recommended: courses 121A, 121B. Topics in the history of medieval Europe. Mr. Bowsky

***237. Russian History. (4) I.**

Seminar—3 hours. Prerequisite: a reading knowledge of Russian. Topics relating to the history of Muscovite and Imperial Russia before 1856. Mr. O'Brien

***242. History of the Enlightenment. (4) III.**

Seminar—3 hours. Prerequisite: a reading knowledge of French. Intellectual and social history of Europe during the Enlightenment. May be repeated for credit. Mr. Schwab

***246. Europe in the Twentieth Century. (4) II.**

Seminar—3 hours. Political history of Europe since 1919, with particular emphasis on the post-1939 period. Mr. Willis

251A-251B. English History. (4-4) II-III.

Seminar—3 hours. Recommended: courses 151A, 151B, and 151C; 152A and 152B; 154. (Deferred grading only, pending completion of sequence.) Mr. Woodfill

261. Latin American History. (4) I, II, III.

Seminar—3 hours. Prerequisite: two courses in Latin American history; reading knowledge of Spanish or Portuguese. Mr. Bauer, Mr. Poppino

***270. Early American History. (4) III.**

Seminar—3 hours. Mr. Jacobson

***271. History of the United States, 1760-1815.**

(4) II.

Seminar—3 hours. Mr. Goodman

272. History of the United States, 1815-1848.

(4) II.

Seminar—3 hours. Mr. Calhoun

***274. Recent History of the United States. (4) I.**

Seminar—3 hours. Topics in twentieth century American history. Mr. Swain

275. American Social and Intellectual History.

(4) I, III.

Seminar—3 hours. Prerequisite: courses 175A, 175B or their equivalent; or consent of instructor. Studies in the recent historiography

of, or research in, American social and intellectual history. May be repeated for credit.

Mr. Smith

***276. Social History of Science and Technology in America. (4) I.**

Seminar—3 hours. Prerequisite: graduate standing. Studies in the historiography of, and research in, the history of science and technology in America from colonial times to the present. Mr. Sherwood

279. History of the United States: the Twentieth Century. (4) II.

Seminar—3 hours. Emphasis on social and economic developments. Mr. Brody

283. History of the United States: The Frontier. (4) III.

Seminar—3 hours. Mr. Jackson

288. History of the United States. (4) I.

Seminar—3 hours. Prerequisite: graduate standing. Emphasis on agricultural history and closely related topics such as exports, transportation and politics. Mr. Shideler

291A-291B. Chinese History. (4-4) I-II.

Seminar—3 hours. Prerequisite: consent of instructor. Research on topics to be chosen by the student for the purpose of writing article-length papers. Mr. Liu

291C. Chinese History. (4) III.

Seminar—3 hours. Prerequisite: reading knowledge of Chinese. Readings in Chinese historical materials. Training in the techniques of using Chinese reference works will be provided. Mr. Price

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-9) I, II, III.

The Staff (Chairman in charge)

299D. Individual Study. (1-6) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

Professional Course

300. The Teaching of History in the Secondary School and the Junior College. (3) III.

Lecture—3 hours. Prerequisite: junior or senior standing with a teaching major or minor in social studies. Methods for the presentation of history at the secondary and junior college level.

HOME ECONOMICS EDUCATION

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 94 and 182.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Professional Courses**300. Teaching Home Economics in Secondary Schools. (3) II.**

Lecture—3 hours. Prerequisite: senior or graduate standing; a teaching major or minor in home economics. Instructional procedures and materials used in teaching home economics in secondary schools. Course should be completed before student teaching and is accepted as a part of the professional education requirements for the teaching credential. Ms. Adams

HOME MANAGEMENT

Related Undergraduate Major.—See page 94.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Upper Division Courses**140. Home Management. (4) III.**

Lecture—4 hours. Prerequisite: Psychology

HUMAN DEVELOPMENT

Related Undergraduate Major.—See pages 77 and 81.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses**12. Human Sexuality and Sexual Behavior. (2) I.**

Lecture—2 hours. Structure and function of genital system; sexual response; fertility; birth control; pregnancy and childbirth; homosexuality; cross-cultural, social and psychological considerations; sex education; courtship and marriage; communication; attitudes and values; lovemaking. (P/NP grading only.)

Mr. Hildebrand

33. Introduction to Supervised Observation.

(2) I, II, III.

Lecture—1 hour; discussion—1 hour. Observation of individuals in a variety of settings; emphasis on observational techniques and the

320A. Introduction to Teaching. (1) I.

Lecture—1 hour. Observations and participation in some form of public school work.

Ms. Adams

320C. Supervised Teaching. (1-12) I, II, III.

Field work—student teaching—36 hours. Prerequisite: course 320A; course 320E must be taken concurrently. Directed teaching for candidates for the credential in home economics.

Ms. Adams

320E. Curriculum and Instruction Procedures.

(3) I, II, III.

Discussion—3 hours. Prerequisite: all students enrolled in 320E must enroll in 320C concurrently. Planning and organizing an effective curriculum. Selection, organization, evaluation, and use of resource material for teaching.

Ms. Adams

IA; senior or graduate standing recommended. Management principles in relation to family resources, goals, and values.

Ms. Bruhn

140L. Laboratory in Home Management. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 140 and senior or graduate standing. Integrated experiences in the various phases of home management.

Ms. Bruhn

discrimination of individual differences.

The Staff (Ms. Jones in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

The Staff (Mr. Thompson in charge)

Upper Division Courses**131. Infancy and Early Childhood. (4) I, II, III.**

Lecture—4 hours. Prerequisite: introductory psychology and biology. An analysis of the biological, social and cultural influences in the psychological growth and development of children; emphasis on the functions served by the parent-offspring relationship; observations.

Mr. Lynn, Mr. Harper

133A-133B. Case Study of a Young Child.

(2-1) I-II; II-III; III-I.

Discussion—1 hour and laboratory—2 hours; seminar—1 hour. Prerequisite: consent of instructor; courses 33 and 131 recommended. Intensive case study of an individual child aged 6 months to 5 years; analysis and use of obser-

vational techniques, cumulative records, and test results. (Deferred grading only, pending completion of sequence.) Ms. Welker

133L. Laboratory in Early Childhood Education.

(3) I, II, III.

Discussion—2 hours; laboratory—5 hours. Prerequisite: course 133B and consent of instructor. Supervised participation in programs administered by the Early Childhood Education Center, field placements at suitable educational institutions. Interaction with groups of young children, observation in schools, evaluation and testing of theories of preschool education and child development. May be repeated for credit. Ms. Welker

136. Middle Childhood and Adolescence. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 131; Psychology 1C; introductory biology. Analysis of the interplay of biological and social-cultural factors in the emotional cognitive and social development from middle childhood through adolescence. Mr. Harper, Mr. Horowitz

136L. Laboratory in Child Development. (2) II, III.

Discussion—1 hour; laboratory—3 hours. Prerequisite: courses 133B or 136 or Psychology 112. Laboratory work with school-age children and adolescents including supervised tutorial work with children with special needs. May be repeated for credit. The Staff

137. Contemporary American Family. (4) II III.

Lecture—4 hours. Sociological and psychological factors influencing marriage and the family in present-day society.

II. Mr. Hawkes; III. Ms. Crockenberg

139. Diagnostic Techniques with Children.

(4) I, II, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 131 and 136, or Psychology 112. Evaluation of intelligence, personality, and special abilities of children. Class demonstration of individual tests for infants, preschool, and school-age children. Concepts of environment. Relevant research findings.

Ms. Bryant, Ms. Werner

140. Emotionally Disturbed Children. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 131 and 136, or Psychology 112. Discussion of psychosis, neurosis, behavior disorders, and learning difficulties in children.

Ms. Bachtold

141. Handicapped and Retarded Children.

(4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 131 and 136 or Psychology 112. Etiology, diagnosis, education, and rehabilitation of children with mental retardation,

minimal brain damage, and sensory or motor handicaps.

I. Ms. Werner; II. Ms. Bryant; III. Ms. Werner

142. Gifted Children. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 136 or Psychology 112 or consent of instructor. Review of research on intellectually gifted; planning appropriate classroom experiences; role of parents and teachers in encouraging creative thinking. Mr. Horowitz, Ms. Bachtold

143. The Adult. (3) III.

Lecture—3 hours. Prerequisite: courses 131 and 136, or psychology 112. Developmental stages of early, middle, and late adulthood; the mature personality. Mr. Horowitz

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Thompson in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Thompson in charge)

Graduate Courses

210. Child Development and Behavior. (3) I.

Lecture-discussion—3 hours. An analysis of the historical, theoretical and empirical issues in child development. The Staff

*211. Physiological Correlates of Behavioral Development. (3) III.

Seminar—3 hours. Prerequisite: consent of instructor. An overview of mechanisms of organismic development and the implications of developmental biology for the analysis of behavioral ontogeny; consideration of parallels between processes of organismic development and infra-human mammals. Mr. Harper

213. Cross-Cultural Study of Children. (3) I.

Seminar—3 hours. Prerequisite: graduate standing. Current theory and research concerned with ethnic and social class differences in children's development. Methods of cross-cultural research, patterns of child rearing, achievement motivation, cognitive and social development among children in the developing countries and ethnic subcultures in the U.S.A. Ms. Werner

*231. Issues in Cognitive and Linguistic Development. (3) II.

Seminar—3 hours. Prerequisite: consent of instructor. Study and evaluation of key issues in the theoretical and empirical literature on cognitive and linguistic development.

Mr. Horowitz

NOTE: For key to footnote symbols, see page 191.

237. Parent-Child Interaction. (3) II.

Seminar—3 hours. Prerequisite: course 210. Current theory and research. Emphasis on parental behavior in other animals and other cultures, child-rearing practices, the child's perception of parents, the differential influence of each parent on the child's psychological well-being, sex-role development, and moral development. Mr. Lynn

290. Seminar. (2) I, II, III.

Discussion—2 hours. Discussion and analysis or research in human development. (S/U grading only.) The Staff (Mr. Thompson in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Thompson in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Thompson in charge)

HUMANITIES

Peter L. Hays, Ph.D., *Chairman of the Committee*
Committee Office, 124 Sproul Hall

Committee in Charge:

Ruby Cohn, Ph.D. (*Comparative Literature and Dramatic Art*)

¹Sherwood A. Fehm, Jr., Ph.D. (*Art*)

¹Neal W. Gilbert, Ph.D. (*Philosophy*)

Peter L. Hays, Ph.D. (*English*)

Richard N. Schwab, Ph.D. (*History*)

Richard G. Swift, M.A. (*Music*)

David A. Traill, Ph.D. (*Classics*)



Major Adviser.—Mr. E. L. Gilbert and Committee.

The Humanities major leads to a Degree of Bachelor of Arts. The purpose of this program is to allow a student great latitude in combining the courses offered by existing departments into a major suiting his individual needs, and to do so with greater ease and flexibility than under current procedures for Double, Group, or Independent Majors. Humanities majors must fulfill all college breadth requirements, and their upper division programs must be approved both by advisers from the departments primarily involved (those departments in which the student is taking twelve or more units) and by the supervising committee.

INSTITUTION MANAGEMENT

Related Major Program.—See pages 86 and 93.

Related Courses. See *Foods and Nutrition*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

125. Quantity Food Production and Service. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Foods 100B. Quantity food preparation, purchasing, service, safety and sanitation as related to large quantity food production. Field trips, observations, and discussions with experts in above areas. Ms. Prophet

The Major Program

Lower Division Courses.—Required: Two of the following sequences (20 units minimum; English and foreign languages will have prerequisites for the sequences listed)—Art 1A, 1B, 1C, 1D (any 3); Classics 10, 40, 41; Dramatic Art 15, 20; English 30A, 30B, 30C or 46A, 46B, 46C; a foreign language, courses 4, 5, 6 (or the equivalent intermediate courses); History 4A, 4B, 4C; Music 27A, 27B (or, depending on prior training, 4A, 4B, 4C or 21A, 21B, 21C); Philosophy 20A, 20B, 20C. Students should take their lower division courses in the departments in which they plan to do their principal upper division work.

Upper Division Courses.—Required: a minimum of 45 units; no fewer than 12 units in each of two departments, both of which will normally be in the Humanities and one of which will always be in the Humanities.

Recommended.—One quarter of Independent Study may be elected (15 units toward the 45 units needed for the major) in the senior year, pulling together the separate strands of study in a project demonstrating the validity of the student's approach.

126. Quantity Food Production Laboratory and Production Planning. (4) II, III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 125. Quantity food production laboratory applying the principles presented in course 125. Menu planning, recipe standardization, portion control, yield studies and financial management as related to food service management. Ms. Prophet

127. Food Service Organization and Management. (4) III.

Lecture—4 hours. Prerequisite: Foods 100B. Administration of quantity food service units,

general principles of organization and management, work simplification, personnel management, planning for layout and equipment.

Ms. Zeman

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: senior standing and consent of

instructor. The Staff (Ms. Zeman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: senior standing and consent of instructor. The Staff (Ms. Zeman in charge)

INTEGRATED STUDIES

Arthur E. McGuinness, Ph.D., *Chairman of the Program*

Program Office, 124 Sproul Hall

Committee in Charge:

- Kenneth R. Greider, Ph.D. (*Physics*)
- Arthur E. McGuinness, Ph.D. (*English*)
- Alan A. Stambusky, Ph.D. (*Dramatic Art*)
- Richard G. Swift, M.A. (*Music*)

Faculty:

Professors:

- Kenneth R. Greider, Ph.D. (*Physics*)
- Alan A. Stambusky, Ph.D. (*Dramatic Art*)

Associate Professors:

- Daniel Brower, Ph.D. (*History*)
- Arthur E. McGuinness, Ph.D. (*English*)

Assistant Professor:

- David A. Robertson, Ph.D. (*English*)

Lecturers:

- Lenora Timm, M.A. (*Linguistics*)
- Roger J. Romani, Ph.D. (*Pomology*)



Major Adviser.—See *Class Schedule*.

Integrated Studies introduces students to a variety of disciplines in humanities, natural sciences, and social sciences, as these disciplines relate to a common historical period or a common theme. The program encourages cross-disciplinary interests in its faculty and students. It values close contact between student and professor both in the classroom and in the residence hall. Integrated Studies offers an intelligent model for the fulfillment of the college breadth requirements. All of these courses count toward the completion of this requirement. Integrated Studies courses are open to all students. There is in addition, a program for a limited number of freshmen who must take four Integrated Studies courses during the year as well as the Integrated Studies Seminar each quarter.

1A-1B-1C. Major Figures of the Seventeenth and Twentieth Centuries: Philosophy, Theology and the Sciences. (4-4-4) I-II-III.

Lecture—4 hours. Prerequisite: courses 2A-

2B-2C and 6 to be taken concurrently. An interdisciplinary study of the ideas and methods of Galileo, Newton, Descartes, Hobbes, Whitehead, Einstein and Neitzsche. Limited enrollment. The Staff (Mr. McGuinness in charge)

2A-2B-2C. Major Figures of the Seventeenth and Twentieth Centuries: The Arts. (4-4-4) I-II-III.

Lecture—4 hours. Prerequisite: courses 1A-1B-1C and 6 to be taken concurrently. An interdisciplinary study of the ideas and work of Rembrandt, Donne, Monteverdi, Stravinsky, Picasso and Eliot. The Staff (Mr. McGuinness in charge)

***3A-3B-3C. Tradition and Change in the Arts and Political Science. (4-4-4) I-II-III.**

Lecture—4 hours. Prerequisite: courses 1C and 2C; courses 4A-4B-4C and 8 may be taken concurrently; consent of instructor. An interdisciplinary study of psychology, drama, the novel, art and music. The Staff (Mr. McGuinness in charge)

***4A-4B-4C. Tradition and Change in the Sciences, Philosophy and Psychology. (4-4-4) I-II-III.**

Lecture—4 hours. Prerequisite: courses 1C and 2C; courses 3A-3B-3C and 8 to be taken concurrently; consent of instructor. An interdisciplinary study of biology, genetics, philosophy of science and psychology. The Staff (Mr. McGuinness in charge)

6. Colloquium. (1) I, II, III.

Discussion—1 hour. Lectures, films, film strips, and readings on the arts and sciences. May be repeated for credit. (P/NP grading only.) The Staff (Mr. McGuinness in charge)

7. Seminar. (1) I, II, III.

Conference—1 hour. Preparation of a research report. Normally to be taken with course 6 and course sequence 1. May be repeated for credit. (P/NP grading only.) The Staff (Mr. McGuinness in charge)

NOTE: For key to footnote symbols, see page 191.

8. Colloquium. (1) I, II, III.

Discussion—1 hour. Lectures, films, film strips, and readings on the arts and sciences. May be repeated for credit. (P/NP grading only.) The Staff (Mr. McGuinness in charge)

9. Seminar. (1) I, II, III.

Conference—1 hour. Preparation of a research report. Normally to be taken with course 8 and course sequence 2. May be repeated for credit. (P/NP grading only.)
The Staff (Mr. McGuinness in charge)

INTERNAL MEDICINE—See Medicine

INTERNATIONAL AGRICULTURAL DEVELOPMENT

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 95 and 182.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Course

10. Population, Food, and Life; Quality or Subsistence? (3) I.

Lecture—3 hours. Food requirements versus self-realization as the limiting force in population growth; the interaction of changing human goals and new technology through successive stages in economic development; agriculture's contributions to development. Mr. Hansen

Upper Division Courses

101. Crop Production under Tropical Conditions. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Science 2 or Botany 2. Climatic and soil adaptation; varieties and varietal improvement in annual and perennial crops; pests, diseases, and their control; fertilization and other management practices. Mr. Williams

102. Livestock and Poultry Production in Developing Areas. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Ecological considerations of developing areas including feed resources, pests, diseases and their control; kinds of livestock, wild game, poultry and fish suited to these areas and their management; uses of animals and their by-products.
The Staff (Mr. Vohra in charge)

190. Proseminar in International Agricultural Development. (3) III.

Lecture—1 hour; seminar—2 hours. Prerequisite: consent of instructor. Coordination of concepts, principles, and information drawn from technical agriculture and the social sciences

presented in the context of economic development. Special emphasis on the problems of program design and implementation. Mr. Davis

195. Field Study in Mexican Agricultural Development. (3) I.

Field trip—8 days; seminar—four 2-hour sessions. Knowledge of Spanish not required. Observation of agricultural development strategies and impact on Northwestern Mexico. Discussion with farmers and agency staff members. Study of unique Mexican institutional arrangements and experiences in dealing with agricultural development problems. United States influences on Mexican agriculture. Preenrollment required. (P/NP grading only.) Mr. Hansen

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Akesson in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Mr. Hedges, Graduate Group Chairman, in charge)

Graduate Courses

280A-280B. Social, Technological, and Economic Factors; Strategies, Planning Procedures and Case Studies. (3-3) II-III.

Seminar—3 hours. Prerequisite: consent of instructor. Problems and analysis in agricultural development; cultural, political, social, and economic organization; human factors in relation to resource use and technology; strategies and planning procedures in agricultural development; case studies of development programs in individual countries.

II. Mr. Hedges, Mr. Peterson
III. Mr. Hedges, Mr. Chancellor

299. Research. (1-9) I, II, III.

(S/U grading only.)
The Staff (Mr. Hedges, Graduate Group Chairman, in charge)

INTERNATIONAL RELATIONS

Robert J. Lieber, Ph.D., *Chairman of the Committee*
Committee Office, 351 Voorhies Hall

Committee in Charge:

Andrzej Brzeski, Ph.D. (*Economics*)
 Robert J. Lieber, Ph.D. (*Political Science*)
 H. Guenther Nerjes, Ph.D. (*German*)
 Rollie E. Poppino, Ph.D. (*History*)
 Paul E. Zinner, Ph.D. (*Political Science*)

Major Adviser.—See *Class Schedule*.

The major in international relations is devised to meet the needs of students interested in acquiring an understanding of the forces and influences conditioning present-day world politics and economics, as well as the main problems and policies of organized states in their relations with one another. Because these problems and policies must be dealt with and determined by governments, the major is built around courses dealing with intergovernmental diplomatic and economic relations. However, it cuts across departmental lines, for international relations are also shaped in relation to political, geographic, economic, and social conditions, and in the light of historical precedents.

The Major Program

Language requirement: approximately 26 quarter units in one modern foreign language. Equivalent course coverage by a placement test or transfer credit is accepted.

Lower Division Courses.—Required: Economics 1A–1B or 2A–2B–2C; History 4B, 4C, or 9A, 9B or 17A, 17B; select two courses from the following: Political Science 1, 2 (or 2D), 3 (or 3D).

ITALIAN

Department Office, 515 Sproul Hall

Assistant Professors:

Jonathan L. Butler, Ph.D.
 Alfonso De Petris, *Dottore in Lettere*.
 Enrico Marelli, *Dottore in Lettere*.

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Departmental Major Adviser.—Mr. Marelli.

The Major Program

Lower Division Courses.—Required: Italian 1, 2, 3, 5, and 6 or their equivalents. Recommended: one year of college Latin or a Romance Language.

Upper Division Courses.—Required: at least 36 units of upper division courses of which two may be chosen from department-approved courses in related fields.

Honors and Honors Program (see page 157). The honors program comprises two quarters of

Upper Division Courses.—From the following four disciplines, select 3 courses from each of two disciplines and 2 courses from each of the remaining two or select 3 courses from each of three disciplines, and at least one course in the remaining discipline:

a) Economics 110B, 115A, 115B, 116, 117, 123, 141, 160, 161;

b) Political Science 112, 117, 118A, 118B, 118C, 121, 122, 123, 124, 125, 127, 128, 129, 131, 132, 134, 137, 138, 139, 140A, 140B, 141, 142, 143, 144, 145, 146, 147A, 147B, 148A, 148B, 149, 170, 172, 173, 174, 176, 185A, 185B;

c) History 102, 115A, 115B, 116, 137D, 141, 143A, 143B, 144B, 146A, 146B, 147B, 151C, 161B, 162, 163B, 164, 165, 166B, 168, 169C, 174A, 174B, 174C, 185B, 191C, 192A, 192B, 193, 194B;

d) Geography 119, 121, 122A, 122B, 123A, 123B, 124, 125A, 125B, 126, 141A, 141B, 143; and/or Sociology 118, 125, 130, 141, 142, 143, 145, 155, 175.

Interdisciplinary seminar (listed under Political Science 192A–192B), 2 quarters of 4 units each (normally taken in the senior year).

Teaching Major.—For the secondary credential: In addition to the departmental major, one upper division course in either history, economics, political science, geography, or sociology is required in order to acquire 16 upper division units in one discipline.

For the elementary credential: The teaching major is the same as the departmental major.

Subject Representative: Mr. Siverson.

study under course 194H, which will include a research paper and a comprehensive examination.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—A minimum of at least 30 units in Italian of which 12 are upper division units including Italian 101 and 102.

Lower Division Courses

A course may not ordinarily be taken for credit if it is a prerequisite to a course already completed. Students offering high school language preparation as a prerequisite must take a placement test.

1. Elementary Italian. (4) I, II, III.

Discussion—4 hours.

The Staff

NOTE: For key to footnote symbols, see page 191.

2. Elementary Italian. (4) I, II, III.

Discussion—3 hours; laboratory—to be arranged. Prerequisite: course 1. The Staff

3. Elementary Italian. (4) I, II, III.

Discussion—3 hours; laboratory—to be arranged. Prerequisite: course 2 or equivalent. The Staff

5. Intermediate Italian: Intensive. (6) I, II, III.

Lecture—6 hours. Prerequisite: course 3 or consent of instructor. Intensive course combining former courses 4 and 5. Emphasis on conversation and reading, acquisition of oral skills. The Staff

6. Reading and Conversation. (4) I, III.

Recitation—4 hours. Prerequisite: course 5 or equivalent. Class discussion; reading of selected works; oral reports; analysis of texts. The Staff

Upper Division Courses**101. Advanced Conversation, Composition, and Grammar. (4) I.**

Lecture—3 hours; weekly essays. Prerequisite: course 6 or consent of instructor. Mr. De Petris

102. Advanced Conversation, Composition, and Grammar. (4) II.

Lecture—3 hours; weekly essays. Prerequisite: course 101 or consent of instructor. Offered in odd-numbered years. Mr. De Petris

***113A. Italian Literature before the Renaissance: from St. Francis to Petrarch. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor. Study of the origins of lyrical forms of Italian literature of the thirteenth and fourteenth centuries. The development of an Italian standard of poetry, with emphasis on the Sicilian school of Poetry. The "Sweet New Style," and Petrarch. Mr. Butler

113B. Italian Literature before the Renaissance: Dante's Divine Comedy and Boccaccio. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor. Study of the origins of non-lyrical forms of Italian literature of the thirteenth and fourteenth centuries. The *Divine Comedy* and the development of a prose style with emphasis on Boccaccio's *Decameron*. Mr. Butler

115A. Italian Literature of the Renaissance and the Baroque: from Humanism to Machiavelli. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor. Detailed examination of the development of the Renaissance ideal of man and the subsequent loss of faith in this ideal as evidenced in the work of Lorenzo de' Medici, Poliziano, Ariosto and Machiavelli. Mr. De Petris

***115B. Italian Literature of the Renaissance and the Baroque: from Cellini to Marino. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 115A. A continued examination into the loss of an ideal. Emphasis on the conflicts in Michelangelo and Tasso leading to Marino, with an excursus on Galileo's role in the formation of a modern literary standard. Mr. De Petris

118. Italian Literature of the Eighteenth Century. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor. Examination of the struggle for the establishment of a modern Italian literature. Emphasis on the work of Goldoni, Bettinelli, Baretti, Parini, Alfieri and Vico. Offered in odd-numbered years. Mr. Marelli

119. Italian Literature of the Nineteenth Century. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor. The various aspects of romanticism in Italy; Manzoni, Verga and *Verismo*. Offered in even-numbered years. Mr. Marelli

***120A. Italian Literature of the Twentieth Century: The Novel. (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor. Study into the development of the novel from Svevo to the present. Emphasis on the work of Svevo, Levi, Moravia, Pavese and Vittorini. Offered in odd-numbered years. Mr. Marelli

***120B. Italian Literature of the Twentieth Century: Poetry and Drama. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor. The main trends in Italian poetry with emphasis on hermeticism; the theater of Luigi Pirandello and its role in the development of contemporary Italian drama. Offered in even-numbered years. Mr. Marelli

139A. Italian Literature in English: Early Italian Literature and Dante Alighieri. (4) I.

Lecture—3 hours; term paper. The origin of the Italian Lyric Tradition with emphasis on authors of the Sicilian School, the Dolce Stil Novo, and Dante's *Vita Nova* (offered in even-numbered years); the *Divina Commedia*. (Offered in odd-numbered years.) Mr. Butler

139B. Italian Literature in English: Boccaccio, Petrarch and the Renaissance. (4) II.

Lecture—3 hours; term paper. Petrarch and Boccaccio and their relations to the Middle Ages and the Renaissance (offered in even-numbered years); the Renaissance, with particular attention to the works of Lorenzo de' Medici, Leonardo da Vinci, Machiavelli, Ariosto, Michel-

angelo, and Tasso (offered in odd-numbered years). Mr. Marelli

139C. Italian Literature in English:

Modern Italian Literature. (4) III.

Lecture—3 hours; term paper. The Romantic Movement in Italy in its relationship to European Romanticism with emphasis on Foscolo, Leopardi and Manzoni (offered in even-numbered years); twentieth-century Italian authors: differing emphasis according to the needs of the students. (Offered in odd-numbered years). Mr. Marelli

194H. Special Study for Honors Students.

(5) I, II, III.

Prerequisite: open only to honors students. Guided research leading to an honors paper.

The Staff (Mr. Bach in charge)

199. Special Study for Advanced Undergraduates.

(1-4) I, II, III.

Prerequisite: consent of instructor. Directed individual study for advanced undergraduate students. The Staff (Mr. Bach in charge)

JAPANESE—See Oriental Languages

LATIN—See Classics

LAW, School of

Daniel J. Dykstra, LL.B., S.J.D., *Dean of the School*

Richard D. Lee, J.D., *Associate Dean of the School*

Dean's Office, 1011 Martin Luther King, Jr. Hall

Professors:

Gerald J. Adler, LL.B., LL.M. (*Acting*)

Homer G. Angelo, J.D., LL.M.

John D. Ayer, J.D., LL.M.

Edward L. Barrett, Jr., J.D.

Brigitte M. Bodenheimer, J.U.D., LL.B.

Edgar Bodenheimer, J.U.D., LL.B.

Charles Davenport, LL.B.

Harrison C. Dunning, LL.B.

Daniel J. Dykstra, LL.B., S.J.D.

G. Meade Emory, LL.B., LL.M.

Floyd F. Feeney, LL.B. (*Acting*)

¹Daniel W. Fessler, J.D., LL.M. (*Acting*)

Ted J. Fiflis, LL.B. (*Visiting*)

Gary S. Goodpaster, J.D. (*Acting*)

Dov M. Grunschlag, LL.B.

James E. Hogan, LL.B.

Pierre R. Loiseau, LL.B., LL.M.

Jean C. Love, J.D. (*Acting*)

Raymond I. Parnas, J.D., LL.M., S.J.D.

John L. Peschel, J.D. (*Visiting*)

John W. Poulos, J.D.

Edward H. Rabin, LL.B.

Mortimer D. Schwartz, J.D., LL.M., M.S.

(*Law Librarian*)

Delbert L. Spurlock, Jr., LL.B., LL.M.

(*Acting*)

John W. Whelan, LL.B.

Donald H. Wollett, LL.B.

Richard C. Wydick, LL.B. (*Acting*)

Lecturers:

Ralph S. Abascal, J.D.

Joseph E. Coomes, LL.B.

Richard D. Lee, J.D.

Alfred J. Lewis, LL.B., A.M.L.S.

(*Assistant Librarian*)

Douglas G. Sykes, M.B.A., J.D.



Admission Requirements and Curriculum:
for details consult the *Announcement of the School of Law.*

Professional Curriculum

First Year

200. Introduction to the American Legal Process.

(3) I.

Lecture—3 hours. An introduction to American Legal Process through study of how courts resolve disputes in selected areas. Emphasis will be upon the operation of the case law system, the lawmaking roles of the courts and the legislatures, and the acquisition of the skills of a lawyer. Mrs. Love, Mr. Poulos, Mr. Whelan

201A-201B. Property. (4-4) II-III.

Lecture—4-4 hours. Study of doctrines and institutions which govern allocation and use of land and improvements thereon. Emphasis is placed upon estates-in-land system, landlord-tenant relationship, conveyancing, and private and public means for land use control. (De-

NOTE: For key to footnote symbols, see page 191.

ferred grading only, pending completion of sequence.) Mr. Dunning, Mr. Peschel

202A-202B. Contracts. (4-4) I-II.

Lecture—4-4 hours. Course examines the sorts of promises that are enforced at law and the nature of protection given. Inquiry is made into the means by which traditional doctrine adjusts—or fails to adjust—to changing social demands. (Deferred grading, pending completion of sequence.)

Messrs. Ayer, Fessler, Loiseaux

203A-203B. Pleading and Procedure in Civil Cases.

(3-4) II-III.

Lecture—3-4 hours. A study of the methodology by which a civil suit is initiated and carried through the courts (excluding, however, the rules and tactics relating to the proof of disputed facts, which are the subject matter of Evidence and Trial Practice respectively). (Deferred grading only, pending completion of sequence.)

Mr. Grunschlag, Mr. Hogan

204A-204B-204C. Torts. (3-3-2) I-II-III.

Lecture—3-3-2 hours. The course in tort law is designed to familiarize the students with the legal concepts which apply to actions brought by litigants who seek relief for injury. It is thus concerned with intentional invasions of personality and property and with the unintentional invasions of these same interests. More specifically the course seeks to analyze civil actions based upon wrongs carrying labels such as: assault, battery, false imprisonment, negligence, defamation, invasion of privacy, misrepresentation, and nuisance. (Deferred grading only, pending completion of sequence.)

Mr. Adler, Mr. Dykstra, Mrs. Love

206. Criminal Law. (5) I.

Lecture—4 hours. A study of the elements and policies of selected criminal offenses.

Mr. Hogan, Mr. Poulos

207A-207B-207C. Legal Research and Writing.

(1-1-2) I-II-III.

Seminar—1-1-2 hours. Small group instruction in the techniques of legal research and writing. (Deferred grading only, pending completion of sequence.)

Mr. Lewis

First-Year Elective. (2-3) III.

First year students are *required* to elect from among a number of courses offered in the spring quarter. Courses available are denominated "open to first-year students" and are found throughout the descriptions for Second and Third Year Courses.

Second and Third Year Courses

212. Introduction to Public Law. (2) II.

Lecture—2 hours. An introduction to the legal aspects of government including the legis-

lative and executive processes, administration, and regulation. Federal and State materials will be studied, coverage will include statutory construction and interpretation.

Mr. Whelan

213. Business Associations. (3) I.

Lecture—3 hours. The business enterprise owned by relatively few persons is the focus of this course. While some treatment is given the partnership and limited partnership, the main emphasis is upon the close corporation. The materials are examined in a planning context and stress the structuring of legally effective and efficient arrangements for the control, management, and dissolution of the close corporation as well as arrangements governing profit sharing and transfer of ownership interests. The fiduciary concepts relevant to this kind of business organization are taken up.

Mr. Fessler.

214. Constitutional Law I. (3) I, II.

Lecture—3 hours. An introductory analysis of the judicial process in constitutional cases; division of powers between the national government and the states.

Mr. Barrett, Mr. Poulos

215A-215B. Corporations. (3-4) II-III.

Lecture—4 hours. Legal problems surrounding the dominant phenomenon of the industrial state, the public issue corporation, are the concern of this course. Attention is given to the traditional statutory and judge-made legal principles as well as the rapidly expanding "federal corporation law." Among the areas studied are the governance of the corporation, its operation through a board of directors, committees and officers; and the prerogatives of shareholders in the decision-making process; the increasing importance of the concept of corporate social responsibility; and the impact of federal regulation of the proxy system. (Deferred grading only, pending completion of sequence.)

Mr. Fessler, Mr. Fifis

216. Commercial Law I. (4) I.

Lecture—4 hours. The basic course in Commercial Law. Emphasis on secured commercial transactions, particularly under Article 9 or the Uniform Commercial Code. Course covers creation of security interests, the relationship between the secured party and the debtor during the existence of the debt and the enforcement of the agreement upon default. Enrollment in this is helpful before, though not a prerequisite to, enrollment in Debtor and Creditor.

Mr. Lee

217A-217B. Constitutional Law II. (3-2) II-III.

217. Constitutional Law II. (5) III.

Lecture—3-2 hours. Constitutional limitations on governmental power, civil rights, and civil liberties. (Deferred grading only, pending completion of 217A-217B sequence.)

II-III. Mr. Barrett; III. Mr. Poulos

219A-219B. Evidence. (3-3) I-II, II-III.

Lecture—3-3 hours. The rules regarding the admissibility of testimonial and documentary proof during the trial of civil and criminal cases, including the concept of relevancy, the hearsay rule, the examination and impeachment of witnesses, the opinion rule, constitutional and statutory privileges, presumptions, and burden of proof. (Deferred grading only, pending completion of sequence.)

I-II. Mr. Hogan; II-III. Mr. Wydick

220A-220B. Federal Taxation I. (3-3) I-II; II-III.

Lecture—3-3 hours. A study of the statutory, judicial, and administrative material concerning federal income taxes. (Deferred grading only, pending completion of sequence.)

I-II. Mr. Davenport; II-III. Mr. Emory

221. Introduction to Estate Planning I. (3) II, III.

Lecture—3 hours. The basic estate planning devices, with emphasis on wills and trusts. Open to first-year students spring quarter only.

Mr. Peschel

222. Strategies and Tactics of Negotiation. (3) III.

Lecture—3 hours. Course deals with the techniques of negotiations in a variety of settings, including personal injury cases, will contests, divorce cases, plea bargaining, etc. Problem method will be the primary teaching technique. Students will be paired as adversaries in dealing with particular negotiations problems, and evaluation of course performance will depend upon how well the student does in the actual negotiation process. Limited to 16 students.

Mr. Wollett

223. Introduction to Estate Planning II. (3) III.

Lecture—3 hours. Prerequisite: Introduction to Estate Planning I. The substantive law needed to prepare and administer modern estate plans. If class size permits, instruction in the drafting of complex dispositive instruments will be included.

Mr. Rabin

225. Marital Property. (3) II.

Lecture—3 hours. California community property law, property consequences of marriage dissolution, and marital property settlement agreements.

Mrs. Bodenheimer

226A-226B. The Criminal Justice Process.

(2-2) I-II.

226. The Criminal Justice Process. (4) II.

Section 1. Course undertakes a detailed coverage of federal and state law, policies, and issues relating to arrest, criminal trial, and conviction. Specifically the course will cover due process and equal protection in criminal cases; arrest; search and seizure; wire tapping and electronic surveillance; police interrogation and

confessions; lineups and other pretrial identification procedures; the scope and administration of the exclusionary rules; right to counsel and other aids; bail and pretrial detention; plea bargaining; grand jury; joinder and severance; right of confrontation; privilege against self-incrimination; criminal discovery; trial by jury; speedy trial; double jeopardy; post-conviction remedies; and retroactivity of constitutional criminal decisions. Examination. (Deferred grading only, pending completion of 226A-226B sequence.)

I-II. Mr. Goodpaster

Section 2. Course covers the police function—arrest, search, surveillance, confessions, lineups—plus selected materials on the charging process, right to counsel, and plea bargaining. Course concentrates on classroom examination of legal materials, with each student expected to do one research and writing exercise which may include field observations. Examination.

II. Mr. Barrett

227. Criminal Law Administration II. (2) I.

Lecture—2 hours. Post-arrest through presentence phases of the criminal process with major emphasis on prosecutorial discretion and plea bargaining.

Mr. Parnas

230. Family Law. (3) I.

Lecture—3 hours. Course covers among other things, marriage and de facto families, legal aspect of birth control, family support obligations (including support of older generation), juvenile dependency and neglect, illegitimacy and legitimation, guardianship, private and agency adoptions, marriage dissolution and annulments, efforts to prevent dissolution, and child custody. Considerable emphasis will be on family law reform, present trends in the United States and elsewhere, and on recent California developments.

Mrs. Bodenheimer

231. Legislation. (3) I.

Lecture—3 hours. Organization and operation of the legislature under constitution and rules; relationship among the legislative, executive, and judicial branches; statutory interpretation and drafting. Limited enrollment.

Mr. Whelan

232. Land Development and Finance. (3) III.

Lecture—3 hours. A study of selected problems in the acquisition, financing, and development of real estate.

Mr. Rabin

233. Philosophy of Responsibility and Punishment. (2) I.

Seminar—2 hours. Interdisciplinary approach to some basic problems of penology, among them the following: 1) relation between freedom of will and criminal responsibility; 2) solutions of this problem proposed by modern schools of psychology, especially deterministic

and existential psychology; 3) impact of these solutions upon the theory, justification, and limits of punishment. Mr. Bodenheimer

234. Agricultural Law. (3) II.

Seminar—3 hours. Selected legal problems related to agricultural industries. _____

235. Administrative Law. (3) I.

Lecture—3 hours. An examination of the powers and procedures of federal and state administrative agencies, with an emphasis on administrative and judicial roles in the performance of a major regulatory function.

Mr. Spurlock

236. Securities Regulation. (3) II, III.

Lecture—3 hours. Prerequisite: corporations. Primary purpose of course is to familiarize students with laws and regulations, federal and state, relating to the issuance of and trading in corporate securities. Includes materials pertaining to the scope of the term "securities," the registration of securities, intrastate and private offerings, broker-dealer regulations and civil liability under the Securities Act of 1933 and the Securities Exchange Act of 1934. Mr. Fiflis

237. Commercial Law II. (3) III.

Lecture—3 hours. Recommended: Commercial Law I. Covers the law governing buyers and sellers of goods, chiefly as embodied in the Uniform Commercial Code Article 2. Statutory regulation of consumer purchases is studied. Open to first-year students. Mr. Loiseaux

238A-238B. Seminar in Comparative Law. (1-1) I-II.

Seminar—1-1 hour. Analysis of differing legal systems, the use of the comparative method in research and practice, examination of actual cases from foreign law practice, and an in depth study of files in recent cases from a civil law country comparing substantive and procedural aspects with American law and practice. (Deferred grading only, pending completion of sequence.) Mr. Angelo

239. Insurance. (3) II.

Lecture—3 hours. The insurance contract and its evolution; life, property, accident and other risks insured against; construction and enforcement of the various types of policies; statutory and regulatory controls. Mr. Whelan

240. Education and the Law. (3) III.

Lecture—3 hours. The focus of this course will be on the relationship between students, teachers, administrators, governing boards, and community groups in publicly funded educational institutions. Emphasis will be given to the rights of students and teachers. Open only to first-year students. Mr. Wollett

241. Legal Accounting. (3) I.

Lecture—3 hours. Course considers the appli-

cation of accounting practices and procedures to a variety of situations arising from financial tax, business, and legal transactions. Basic concepts will be stressed to assure that accounting fundamentals are understood and that their relation to legal problems may be demonstrated. Mr. Davenport

242A-242B. Conflict of Laws. (2-3) I-II; II-III.

Lecture—2-3 hours. A study of cases involving transactions with multistate contacts, to be viewed from the angles of jurisdiction, effect of foreign judgments, and choice of applicable law. Special attention will be given to the judicial techniques used in solving conflicts problems. (Deferred grading only, pending completion of sequence.)

I-II. Mr. Bodenheimer; II-III. Mr. Adler

243. Debtor and Creditor. (4) II.

Lecture—4 hours. Recommended: Commercial Law I. Course focuses on the rights of debtors and creditors. The first part concentrates upon remedies of unpaid creditors under state law and the protection of debtors through limitations on creditors such as exemption laws. The second part involves a study of the Federal Bankruptcy Act with emphasis upon ordinary bankruptcy. Mr. Loiseaux

245. Estate Planning and Taxation. (4) III.

Lecture—4 hours. Prerequisite: Introduction to Estate Planning I. Federal estate and gift taxes; federal income taxation as it affects trusts, estates, and their beneficiaries. Mr. Davenport

246. Federal Jurisdiction. (4) II.

Lecture—4 hours. Prerequisite: Constitutional Law I. Congressional power over the jurisdiction of the federal courts; Supreme Court review of state court decisions; federal post-conviction review; the federal-question jurisdiction of the federal district courts; the choice-of-law applicable in federal litigation; the role of state courts in enforcing federal laws. Mr. Grunschlag

247. Federal Taxation II. (4) I.

Lecture—4 hours. Prerequisite: Federal Taxation I. Emphasis on income tax problems of corporations and their shareholders. Mr. Davenport

248. International Business Transactions. (4) II.

Lecture—4 hours. A basic introduction to legal rules and techniques in doing business with and in foreign countries. Foreign and U.S. law materials will be examined. Students will be presented with actual recent transactions which have arisen in the representation of U.S. interests in Europe, Africa, and Latin America, involving sales of goods (including agricultural products), establishing foreign corporations, taxation in more than one country, anti-trust, and regulation by international organizations such as the GATT, and the European Common Market. Mr. Angelo

249. Introduction to International and Foreign Legal Systems. (4) I.

Lecture—4 hours. Examination of international and foreign legal systems. The shortcomings of classic international law, and the basic and emerging concepts and terminology in international law and relations between national legal systems will be examined. Efforts to establish regional (i.e., EEC, OAS) and universal (United Nations and other organizations) legal systems will be examined. Visiting lecturers and student groups will undertake case studies of key problems such as human rights, regulation of the use of force (Indo-China, Middle East, and others), disarmament, and U.S. participation in international law and relations. This course is recommended for completion prior to courses 238, 248, 268. Mr. Angelo

250. Jurisprudence. (3) I.

Lecture—3 hours. The aim of this course is to offer a comprehensive view of the legal system as a whole from a philosophical, psychological, and sociological perspective. Problem connected with the taming of power and control of aggression will receive special attention. An anatomy of the values to be protected by the legal order will be attempted against the background of influential theories of natural law and justice. The relations between the individual and the state will be further subject of inquiry.

Mr. Boderheimer

251. Labor Relations and Social Problems I. (3) I.

Lecture—3 hours. The principle concern of this course is unions and collective bargaining. Emphasis will also be given to other legal developments which effect the work environment.

Mr. Wollett

252. Labor Relations and Social Problems II. (3) II.

Lecture—3 hours. Processes for conflict resolution including self-help, negotiations, mediation and fact finding, and arbitration. Most of the problems will involve unions and collective bargaining. However, some of them will relate to other types of group conflict resolution. Each student will be expected to participate in a demonstration of conflict of resolution which will be video taped and critiqued in the class.

Mr. Wollett

253. Products Liability. (2) II.

Seminar—2 hours. The civil action for harm to the consumer resulting from dangerous and defective products. Open to first-year students.

Mr. Adler

254. Developmental Legal History. (2) III.

Lecture—2 hours. While some fifteenth, sixteenth and seventeenth century English materials will be used, course will focus on certain

major transformations in Anglo-American legal doctrine during the period 1780–1880. The emergence of a conscious conception of law as an instrument of wealth regulation and allocation will be charted by examination of selected facets of the relationship between economic development and transformations in legal doctrine during the nineteenth century. Related topics include: changes in legal doctrine due to the emergence of competitive economic uses; the recognition of functional and doctrinal limitations upon the absoluteness of rights in real property; and the early experience with the promotion, regulation and evolution of a transportation matrix with emphasis on the security of private investment vs. the demands of public convenience and necessity. Mr. Fessler

255. Equity, Restitution and Damages. (4) III.

Lecture—4 hours. The nature of equity jurisdiction and the principles of equity as developed in the law of specific performance of contracts, the law of equitable servitudes on land and chattels, the law of vendor and purchaser, and the law of injunctions. Restitution is studied as a remedy for tort of equitable wrong, as a method for disgorging benefits conferred under agreements, and as a vehicle for remedying wrongs caused by mistake, misrepresentation, or due to illegal transactions. Problems involving quasi contracts, constructive trusts, equitable accounting, and equitable liens are covered. Mrs. Love

256. Land Use Planning. (3) I.

Seminar—3 hours. The legislative, judicial, and administrative methods used to facilitate the rational use of land. Legal topics considered within this context will include zoning, subdivision regulation, nuisance, eminent domain, city planning, and environmental law.

Mr. Coomes

257. Law and Social Science. (2) II.

Seminar—2 hours. A study of the methodology of social science and its application to law.

Mr. Poulos

258. Legal Profession. (2) II.

Seminar—2 hours. The dynamics of the attorney's role in the practice of law. The attorney-client relation including interviewing and counseling. The attorney as a participant in the courtroom and before governmental agencies. Licensure and policing the profession. The organized bar. Law office management and practice. Delivery of legal services to special clients with unique needs. Relations with other professions. Selected current problems.

Mr. Schwartz

NOTE: For key to footnote symbols, see page 191.

259. Problems in Modern Social Legislation. (2) III.

Seminar—2 hours. An examination of selected problems in welfare and other recent legislation.
Mr. Spurlock

260. Discrimination in Employment. (2) II.

Lecture—2 hours. Discrimination in employment on the basis of race, color, religion, national origin, and sex. State laws will be discussed, as will labor relations laws, constitutional protections, and the Civil Rights Act of 1866. Course will focus on Title VII of the Civil Rights Act of 1964 and the affirmative action programs under Presidential Executive Orders. Course not open to students who have taken course 209, section 4, in spring quarter 1972.
Mr. Spurlock

261. Local Government—Managing the Urban Environment. (3) III.

Seminar—3 hours. Problems in the organization and finance of urban areas. Open to first-year students.
Mr. Ayer

262A–262B. Trade Regulation. (2–3) II–III.

Lecture—2–3 hours. Examination of the economic and social policies of federal antitrust laws governing collaboration among competitors, restraints upon distribution of goods and services, monopolization, and mergers. (Deferred grading only, pending completion of sequence.)
Mr. Wydick

263A–263B–263C. Trial Practice and Procedure.

(1–2–2) I–II–III.

Trial practice and applied procedure. Mock trials will be conducted. (Deferred grading only, pending completion of 263A–263B or 263A–263B–263C sequence.)
Mr. Wydick

264. Water Law. (3) I.

Lecture—3 hours. Legal aspects of water resources management with emphasis on property systems in water, the development of new supplies, the transfer of water rights, and special problems of groundwater management.
Mr. Dunning

265. Government Contracts. (2) III.

Lecture—2 hours. A study of the organization of the Federal Government with respect to acquisition and disposal of public property; expenditure of public funds; federal contracts as vehicles for carrying public policies into effect; making, administering, and terminating contracts; subcontracts; state power and federal contractors; remedies.
Mr. Whelan

266. Law and Medicine. (3) I.

Seminar—3 hours. A seminar approach involving class work, field trips and special projects to study medical education and practice, attorney-physician relations, human behavior development, community health care, and current problems. Limited enrollment. Mr. Schwartz

267. Seminar in Problems of Small Business. (2) I.

Seminar—2 hours. The basic aim of the course is to provide the student who intends to practice law in a ghetto, barrio or other poverty area with the basic tools for advising economic development corporations and other organizations and individuals engaged in small business activities. Emphasis will be on both the practical and the theoretical.
Mr. Sykes

268. Taxation of Foreign Income. (2) III.

Lecture—2 hours. Analysis of the manner in which the United States taxes foreign source income and income of foreign corporations and aliens. Special emphasis will be given to the use of the controlled foreign corporation as an avoidance device and to tax incentives for the export of U. S. products (i.e., domestic international sales corporations). Consideration will also be given to such topics as Western Hemisphere Trade Corporations, income from U. S. possessions, the foreign tax credit and tax treaties. Problem approach will be followed.
Mr. Emory

269. Problems in International and Transnational Law. (3) III.

Seminar—3 hours. Recommended: prior international law study. Application of the international legal process to recent and current problems of international force, including war and other armed conflict; world order, including alternatives to the use of force; utilization of non-national resources, including the oceans and seabeds; and human rights in international law, including race relations and enforcement of individual rights.
Mr. Adler

270. Seminar in Judicial Decision Making. (2) II.

Seminar—2 hours. Recommended: jurisprudence. A detailed study of the role of logic, policy, and social ethics in the judicial process, with special emphasis upon the function of the judiciary in the political and constitutional structure. Limited enrollment.
Mr. Bodenheimer

271. Selected Problems in Tax Policy. (2) II.

Seminar—2 hours. A study of selected problems of public policy in relation to the tax laws.
Mr. Davenport

272. Business Planning. (3) III.

Seminar—3 hours. Course based on a series of problems involving common business transactions in the context of business planning and counseling. Emphasis is placed upon problems of closely held corporations. Topics dealt with will include the formation of corporations; allocation of stock and control; issuance of securities and capital structure; valuation; Securities Act problems; buying out of stockholders; acquisitions via merger or purchase of stock or assets; redemptions and liquidations. Mr. Emory

273. The Law and the Police. (3) III.

Seminar—3 hours. A study of all aspects of legal control of police practice and behavior. In addition to constitutional problems such as arrest, search and seizure, line-ups and confessions, attention will be given to state legislation, municipal codes, basic authorizing statutes, administrative practices, and informal controls. (An additional 2 units credit either as research or as clinical experience is available to students with consent of instructor.) Limited enrollment.

Mr. Feeney

274. Unfair Trade Practice. (3) I.

Lecture—3 hours. Business torts, including interferences with contractual relations, commercial disparagements, and appropriation of values created by another (trade secrets, trademarks, copyrights); the privilege to compete as a defense.

Mr. Wydick

275. The Correctional Process. (3) I.

Lecture—3 hours. Sentencing, probation; incarceration; and parole.

Mr. Parnas

276. Juvenile Justice Process. (3) II.

Seminar—3 hours. A study of the administration of the laws dealing with juvenile offenders. Major emphasis on the role of counsel at each phase of the process.

Mr. Parnas

277. Public Administration. (2) III.

Seminar—2 hours. A study of the administration of law by the principal executive departments; the function of the nonlitigant lawyer in public administration; interdepartment relationships. Guest lecturers. Open to first-year students.

Mr. Whelan

278. Public Employee Bargaining. (3) III.

Seminar—3 hours. Focus on the development and operation of structured collective bargaining by public employees at the federal, state, and local levels. No examination. Each student will be required to submit a written report in respect to some problem or aspect of a problem.

Mr. Wollett

279A-279B. Clinical Program in Manpower Planning. (2-2) I-II.

Program deals with problems which arise in developing and using the capacities of human beings as actual and potential members of the labor force. Specifically the clinical course is concerned with the various problems of unemployment and underemployment as they relate to the culturally and economically disadvantaged. Course emphasis is on creating jobs and educating, training, and upgrading disadvantaged persons and bringing them into the world of work in a meaningful and productive way. During fall quarter each student is assigned to

work eight hours a week with various attorneys employed in the Legal Section offices of the State Department of Human Resources Development. During the second quarter students are engaged in counseling clients in HRD Service Centers located throughout Sacramento. Program participants meet in a two-hour seminar session every two weeks. Enrollment limited. (Deferred grading only, pending completion of sequence.)

Mr. Spurlock

280. Legal Problems of the Disadvantaged. (2) II.

Seminar—2 hours. Legal problems of the poor are selected for intensive study through readings, class discussion, and field research.

Mr. Abascal

281. Children and Law. (2) III.

Seminar—2 hours. Among subjects to be covered are: the rights of children in custody and adoption law, parent-child conflict, step-parenthood, school problems, minority and emancipation, and possible law reform, including solutions in other countries. Limited enrollment. Open to first-year students.

Mrs. Bodenheimer

282. Women and Law. (3) III.

Seminar—3 hours. Topics covered are historical and sociological background; constitutional law and the proposed Equal Rights Amendment; education; employment; reproduction control; the treatment of women in family law; the treatment of women in tax law; the treatment of women in criminal law; and women in the legal profession. Open to first-year students. Limited enrollment.

Ms. Weitzman

283. African Legal Systems. (2) II.

Seminar—2 hours. An introduction to the development of legal systems in anglophonic Africa. Emphasis will be on the historical development of these systems under colonial rule, their response to particular problems such as the maintenance of law and order, resource allocation and the maintenance of legality and the directions in which they may develop as part of independent states. Offered in odd-numbered years.

Mr. Dunning

284. Legal Problems of Consumer Credit. (3) III.

Lecture—3 hours. Focus on current California consumer protection statutes, with comparison to two major current reform proposals. Topics include: rate regulation (usury); rate disclosure; consumer chattel security agreements; holders in due course; creditor's remedies; credit insurance; and bankruptcy. Little time will be devoted to breach of warranty or products liability problems. Open to first-year students. Students who have taken course 209, Sections 1A and 1B, in spring quarter 1972, or Section 1 in spring quarter 1971, may not enroll in this course.

Mr. Ayer

285. Environmental Law. (3) III.

Lecture—3 hours. Introduction to contemporary attempts to use law for the protection and enhancement of environmental quality. Production of electrical power in light of the "energy crisis" will be taken as the focal point for an exploration of problems in the control of public and private decision-making with an environmental impact. Federal and California legislation on environmental policy, water quality, air quality, atomic energy, and power plant siting will be considered as will suggestions for legislation aimed at patterns of consumption of electricity. Students who have taken course 209, Section 2, in spring quarter 1971 or 1972 may not enroll in this course. Mr. Dunning

286. Economics of Legal Issues. (2) II.

Lecture—2 hours. Some fundamental legal issues are studied from the perspective of certain elementary principles of economics. Course is designed for students who do not have significant prior training in economics. Mr. Ayer

287. Native American Law I. (2) III.

Seminar—2 hours. The allocation of legislative and judicial power between reservation, state, and federal governments in areas such as crimes, property utilization, taxation, and family relations. Also, the executive power of the federal government over Native Americans.

288. Native American Law II. (2) II.

Seminar—2 hours. Native Americans' rights to state and federal benefits (voting, education, welfare, health, etc.). Property rights (land, water, natural resources, inheritance, federal management of trust property, economic development). Relocation of Native Americans to urban areas and the termination of the special relationship between the Federal Government and Native Americans.

289. Law and Poverty. (3) I.

Seminar—3 hours. A selective study of the processes, institutions, laws and practices which produce, maintain, exacerbate, regulate or otherwise affect the conditions of being poor, together with an examination of the role of law and the lawyer in ending poverty, its sustaining conditions and effects. Mr. Goodpaster

290. Selected Problems in Criminal Justice Administration. (2) I.

Seminar—2 hours. Selected current reform efforts in criminal justice administration. Emphasis on the pre-trial process. Specific topics include bail reform, preventive detention, alternatives to arrest, and noncriminal methods for handling juveniles. (Additional 2 units credit, either as research or as clinical experience, available to students with consent of instructor.)

Mr. Feeney

291. Selected Problems in Constitutional Litigation. (3) III.**Section 1: Mr. Goodpaster**

Examines selected constitutional cases pending before the United States Supreme Court which relate to due process, equal protection, poverty, discrimination, criminal procedure, and First Amendment rights, and hopefully will develop for the student a working sensitivity for constitutional litigation. Course will be conducted as a moot court, with extended discussion following presentation of cases. Each student will be expected to write a brief in a case assigned him and argue that case before a bench composed of his classmates and instructor. Each student will also be assigned an opinion to write and circulate for comments. No examination.

Section 2: Mr. Barrett

Course will focus on the injunction as the principal vehicle for constitutional (and much environmental) litigation. Essentially course will be on the law governing injunctions and their enforcement with emphasis on their relevance to constitutional litigation. Course will be primarily class discussion of casebook materials with an examination supplemented by a paper. If class enrollment is small, course will be informal with more attention to written work; if it is large, it will be more formal. Examination designed to cause students to pull together in their studying the rather complex legal doctrines involved. Open to first-year students.

292A-292B. Clinical Program in Civil Legal Services. (5-5) I-II.**292A-292B-292C. Clinical Program in Civil Legal Services. (3-3-3) I-II-III.**

Course designed to introduce students to the legal problems of the poor and the practice of poverty lawyering. Course work will consist of an initial and relatively short but intensive period of training to familiarize students with poverty law practice and litigation, followed by assignment (for a two- or three-quarter period) to a legal aid office. Materials used in training are especially designed for novice practitioners and will utilize simulations and video taping. Students will be assigned to local legal aid offices and specialized programs where they will receive a structured clinical experience ranging from interviewing and assisting clients, going to court, drafting pleadings, and other legal documents, to assisting in law reform activities. Students will also participate in a seminar keyed to their poverty law practices. (Deferred grading only, pending completion of a sequence.)

Mr. Goodpaster

293A. Legal Problems of the Prison Inmate. (2) I, II.

The clinical program offers students an opportunity to assist inmates of the California

Medical Facility at Vacaville with their legal problems, including both civil and criminal matters. Students are engaged throughout the quarter interviewing inmates, and investigating and evaluating their cases. Seminar sessions devoted to discussion of the legal problems of the inmate are scheduled throughout the quarter. Enrollment limited. Course may be repeated once for credit. Mr. Feeney

294. Clinical Program in the Legislative Process.

(3-3) II-III

Prerequisite: legislation. The Legislative Externship Program is designed to provide students with practical, day-to-day experience in the operation of the office of a legislator or the operation of a legislative committee. A major thrust of the program is to enable students to become familiar with the process of making laws as contrasted with their interpretation and enforcement. Students are assigned to the equivalent of one day a week with an individual Senator, Assemblyman, Consultant, or other person in the Legislature. Enrollment limited with preference given to third-year students. Mr. Whelan

295A-295B-295C. Instruction in Legal Research and Writing. (2-2-2) I-II-III.

Laboratory—2-2-2 hours. Each participant in this course will be responsible for planning and carrying out a program of instruction in legal research and writing for eight or nine first-year students. Enrollment limited to 21 students and subject to approval of the professor in charge. (Deferred grading only, pending completion of sequence.) Mr. Lewis, Mr. Schwartz

296. Clinical Program in the Administration of Criminal Justice. (6-12) I, II.

Program affords students the opportunity to gain practical experience working full or part time in a District Attorney's and Public Defender's office in one of several surrounding counties. Students enrolled in the program engage in the full range of activities associated with their specific office including research, writing, interviewing, investigation, counseling, arguing motions, evidentiary hearings, and trials under supervisory conditions of state bar rules. Weekly evening seminar sessions are scheduled for the purpose of exchanging clinical experiences and discussing pertinent resource materials with instructor and a variety of guests. Enrollment currently limited to third-year students. Mr. Parnas

297. Individual Clinical Study. (1-12) I, II, III.

Students may engage in individual clinical interests with the approval of a faculty committee and under the supervision of individual fac-

ulty members. A detailed outline of the proposed clinical work, endorsed by the proposed supervising faculty member, should be submitted to the Deans' Office prior to the beginning of the quarter in which credit is requested. The program must be under appropriate legal supervision and designed to maximize educational benefits. Normally, a student may enroll for no more than 6 units of individual clinical work (no more than 3 units in spring quarter for third-year students). In exceptional cases, students may receive 12 units credit for full-time program.

The Staff (Mr. Lee in charge)

298. Group Study. (1-5) I, II, III.

Groups of students (not less than 4 nor more than 10) with common interest in studying a stated legal problem may plan and conduct their own research and seminar program, subject to the following regulations: 1) program may extend over no more than three quarters; 2) plan for the program and the list of members of the group must be submitted to Dean's Office at least 4 weeks prior to opening of the quarter in which the program is to begin; 3) three-man faculty board will be appointed for each group proposed and will have authority to approve or disapprove the program and the amount of credit sought; 4) changes in the program or in membership of the group must be approved by the faculty board and normally will be approved only prior to the quarter involved; 5) group members must conduct a weekly seminar session to be arranged by them; 6) each member of the group must submit to the faculty board an individual paper or an approved alternative grading out of the seminar subject; 7) S/U grading basis only unless the entire group requests letter grades in advance. The Staff

299. Research in Legal Problems. (1-5) I, II, III.

Students may receive credit for individual research projects, subject to the following regulations: 1) project may extend over no more than three quarters; 2) each project will be under the supervision of a faculty member (normally, no faculty member will be permitted to supervise more than 5 students working on individual programs during any quarter); 3) an outline of the project must be approved by the supervising faculty member in advance of the quarter in which it is to be undertaken; 4) student must submit an individual paper or approved alternative to the supervising faculty member; 5) grading will be on a S/U basis unless a request for letter grading has been made in advance. (Deferred grading pending completion of a sequence of more than one-quarter can be in effect.) The Staff

NOTE: For key to footnote symbols, see page 191.

LIBERAL ARTS

Gerald P. Mohrmann, Ph.D., *Chairman of the Committee*
Committee Office, 201 North Hall

Committee in Charge:

Peter K. Cline, Ph.D. (*History*)
Richard Cowen, Ph.D. (*Geology*)
Harvey Himelfarb, M.A. (*Art*)
Gerald P. Mohrmann, Ph.D. (*Rhetoric*)



Major Adviser.—See *Class Schedule* listing.

The Liberal Arts major which leads to a Bachelor of Arts degree, is intended for students who have strong interdisciplinary or cross-disciplinary interests and who wish to be introduced systematically to a number of intellectual disciplines and styles. The major consists of a series of core sequences on the lower division level followed by a rigorous, individually planned upper division program.

The Major Program

Lower Division Courses.—Required: Rhetoric 1 and one course chosen from English 1, 2, 3, 4A, or 4B; 18 units or the equivalent of a foreign language through the intermediate level; and for humanities, History 4A-4B-4C is required and one from the following four course sequences is recommended: Philosophy 20A-20B-20C, English 46A-46B-46C or 30A-30B-30C, select three courses from Art 1A-1B-1C-1D, Music 27A-27B or for students with previous musical training, Music 4A-4B-4C or 21A-21B-21C. For the natural science and mathematics requirement choose one from the following five course sequences: Mathematics 16A-16B-16C; Chemistry 1A-1B-1C; Physics 2A-2B-2C; Chemistry 1A-1B, Biological Sciences 1, and one course from: Bacteriology 2, Botany 2, or Zoology 2 (Designed as a basic introductory sequence for students interested in the biological sciences.); Geology 1, 3, and 16 and either 1L or 3L. For social science choose

one from the following four course sequences: Economics 1A and 1B; select three from Political Science 2, 3, 4, and 5; Anthropology 2, Sociology 1, and Sociology 3; Psychology 1A-1B-1C.

Students electing this major must also satisfy the area requirements established by the College of Letters and Science. The lower division requirements of the Liberal Arts major fully satisfy the humanities area requirements but do not necessarily satisfy the natural science and social science area requirements. Elective courses should be selected with this in mind. With the permission of the adviser, transfer students may use courses from other institutions to satisfy lower division requirements of the major.

Upper Division Courses.—In consultation with his adviser, each student shall propose a plan of upper division course work which will satisfy his general educational objectives and meet the following requirements: the minimum of 45 units; at least 12 units must be in each of two departments; and during the senior year, a sequence of 20-25 units of independent study, concluding with one full quarter (15 units) in the Independent Study Program.

The intent is to require the student to plan a coherent upper division program that culminates in a 15-unit independent studies project which will encourage the integration of learning and result in a substantial written research paper. The student's proposed upper division program must be approved by both his adviser and the committee in charge of the major. It is expected that the student will work closely with his adviser in planning his program. Each student must have his plan approved by the end of his junior year. The one-quarter independent study project (15 units) must be approved by the Independent Studies Board of the Davis Division. (See pages 7 and 189 for filing.)

LINGUISTICS

Wayne Harsh, Ph.D., *Chairman of the Committee*
Committee Offices, 813 and 124 Sproul Hall

Committee in Charge:

Ronald A. Arbini, Ph.D. (*Philosophy*)
Wilbur A. Benware, Ph.D. (*German*)
Wayne Harsh, Ph.D. (*English and Linguistics*)
David L. Olmsted, Ph.D. (*Anthropology*)
Carol F. Wall, Ph.D. (*Anthropology*)

Faculty

Ronald A. Arbini, Ph.D. (*Philosophy*)
Jarvis R. Bastian, Ph.D. (*Psychology*)
Martin A. Baumhoff, Ph.D. (*Anthropology*)
Wilbur A. Benware, Ph.D. (*German*)
Jonathan L. Butler, Ph.D. (*French*)

Thomas P. Campbell, III, Ph.D. (*English*)
 Marianne Cooley, Ph.D. (*English*)
 Linnea C. Ehri, Ph.D. (*Education*)
 Wayne Harsh, Ph.D. (*English and Linguistics*)
 Larry N. Hillman, Ph.D. (*French*)
 Burt Liebert, M.F.A. (*Education*)
 Lenora Timm, M.A. (*Linguistics*)
 Wolfgang W. Moelleken, Ph.D. (*German*)
 Jerry A. Moles, Ph.D. (*Anthropology*)
 David L. Olmsted, Ph.D. (*Anthropology*)
 Edward J. Tully, Jr., Ph.D. (*Mathematics*)
 Galina Tuniks, Ph.D. (*German*)
 Carol F. Wall, Ph.D. (*Anthropology*)
 Benjamin E. Wallacker, Ph.D. (*Oriental Languages*)



Major Advisers.—Mr. Harsh, Miss Wall.

Graduate Adviser.—Mr. Harsh.

The Major Program

For the A.B. Degree in Linguistics students must complete 36 upper division units including Anthropology 109, 110, 111, 112, (phonetics; elementary linguistic analysis; intermediate linguistic analysis; comparative linguistics); Linguistics 140 (grammatical analysis). Other courses which may be elected to complete the required upper division 36 units are Anthropology 120 (language and culture); English 105A, 105B, 105C, 195, 196 (present-day English; history of the English language; language change; theory and methods in modern linguistics; language, thought, and expression stylistics); French 160 (structure of French language); German 105, 106, 108 (history of German language; linguistic structure of German; contrastive structures of English and German); Linguistics 139, 150 (phonological analysis; contrastive analysis — English and Spanish); Oriental Languages 123A, 123B, 123C (Chinese phonology; Chinese morphology; Chinese syntax); Philosophy 137 (philosophy of language); Psychology 132, 180G (language and cognition; psycholinguistics); Spanish 131A, 131B, 132 (modern Spanish syntax; introduction to Spanish linguistics); Human Development 131, 133A, 133B, (infancy and early childhood; case study of a young child).

Language Requirement.—Students are also required to become familiar with one or more of the non-Indo-European languages. This requirement may be satisfied by taking (a) Oriental Languages 100 (languages of Eastern Asia) and Anthropology 220 (field course in linguistics)

or (b) by taking three quarters of study in one or more specific non-Indo-European language(s).

Graduate Study.—Requirements for the M.A. degree are 30 units in addition to a thesis plus a reading knowledge of German, French, Russian, or a language approved by the Committee. The courses must be graduate courses or upper division undergraduate courses. At least 12 of the 30 units must be strictly graduate work in the major subject. The following courses, or their equivalents, are specifically required: Linguistics 140, 202, 225 (grammatical analysis; principles of historical linguistics; modern linguistic theory). Graduate courses in related departments that candidates may take include the following: Anthropology 220 (field course in linguistics); English 205, 207 (introduction to Old English; middle and early modern English); French 200, 201A, 201B, 230 (seminar in French linguistics; history of French language; old Provençal); German 200, 201, 202, 203 (Gothic; old high German; middle high German; old Saxon); Psychology 264 (psycholinguistics); Russian 200, 202, 204 (old Church Slavonic; descriptive Russian grammar; historical Russian grammar); Spanish 230A, 230B (history of Spanish language); English 301 (teaching of English as a foreign language).

Lower Division Course

35. Introduction to Linguistics. (4) I.

Lecture—3 hours; laboratory—2 hours. Introduction to the study of language: its nature, diversity, and structure. Ms. Timm

Upper Division Courses

105C. Language Change Reflected in Literature.

(4) II, III.

Lecture—3 hours; term paper. Prerequisite: English 105A, 105B. Study of literary texts from the various historical periods in the English language, considering in addition to other stylistic features, those characteristics particularly connected with development and change in the respective linguistic periods. (Same course as English 105C.) Mr. Harsh, Mr. Campbell

138. Language Development. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 111. Theory and research on children's acquisition of their native language including the sound system, grammatical structure, basic semantic categories, and social aspects of usage. Miss Wall

139. Phonological Analysis. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 111. Introduction to and application of phonological theory.

Mr. Butler, Mr. Campbell

NOTE: For key to footnote symbols, see page 191.

140. Grammatical Analysis. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 111. Introduction to the theory of grammatical analysis; practice in solving exercise problems. The Staff

146. Comparative Study of European Languages.

(4) III.

Lecture—3 hours; discussion—1 hour. Introduction to morphemic analysis of both modern (Slavic, Baltic, Finno-Ugric) and old (Latin, Gothic) languages, with concentration on paradigmatic patterns and structural relationships. The Staff

150. Contrastive Analysis: English and Spanish.

(4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Comparison of the linguistic structures of English and Spanish with emphasis on problems of the Spanish-speaker learning English. Analysis of the role of the school and of the sociolinguistic situation of Spanish-speakers in California and the Southwest.

***192. Theory and Methods in Modern Linguistics.**

(4) II.

Lecture—3 hours; term paper. Prerequisite: English 105A, 105B. Survey of scholarship in linguistic studies from European backgrounds to present, concentrating primarily but not exclusively on descriptions of the English language. Contrastive analysis with other Germanic languages. (Same course as English 192.) Mr. Campbell

***195. Language, Thought, and Expression. (4) II, III.**

Seminar—3 hours; term paper. Prerequisite: course 192. Investigation of a range of theories on the relationship between language structure and thought, from philosophical, linguistic, and historical points of view. Readings will include Chomsky, Empson, Hayakawa, Ogden, Richards, Vygotsky, Whorf, et al. (Same course as English 195.)

196. Stylistics. (4) II, III.

Seminar—3 hours; term paper. Prerequisite: course 192. Analysis of linguistic stylistic variations in specific works to be selected from the corpus of writings in English. (Same course as English 196.) Mr. Baker, Mr. Harsh

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Harsh in charge)

Graduate Courses**202. Principles of Historical Linguistics. (3) II.**

Lecture—3 hours. Prerequisite: Anthropology 112. Advanced treatment of the theory and method of historical linguistics.

Mr. Benware, Mr. Butler

210. Historical Germanic Linguistics. (4) II.

Seminar—3 hours. The principles and techniques of historical linguistics will be used to study the development of the Germanic languages from Proto-Indo-European through Proto-Germanic and into early Germanic dialects such as Old Norse, Gothic, Old Saxon, and Old English. Mr. Benware

215. Computational Linguistics. (2) III.

Lecture—2 hours. Prerequisite: consent of instructor. The use of electronic computers and other computational devices in linguistic analysis, mechanical translation, and lexicography. The Staff

220. Romance Linguistics. (4) II.

Seminar—3 hours. Prerequisite: consent of instructor. Phonology, morphology, and lexicography of the major Romance languages. Mr. Butler, Mr. Hillman

225. Modern Linguistic Theory. (3) III.

Lecture—3 hours. Prerequisite: course 140 and Anthropology 111. Survey of leading contributions to linguistic theory from de Saussure to the present. The Staff

299. Research. (1-12) I, II, III.

The Staff (Mr. Harsh in charge)

MANDARIN—See Oriental Languages**MATHEMATICS**Kurt Kreith, Ph.D., *Chairman of the Department*David G. Mead, Ph.D., *Vice-Chairman of the Department*

Department Office, 565 Academic Office Building III.

Professors:

Henry L. Alder, Ph.D.

George A. Baker, Ph.D. (*Emeritus*)

Dallas O. Banks, Ph.D.

*Donald C. Benson, Ph.D.

Carlos R. Borges, Ph.D.

Albert C. Burdette, Ph.D. (*Emeritus*)

Gulbank D. Chakerian, Ph.D.

Curtis M. Fulton, Ph.D.

Robert D. Glauz, Ph.D.

Charles A. Hayes, Jr., Ph.D.
 Kurt Kreith, Ph.D.
 Gary J. Kurowski, Ph.D.
^{8,4}David G. Mead, Ph.D.
 Edward B. Roessler, Ph.D. (*Emeritus*)
 Sherman K. Stein, Ph.D.
¹Takayuki Tamura, D.Sc.
 Howard J. Weiner, Ph.D.

Associate Professors:

Hubert A. Arnold, Ph.D.
^{3,4}David W. Barnette, Ph.D.
 Doyle O. Cutler, Ph.D.
 Charles E. Franti, Ph.D. (*Biostatistics*)
 Melven R. Krom, Ph.D.
 Peter Linz, Ph.D.
 Donald A. Norton, Ph.D.
 Washek F. Pfeffer, Ph.D.
 G. Thomas Sallee, Ph.D.
 Robert W. Stringall, Ph.D.
 Edward J. Tully, Jr., Ph.D.

Assistant Professors:

^{2,3}Robert J. Buck, Ph.D.
 James R. Diederich, Ph.D.
 George T. Duncan, Ph.D.
^{2,3}Allan L. Edelson, Ph.D.
 Alan P. Fenech, B.A. (*Acting*)
 Arthur J. Krener, Ph.D.
^{3,4}E. O. Milton, Ph.D.
 John K. Moore, Ph.D.
 Francisco J. Samaniego, Ph.D.
 Alvin D. Wiggins, Ph.D. (*Biostatistics*)

Lecturer:

Shirley A. Goldman, M.S.



Major Subject Advisers.—Mr. Alder, Mr. Benson, Mr. Buck, Mr. Chakerian, Mr. Cutler, Mr. Diederich, Mr. Edelson, Mr. Glauz, Mr. Kurowski, Mr. Milton, Mr. Norton, Mr. Samaniego, Mr. Weiner.

Special Area Advisers.—Statistics, Mr. Duncan; Computer Science, Mr. Glauz; Biological Sciences, Mr. Moore; Physical Sciences, Mr. Banks; Social Sciences, Mr. Sallee.

Graduate Advisers.—Mr. Barnette, Mr. Duncan, Mr. Linz, Mr. Stein, Mr. Stringall.

Students interested in the study of mathematics should obtain the Undergraduate Brochure, which is available at the Department office. Assistance in planning an undergraduate major program in mathematics should be obtained from a major subject adviser. In addition, students seeking information pertaining to statistics, computer science, or applications of mathematics to the biological, physical, or social sciences may contact the appropriate special

area adviser. Beyond this, students with particular questions concerning preparation for graduate work may contact a graduate adviser and obtain the Graduate Brochure, which is also available at the Department office.

The Major Programs.—There are two degree programs: Bachelor of Arts and Bachelor of Science. The latter is especially recommended for students who intend to pursue mathematics at the graduate level. Under either degree program the student may prepare for various careers by an appropriate choice of elective courses.

Lower Division Requirements: courses 11 (or its high school equivalent), 21A–21B–21C, 22A–22B–22C, and 24.

Upper Division Requirements: courses 101 and 108A (both courses should be taken before the junior year). For the A.B. program, the student must complete an additional 31 units of upper division mathematics courses; for the B.S. program, 35 additional units of upper division mathematics must be completed. During the first quarter of the junior year, each mathematics major is required to submit to his adviser a statement of his mathematical objectives, together with a proposed upper division program consistent with those objectives. The form to be used for this statement is available from the Department, and must be submitted in time to receive approval of the proposed program prior to the last day of the quarter involved. In general, 198 and 199 courses are not appropriate to be applied towards the 31- or 35-unit requirement; any exceptions must be approved by the Department's committee on program review. Certain mathematically oriented courses given by other departments may be admissible in partial satisfaction of the above mentioned 31- or 35-unit requirements with prior departmental approval.

Recommended preparation for *Graduate study in pure mathematics*: courses 127A–127B–127C and 151A–151B–151C. The remainder of the 31 or 35 units may be chosen from those courses reflecting special interests of the student. To ensure that appropriate combinations of courses are included, the student should seek the counsel of advisers in the department.

Recommended preparation for *secondary teaching in mathematics*: courses 108A–108B, 139A–139B–139C and 141 are virtually essential; a selection from courses 13, 19 (or 29), 36A–36B, 112, 114, 115A, 128A–128B–128C is highly recommended.

Recommended preparation for a career in *statistics*: courses 29, 32, 105A–105B, 127A–127B–127C, 131A–131B–131C, 132A–132B, and at least one quarter of 133, 134, or 135. It is strongly recommended that courses 127A–127B–127C and 131A–131B–131C be taken in the junior year.

Recommended preparation for a career in *applied mathematics*: Because of the great variety of possibilities, the student should obtain advice from advisers in the department concerning his special interests.

Recommended *B.S. Language Preparation*: B.S. degree candidates are advised (but not required) to satisfy the same language requirement as that for the A.B. degree, but to fulfill it in French, German or Russian.

Graduate Study.—The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in mathematics. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Mathematics.

Qualifying Examinations.—A student entering from high school who believes that he has had the equivalent of a course offered by the Department of Mathematics (e.g., analytic geometry and calculus) may demonstrate his proficiency in this course by examination. If, in the opinion of the department, his level of achievement is sufficiently high, he will be permitted to enter the next course in the sequence. No University credit is earned by passing such an examination. Arrangements for an examination must be made with the Department secretary on or before the Monday of registration week.

Teaching Major.—The teaching major is satisfied by either the A.B. or the B.S. degree in mathematics. Recommended preparation is given under the major programs section above.

Teaching Minor.—Thirty units of mathematics which must include: 4 units of fundamentals of mathematics (course 36A); 8 units of calculus (courses 11, 21A, 21B or 16A–16B–16C); 3 units of probability and/or statistics (course 13 or 131A); 3 units of geometry (course 37 especially recommended, 112, 114, 116, or 141).

The remainder of the 30 units are elective, except that students with a non-academic major must include 18 units in mathematics at the upper division or graduate level.

Subject Representative: Mr. Stringall.

Lower Division Courses

B. Elementary Algebra. (no credit) I.

Lecture—3 hours. Basic concepts of algebra, including polynomials, factoring, equations, graphs, and inequalities. Offered if sufficient number of students enroll. (There is a fee of \$45.) The Staff

C. Trigonometry. (no credit) I, II.

Lecture—2 hours. Basic concepts of trigonometry, including trigonometric functions, identities, inverse functions, and applications. Offered if sufficient number of students enroll. (There is a fee of \$30.) The Staff

D. Intermediate Algebra. (no credit) II.

Lecture—3 hours. Basic concepts of algebra, designed to prepare the student for college work in mathematics, such as courses 13, 16A, or 21A. Functions, equations, graphs, logarithms, systems of equations, and trigonometric functions. Offered if sufficient number of students enroll. (There is a fee of \$45.) The Staff

11. Analytic Geometry. (2) I, II, III.

Lecture—2 hours. Prerequisite: two years high school algebra, plane geometry, plane trigonometry. Analytic geometry in two dimensions. Not open to students who have received credit for course 16A. The Staff

13. Elementary Statistics. (4) I, II, III.

Lecture—4 hours. Prerequisite: two years of high school algebra. Measures of central tendency and dispersion; binomial, normal, Student-t, and chi-square distributions; testing hypotheses; non-parametric statistics; regression and correlation theory. (Students having had courses 130A or 131A may not take course 13 for credit.) The Staff

15. Matrix Theory. (3) I, II.

Lecture—3 hours. Vector algebra, matrix algebra, determinants, applications. The Staff

16A. Analytic Geometry and Calculus. (3) I, II, III.

Lecture—3 hours. Prerequisite: one and one-half years of high school algebra, plane geometry, plane trigonometry. Not open for credit to students who have received credit in course 21A. Only 2 units of credit allowed students who have received credit for course 11. A short course in analytic geometry and differential and integral calculus. Not recommended for students who may wish to major in the mathematical sciences. The Staff

16B. Analytic Geometry and Calculus. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 16A or 21A. Not open for credit to students who have received credit in course 21B. Continuation of course 16A. The Staff

16C. Analytic Geometry and Calculus. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 16B or 21B. Only 1 unit of credit will be allowed to students who have received credit for course 21B. Continuation of course 16B with special emphasis on the calculus of three dimensions including partial differentiation and total differentials; designed for students desiring to take physical chemistry. The Staff

19. Basic Concepts of Computing. (3) I, II, III.

Lecture—2 hours; laboratory—2 hours. Prerequisite: two years of high school algebra. Introduction to principles of computing. Methods and algorithms for solving problems by use of a digital computer. Course not intended for stu-

dents in physical sciences and mathematics. Students having had course 29, Engineering 5, or former course 30 may not receive credit for this course. Mr. Kurowski, Mr. Linz

21A. Calculus. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: two years high school algebra, plane geometry, plane trigonometry, and analytic geometry. Basic concepts of the calculus, derivatives, definite integral, fundamental theorem of calculus. If analytic geometry has not been completed, course 11 must be taken concurrently. Only 2 units of credit will be allowed in course 21A for students who have received credit for 16A. The Staff

21AH. Honors Calculus. (4) I.

Lecture—4 hours. More intensive treatment of material covered in course 21A. Students completing 21AH can continue with course 21BH or the regular 21B. Mr. Diederich

21B. Calculus. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21A. Continuation of course 21A. Multiple integrals, improper integrals, partial derivatives. Only 2 units of credit will be allowed students who have received credit for 16B. The Staff

21BH. Honors Calculus. (4) II.

Lecture—4 hours. More intensive treatment of material covered in course 21B. Students completing 21BH can continue with course 21CH or the regular 21C. Mr. Diederich

21C. Calculus. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21B or 16C. Continuation of course 21B. Infinite series, calculus of vector functions, Green's theorem in the plane. The Staff

21CH. Honors Calculus. (4) III.

Lecture—4 hours. More intensive treatment of material covered in course 21C. Mr. Diederich

21L. Introduction to Programming for Calculus.

(1) II.

Laboratory—2 hours. Prerequisite: course 21B (may be taken concurrently). Course in programming for calculus students. Examples will be chosen to illustrate the ideas of calculus. Mr. Norton

22A. Linear Algebra. (3) I, II, III.

Lecture—3 hours. Prerequisite: nine units of college mathematics. Matrices and linear transformations, determinants, complex numbers, quadratic forms. (Courses 22A, 22B, 22C may be taken in any order. However, if enrolled in

Physics 4 sequence, 4C, 4D, 4E, courses should be taken in reverse order, 22C, 22B, 22A.)

The Staff

22AH. Honors Linear Algebra. (3) I.

Lecture—3 hours. Prerequisite: course 21CH or consent of instructor. Honors course covering the material of course 22A. Mr. Chakerian

22B. Differential Equations. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 21C. Solutions of elementary differential equations. The Staff

22BH. Honors Differential Equations. (3) III.

Lecture—3 hours. Prerequisite: course 22CH. Honors course covering material of course 22B. Mr. Chakerian

22C. Vector Analysis. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 21C. Green's theorem, Stoke's theorem, divergence theorem. The Staff

22CH. Honors Vector Analysis. (3) II.

Lecture—3 hours. Prerequisite: course 22AH. Honors course covering material of course 22C. Mr. Chakerian

24. Infinite Series. (2) II, III.

Lecture—2 hours. Prerequisite: course 21C (may be taken concurrently). Elements of infinite series including Fourier series and series with complex terms. The Staff

29. Introduction to Computer Science. (3) I.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 21C. Introduction to properties of a digital computer. Implementation of mathematical algorithms on a computer. Students electing this course may not receive credit for Engineering 5 and only two units of credit will be allowed for students who have had course 19. Students may not receive credit for course 29 if they have completed former course 30. Mr. Norton

32. Basic Statistical Analysis Through Computers.

(3) II.

Lecture—3 hours. Prerequisite: course 16B or 21B; course 19, 29, or Engineering 5A. Introduction to modern statistical thinking using student-developed digital computer algorithms. Simulation and approximation methods. Sampling. Robust estimation and hypothesis testing. Association methods: regression, correlation, and contingency tables. Mr. Duncan

36A. Fundamentals of Mathematics. (4) I, II, III.

Lecture—4 hours. Introduction to fundamental mathematical ideas selected from the principal areas of modern mathematics. Properties of the primes, the fundamental theorem of arithmetic, properties of the rationals and irrationals, binary and other number systems. The Staff

NOTE: For key to footnote symbols, see page 191.

36B. Fundamentals of Mathematics. (2) III.

Lecture—2 hours. Prerequisite: course 36A. The content will be selected from the following topics: number systems, set theory, number theory, the axiomatic method, topology, and combinatorics.
The Staff

37. Topics in Geometry. (4) III.

Lecture—4 hours. Prerequisite: one year high school geometry. Topics in Euclidian geometry selected from the theory of geometric transformations, the area and dissection of plane figures, convex polyhedra, foundations of geometry.
Mr. Barnette

Upper Division Courses**101. Survey of Contemporary Mathematics. (2) II.**

Lecture—2 hours. Prerequisite: course 21C. An introduction to modern mathematics, its methods and applications, including the relationship between pure and applied mathematics.
The Staff

105A. Applied Statistical Methods: Analysis of Variance. (4) II, III.

Lecture—4 hours. Prerequisite: course 13. Design of experiments including randomized complete block designs, Latin squares, split-plot designs, factorial designs, and incomplete block designs.
Mr. Duncan

105B. Applied Statistical Methods: Multiple Regression. (3) III.

Lecture—3 hours. Prerequisite: course 105A. Continuation of course 105A. Multiple regression and analysis of covariance.
Mr. Duncan

108A. Introduction to Abstract Algebra and Analysis. (3) I, III.

Lecture—3 hours. Prerequisite: course 21C. Introduction to abstract mathematics, including the real number system, sets, mappings, mathematical induction, and algebraic structures.
The Staff

108B. Introduction to Abstract Algebra and Analysis. (3) II.

Lecture—3 hours. Prerequisite: course 108A. Unique factorization, Gaussian integers and applications. Introduction to integration theory. Course 108B may not be taken for credit after students have completed courses 127A or 151A, and may not be taken concurrently with 127A or 151A.
The Staff

112. Projective Geometry. (3) I.

Lecture—3 hours. Prerequisite: course 108A. Analytic and synthetic methods applied to topics chosen from the following: perspectivities, projectivities, harmonic sets, involutions, and conics. Offered in odd-numbered years.
Mr. Fulton

114. The Theory of Convex Sets. (3) III.

Lecture—3 hours. Prerequisite: courses 21C, 22A, 108A; or consent of instructor. Topics selected from the theory of convex bodies, convex functions, geometric inequalities, combinatorial geometry, and integral geometry. Offered in even-numbered years.
Mr. Sallee

115A. The Theory of Numbers. (3) I.

Lecture—3 hours. Prerequisite: course 108A. Divisibility and related topics, diophantine equations, selected topics from the theory of prime numbers.
Mr. Alder

115B. The Theory of Numbers. (3) II.

Lecture—3 hours. Prerequisite: course 108A. Euler-function, Moebius function, congruences, primitive roots, quadratic reciprocity law. Offered in even-numbered years.
Mr. Alder

115C. The Theory of Numbers. (3) III.

Lecture—3 hours. Prerequisite: course 108A. Continued fractions, partitions. Offered in even-numbered years.
Mr. Alder

***116. Metric Differential Geometry. (4) III.**

Lecture—4 hours. Prerequisite: courses 22A, 22C; or consent of instructor. Vector analysis, curves and surfaces in three dimensions. Offered in odd-numbered years.
Mr. Chakerian

118A. Partial Differential Equations. Elementary Methods of Solution. (3) I.

Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C, 24. Partial differential equations of mathematical physics, solution by separation of variables, Fourier series.
Mr. Banks

118B. Partial Differential Equations: Boundary Value Problems and Special Functions. (3) II.

Lecture—3 hours. Prerequisite: course 118A. Classical boundary value problems, expansion by orthogonal functions, Sturm-Liouville theory, special functions.
Mr. Banks

118C. Partial Differential Equations: Complex Analysis and Integral Transforms. (3) III.

Lecture—3 hours. Prerequisite: course 118B or consent of instructor. Functions of a complex variable, Fourier and Laplace Transforms, applications to boundary value problems.
Mr. Banks

119. Theory of Ordinary Differential Equations. (3) I.

Lecture—3 hours. Prerequisite: courses 22A, 22B; course 24 recommended. Existence and uniqueness theorems, theory of linear equations of the second and higher orders, regular singular points, Sturm-Liouville systems, Laplace transforms.
Mr. Diederich

125. Introduction to Mathematical Logic. (3) I.

Lecture—3 hours. Prerequisite: course 108A or consent of instructor. Propositional calculus, predicate calculus, normal forms, completeness. Offered in odd-numbered years. Mr. Krom

***126. Introduction to the Theory of Sets. (3) II.**

Lecture—3 hours. Prerequisite: course 21C or consent of instructor. Fundamental concepts including cardinal numbers, order types, ordinal numbers. Offered in odd-numbered years. Mr. Cutler

127A. Advanced Calculus. (4) I, II.

Lecture—4 hours. Prerequisite: courses 22A, 22C; course 108A recommended. Real number system, continuity, differentiation, and integration on the real line; vector calculus and functions of several variables; theory of convergence. Mr. Stein

127B. Advanced Calculus. (4) II.

Lecture—4 hours. Prerequisite: course 127A. Continuation of course 127A. Mr. Stein

127C. Advanced Calculus. (4) III.

Lecture—4 hours. Prerequisite: course 127B. Continuation of course 127B. Mr. Stein

128A. Numerical Analysis. (4) I.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 29 or a knowledge of FORTRAN or ALGOL. Error analysis, approximation, interpolation, numerical differentiation, and integration. Mr. Glauz, Mr. Kurowski

128B. Numerical Analysis in Solution of Equations. (4) II.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 22A, and course 29 or a knowledge of FORTRAN or ALGOL. Solution of non-linear equations, simultaneous equations, eigenvalues, linear programming. Mr. Glauz, Mr. Kurowski

128C. Numerical Analysis in Differential Equations. (4) III.

Lecture—3 hours; laboratory—1 hour. Prerequisite: courses 22A, 22B, and course 29 or a knowledge of FORTRAN or ALGOL. Difference equations, operators, numerical solution of differential equations, partial differential equations. Mr. Glauz, Mr. Kurowski

129A. Introduction to the Theory of Programming. (3) II.

Lecture—3 hours. Prerequisite: course 22A, course 29 or equivalent. Assembly languages; arrays and lists; data processing algorithms. Mr. Norton

129B. The Theory and Structure of Computer Languages. (3) III.

Lecture—3 hours. Prerequisite: course 129A. Theory of compilers; structure of computer languages, their limitations and ambiguities; study of a particular language. Mr. Norton

130A-130B. Mathematical Statistics, Brief Course. (4-4) I-II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 16B. Course in mathematical statistics for non-majors. Concepts of probability and sampling, principles of estimation, properties of estimators, sampling distributions, bivariate normal and principles of testing. Mr. Samaniego

131A. Introduction to Probability Theory. (4) I.

Lecture—3 hours; laboratory—2 hours. Prerequisite: courses 22A, 24. Fundamental concepts of probability theory, discrete and continuous random variables, standard distributions, moments and moment-generating functions, laws of large numbers and the central limit theorem. Mr. Moore

131B-131C. Introduction to Mathematical Statistics. (4-4) II-III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 131A. Sampling, point estimation, exact sampling distributions, confidence intervals, hypothesis testing, linear regression and analysis of variance. Mr. Moore

132A-132B. Introduction to Stochastic Processes. (3-3) II-III.

Lecture—3 hours. Prerequisite: course 131A. Random walks, recurrent events, Markov chains, birth-and-death processes. Mr. Moore

133. Probabilistic Models in Operations Research. (3) I.

Lecture—3 hours. Prerequisite: course 130B or 131B. Applications of probability and statistics to the study of systems and organizations. Topics in reliability theory, replacement models, waiting-line models, inventory models. Offered in odd-numbered years. Mr. Duncan

***134. Nonparametric Inference. (3) II.**

Lecture—3 hours. Prerequisite: course 130B or 131B. Selected topics in nonparametric statistical inference from a one-sample and a k-sample point of view. Topics include Kolmogorov-Smirnov type tests; confidence intervals for quantiles, locations and scale parameters; rank tests, dispersion tests, efficiency. The Staff

135. Multivariate Data Analysis. (3) III.

Lecture—3 hours. Prerequisite: course 130B or 131B. Quantitative description and analysis

of social and biological problems. Multivariate statistical procedures implemented through computer methods. Applied time series, factor and cluster analysis.
Mr. Duncan

136. Development of Mathematical Ideas. (3) II.

Lecture—3 hours. Prerequisite: course 21C. Topics and mathematicians studied with an emphasis on the origin of modern mathematics. May be repeated for credit with consent of instructor.
Mr. Buck

139A–139B–139C. Introduction to Algebra.

(3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: courses 22A, 108A; or consent of instructor. Not open for credit to students who have received credit in course 151A without consent of Department, and may not be taken concurrently with 151A. Theory of equations, symmetric functions, vector space aspects of Galois theory, Euclidean rings, integers in quadratic fields.
Mr. Barnette

140. Applications of Mathematics. (3) III.

Lecture—3 hours. Prerequisite: course 108A. Applications of algebra, geometry and analysis in the natural, social and physical sciences.
Mr. Krener

141. Euclidean Geometry. (3) II.

Lecture—3 hours. Prerequisite: course 108A. An axiomatic and analytic examination of Euclidean geometry from an advanced point of view. In particular, a discussion of its relation to other geometries.
Mr. Chakerian

147. Topology. (3) II.

Lecture—3 hours. Prerequisite: course 127C, and 151A or 139A–139B. Basic notions of point set and combinatorial topology.
Mr. Borges

151A–151B–151C. Algebra. (4–4–4) I–II–III.

Lecture—4 hours. Prerequisite: course 108A. Introduction to groups, rings, fields and linear transformations.
Mr. Cutler

*168. Linear Programming and Game Theory. (3) I.

Lecture—3 hours. Prerequisite: course 21C or 15. Introduction to zero-sum, two-person games; the fundamental theory for matrix games; basic concepts of linear inequalities; the duality theorem; the simplex method. Offered in even-numbered years.
Mr. Sallee

185A–185B. Functions of a Complex Variable.

(3–3) I–II.

Lecture—3 hours. Prerequisite: courses 22C, 24. Complex number systems, Cauchy-Riemann equations, elementary functions, Cauchy integral theorem, power series, Laurent series, residue theorem, conformal mapping, special topics.
Mr. Milton

197T. Tutoring in Mathematics. (1–4) I, II, III.

Seminar—1–2 hours; laboratory—2–6 hours. Prerequisite: upper division standing and con-

sent of instructor. Special projects in mathematical education which involve the development of techniques for mathematics instruction and tutoring on an individual or small group basis. (P/NP grading only.)
The Staff

198. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor. (P/NP grading only.) The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

(P/NP grading only.)

The Staff (Chairman in charge)

Graduate Courses

201A–201B–201C. Real Analysis. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 127C. Point set topology; Lebesgue measure and integration on the real line; abstract spaces; general measure and integration.
Mr. Benson

202A–202B–202C. Functional Analysis.

(3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: courses 127C, 151C, 201C. Hilbert spaces, spectral theorem, Banach spaces, commutative Banach algebras.
Mr. Kreith

*205A–205B–205C. Functions of a Complex Variable.

(3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: course 127C. Theory of analytic functions, Cauchy integral theorem, power series, analytic continuation, conformal mapping, special functions.
Mr. Milton

210A–210B–210C. Topics in Algebra, Analysis and Geometry. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced algebra, analysis, and geometry related to curriculum at all levels. Required in the M.A. program for prospective teachers. (Course 210A, 210B, 210C series may be repeated for credit with prior consent of instructor.)
Mr. Stein

*215A–215B–215C. Topology. (3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Topics selected from point set topology and homotopy theory.
Mr. Edelson

*218A–218B–218C. Partial Differential Equations.

(3–3–3) I–II–III.

Lecture—3 hours. Prerequisite: courses 22A, 127C. Topics from the theory of partial differential equations and integral equations. Offered in even-numbered years.
Mr. Chakerian

219. Ordinary Differential Equations. (3) I.

Lecture—3 hours. Prerequisite: courses 22A, 127C. Ordinary differential equations in the

real and complex domains; existence and uniqueness theorems; linear systems; analysis of singular points; Sturm-Liouville theory; asymptotic expansions. Offered in odd-numbered years.

Mr. Banks

220A-220B-220C. Mathematics for the Physical Sciences. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 118B, 118C or their equivalents. Topics in ordinary and partial differential equations, boundary value problems, functions of a complex variable, matrices and calculus of variations. Mr. Krener

225A-225B. Metamathematics. (3-3) II-III.

Lecture—3 hours. Prerequisite: courses 151A and either 125 or Philosophy 12A-12B; or consent of instructor. Axiomatizability, consistency, and completeness of the formalized mathematical theories; definability in formal languages; topics from the theory of models. Offered in even-numbered years. Mr. Krom

227A-227B-227C. Advanced Numerical Analysis. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Fundamental concepts in advanced numerical analysis, well-posedness, condition-numbers, truncation errors of finite algorithms, round-off error analysis, theory of iterative procedures, numerical integration, interpolation, approximation theory, applications of functional analysis. Mr. Linz

***228A-228B. Advanced Numerical Analysis of Ordinary Differential Equations. (3-3) I-II.**

Lecture—3 hours. Prerequisite: course 128C. Numerical solutions of initial and boundary value problems for systems of ordinary differential equations; error analysis and stability. Offered in even-numbered years. Mr. Kurowski

229A-229B-229C. Numerical Methods in Linear Algebra and Selected Topics. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: consent of instructor. Computational methods and theoretical aspects in the solution of simultaneous algebraic equations and matrix eigenvalue problems. Numerical analysis in the solution of partial differential equations, optimization, data analysis, Monte Carlo, etc. Offered in odd-numbered years. Mr. Glauz

231A-231B-231C. Mathematical Statistics. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: courses 22C and 131C, or consent of instructor. First-year graduate course in theoretical statistics.

Mr. Samaniego

***232. Analysis of Variance. (3) I.**

Lecture—3 hours. Prerequisite: course 131C. Estimation and testing for the general linear hypothesis, components of variance, multiple comparisons. Offered in even-numbered years.

The Staff

***233A-233B. Design of Experiments. (3-3) II-III.**

Lecture—3 hours. Prerequisite: course 232. Topics from balanced and partially balanced incomplete block designs, fractional factorials, and response surfaces.

The Staff

235A-235B-235C. Analytic Probability Theory. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 201A or equivalent. Measure-theoretic foundations of probability, distribution functions and characteristic functions, law of large numbers and central limit theorems, conditional probabilities, martingales.

Mr. Weiner

***236A-236B-236C. Advanced Mathematical Statistics. (3-3-3) I-II-III.**

Lecture—3 hours. Prerequisite: courses 127C and 131C. Distribution theory, parametric and nonparametric estimation, principles of statistical tests, sequential analysis, statistical decision functions.

The Staff

***237A-237B. Nonparametric Inference. (3-3) II-III.**

Lecture—3 hours. Prerequisite: course 131C. Survey of nonparametric methods in estimation and hypothesis testing.

The Staff

***238A-238B-238C. Analysis of Stochastic Processes. (3-3-3) I-II-III.**

Lecture—3 hours. Prerequisite: course 132B. Analytical theory of second-order stochastic processes, Poisson processes, birth-and-death processes, and Markov processes, including a study of statistical inference for these processes.

Mr. Weiner

240A-240B-240C. Differential Geometry. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 116. Transformation of coordinates, tensor analysis, intrinsic geometry of surfaces, parallel displacement, Riemannian manifolds, the geometry of subspaces, subspaces of a flat space, application of tensor analysis to the theory of relativity. Offered in odd-numbered years. Mr. Chakerian

245A-245B-245C. Algebraic Topology. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 215C. Algebraic invariants of spaces and their behavior with respect to continuous functions. Offered in even-numbered years. Mr. Pfeffer

250A-250B-250C. Algebra. (3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. The theory of groups, rings, and fields.

Mr. Tully

***251A-251B. Theory of Groups. (3-3) I-II.**

Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Normal subgroups, composition series, Sylow subgroups, nilpotent groups, solvable groups, group representations, groups with operators, group extensions, free groups, and ordered groups. Offered in even-numbered years.

Mr. Tully

***252. Linear Algebra. (3) I.**

Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Vector spaces. Offered in even-numbered years.

Mr. Mead

253. Theory of Binary Systems. (3) III.

Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Elements of semigroups, quasigroups, and groupoids.

Mr. Tamura

290. Seminar. (1-8) I, II, III.

Advanced study in various fields in mathematics as follows: applied statistics and statistical consulting (Mr. Duncan); K-theory (Mr. Edelson); differential geometry (Mr. Fulton); theory of distributions (Mr. Milton); convex bodies (Mr. Sallee); algebraic theory of semigroups (Mr. Tamura); stochastic processes (Mr. Weiner). (S/U grading only.)

299. Research. (2-6) I, II, III.

(S/U grading only.)

The Staff

Professional Courses**300A. The Teaching of Mathematics, K-9. (3) I, II, III.**

Lecture, discussion, laboratory, and field work—2-6 hours. Prerequisite: senior or graduate standing, simultaneous teaching experience, and sufficient background for successful completion of the mathematics portion of the Commission for Teaching Preparation Licensing General Subject Matter Examination or its equivalent; or consent of instructor. Mathematics curriculum and teaching methods for grades K-9. Students may complete the course in 1, 2, or 3 quarters. Grades will be awarded upon completion of the course. Arrangements for enrollment must be made at the beginning of the fall quarter.

Mr. Stringall

300B. The Teaching of Mathematics. (3) I, II, III.

Lecture, discussion, laboratory and field work—2-6 hours. Prerequisite: consent of instructor or senior or graduate standing; simultaneous teaching experience, and a mathematics minor or equivalent. Mathematics curriculum and teaching methods. Students may complete the course in 1, 2, or 3 quarters. Grades will be awarded upon completion of the course. Students teaching full time who wish to complete 3 units during a single year must enroll during the fall quarter.

MEDICAL EDUCATION—See Medicine**MEDICAL MICROBIOLOGY—See Medicine****MEDICAL SCIENCES—See Medicine Bulletin****MEDICINE—School of, this page; Medicine—Veterinary Medicine, see page 388****MEDICINE, School of**

C. John Tupper, M.D., *Dean of the School*
 Alexander Barry, Ph.D., *Associate Dean*
 Morton Levitt, Ph.D., *Associate Dean*
 Earl F. Wolfman, Jr., M.D., *Associate Dean*
 John R. Beljan, M.D., *Assistant Dean*
 Charles C. Semple, M.B.A., *Assistant Dean*

Professors:

Charles F. Abildgaard, M.D. (*Pediatrics*)
 Neil C. Andrews, M.D. (*Surgery, Regional Medical Program*)
 Len Hughes Andrus, M.D. (*Family Practice*)
 Alexander Barry, Ph.D. (*Human Anatomy*)
 Eliezer Benjamini, Ph.D. (*Medical Microbiology*)

Leslie Bernstein, M.D., D.D.S. (*Otorhinolaryngology*)
 Robert J. Bolt, M.D. (*Internal Medicine*)
 Nemat O. Borhani, M.D. (*Community Health, Internal Medicine*)
 Robert H. Brownson, Ph.D. (*Human Anatomy*)
 Marion A. Carnes, M.D. (*Anesthesiology*)

- Robert S. Chang, M.D., D.Sc. (*Medical Microbiology*)
 Loring F. Chapman, Ph.D. (*Behavioral Biology*)
 Hamilton S. Davis, M.D. (*Anesthesiology*)
 Gerald L. DeNardo, M.D. (*Radiology, Internal Medicine*)
 Pierre M. Dreyfus, M.D. (*Neurology*)
 William M. Fowler, Jr., M.D. (*Physical Medicine and Rehabilitation*)
 Ernest D. Gardner, M.D. (*Neurology*)
 John P. Geyman, M.D. (*Family Practice*)
 Marvin Goldman, Ph.D. (*Adjunct; Human Physiology*)
 Paul F. Gulyassy, M.D. (*Internal Medicine*)
 Paul C. Hattersley, M.D. (*in Residence; Internal Medicine, Pathology*)
 Glenn R. Hawkes, Ph.D. (*Family Practice, Applied Behavioral Sciences*)
 Robert E. Hodges, M.D. (*Internal Medicine*)
 Paul D. Hoeprich, M.D. (*Internal Medicine, Pathology*)
 Arnold C. L. Hsieh, M.D., D.Sc. (*Human Physiology*)
 Robert L. Hunter, Ph.D. (*Human Anatomy*)
 Edward J. Hurley, M.D. (*Surgery*)
 Lucille S. Hurley, Ph.D. (*Nutrition*)
 Gordon D. Jensen, M.D. (*Psychiatry, Pediatrics*)
 Eva K. Killam, Ph.D. (*in Residence; Pharmacology*)
 Keith F. Killam, Jr., Ph.D. (*Pharmacology*)
 Edwin G. Krebs, M.D. (*Biological Chemistry*)
 Lindy F. Kumagai, M.D. (*Internal Medicine*)
 Donald G. Langsley, M.D. (*Psychiatry*)
 Morton Levitt, Ph.D. (*Psychiatry*)
 Jerry P. Lewis, M.D. (*Internal Medicine*)
 Paul R. Lipscomb, M.D. (*Orthopaedic Surgery*)
 George H. Lowrey, M.D. (*Postgraduate Medicine, Pediatrics*)
 Dean T. Mason, M.D. (*Internal Medicine, Human Physiology*)
 Rashid Massumi, M.D. (*Internal Medicine*)
 Arnold Meadow, Ph.D. (*Psychiatry*)
 Kenneth R. Niswander, M.D. (*Obstetrics and Gynecology*)
 Philip E. S. Palmer, M.D. (*Radiology*)
 Demosthenes Pappagianis, M.D., Ph.D. (*Medical Microbiology*)
 Antolin Raventos, M.D. (*Radiology*)
 Boris H. Ruebner, M.D. (*Pathology*)
 Jerome L. Schwartz, Ph.D. (*in Residence; Community Health*)
 Robert S. Stempel, Jr., M.D. (*Pediatrics*)
 Harold M. Sterling, M.D. (*Physical Medicine and Rehabilitation, Pediatrics*)
 Robert E. Stowell, M.D., Ph.D. (*Pathology*)
 Wilfred E. Toreson, M.D., Ph.D. (*Pathology*)
 Makepeace U. Tsao, Ph.D. (*Surgery*)
 Joe P. Tupin, M.D. (*Psychiatry*)
 C. John Tupper, M.D. (*Internal Medicine*)
 Irving H. Wagman, Ph.D. (*Human Physiology*)
 G. Worden Waring, Ph.D. (*Physical Medicine and Rehabilitation*)
 Sefton R. Wellings, M.D., Ph.D. (*Pathology*)
 Theodore C. West, Ph.D. (*Medical Education, Pharmacology*)
 Wallace D. Winters, M.D., Ph.D. (*Pharmacology, Family Practice*)
 Earl F. Wolfman, Jr., M.D. (*Surgery*)
 Julian R. Youmans, M.D., Ph.D. (*Neurosurgery*)
²Antonio Zappala, M.D. (*Human Anatomy*)

Associate Professors:

- John R. Beljan, M.D. (*Surgery*)
 Robert D. Cardiff, M.D., Ph.D. (*Pathology*)
 John H. Eisele, M.D. (*Anesthesiology, Human Physiology*)
 Gerald A. Deneau, Ph.D. (*in Residence; Pharmacology*)
 Ernest M. Gold, M.D. (*Internal Medicine*)
 Lawrence M. Greenberg, M.D. (*in Residence; Psychiatry*)
 Charles E. Franti, Ph.D. (*Community Health*)
 Elliot Goldstein, M.D. (*Internal Medicine*)
 Anthony J. Hance, Ph.D. (*Pharmacology*)
 Albert B. Iben, M.D. (*Surgery*)
 Malcolm R. MacKenzie, M.D. (*Internal Medicine*)
 Larry W. McDonald, M.D. (*Pathology*)
 Lois F. O'Grady, M.D. (*Internal Medicine, Medical Education*)
 John M. Palmer, M.D. (*Urology*)
 V. James Polidora, Ph.D. (*Behavioral Biology*)

NOTE: For key to footnote symbols, see page 191.

Gerald L. Portney, M.D. (*Ophthalmology*)
 Lawrence Rabinowitz, Ph.D. (*Human Physiology*)
 Richard S. Riggins, M.D. (*Orthopaedic Surgery*)
 Robert El. Smith, Ph.D. (*Human Physiology*)
 Robert R. Traut, Ph.D. (*Biological Chemistry*)
 John D. Trelford, M.D. (*Obstetrics and Gynecology*)
 David W. Watson, M.D. (*Internal Medicine*)
 Edward J. Watson-Williams, M.D. (*Internal Medicine*)
 Lowell D. Wilson, M.D., Ph.D. (*Internal Medicine, Biological Chemistry*)
 Robert F. Zelis, M.D. (*Internal Medicine, Human Physiology*)

Assistant Professors:

Otmar W. Albrand, M.D. (*Neurosurgery*)
 Ezra A. Amsterdam, M.D. (*Internal Medicine, Pharmacology*)
 David G. Anderson, Ph.D. (*Adjunct; Obstetrics and Gynecology*)
 Stefan D. Arnon, M.D. (*Radiology*)
 Joseph H. Asling, M.D. (*Anesthesiology*)
 William F. Benisek, Ph.D. (*Biological Chemistry*)
 Willard J. Blankenship, M.D. (*Pediatrics*)
 Kurien Chacko, Ph.D. (*Human Anatomy*)
 Robert G. Chuinard, M.D. (*in Residence; Orthopaedic Surgery*)
 Nanine H. Clark, Ph.D. (*Human Anatomy*)
 Sheldon E. Cohen, M.D. (*Surgery*)
 Matthew H. Connors, M.D. (*in Residence; Pediatrics*)
 Carroll E. Cross, M.D. (*Internal Medicine, Human Physiology*)
 Robert D. D'Ambrosia, M.D. (*in Residence; Orthopaedic Surgery*)
 Lawrence A. Danto, M.D. (*in Residence; Surgery*)
 Anthony N. DeMaria, M.D. (*in Residence; Internal Medicine*)
 William G. Ellis, M.D. (*Pathology*)
 W. Frank Emmons, M.D. (*in Residence; Neurosurgery*)
 Dennis L. Fung, M.D. (*Anesthesiology*)
 Andrew J. Gabor, M.D., Ph.D. (*Neurology*)
 Stanley E. Geel, Ph.D. (*Adjunct; Neurology*)
 Lindsay C. Getzen, M.D. (*in Residence; Surgery*)
 Andrew M. Goldner, Ph.D. (*Human Physiology*)

Sarah D. Gray, Ph.D. (*Human Physiology*)
 Jerry F. Green, Ph.D. (*Human Physiology*)
 Frederick W. Hanson, M.D., (*Obstetrics and Gynecology*)
 Gary L. Henderson, Ph.D. (*Pharmacology*)
 John W. B. Hershey, Ph.D. (*Biological Chemistry*)
 Manfred A. Hollinger, Ph.D. (*Pharmacology*)
 Julian J. A. Irias, M.D. (*Pediatrics*)
 Hanne M. Jensen, M.D. (*in Residence; Pathology*)
 Mark A. R. Kendall, M.D. (*Radiology*)
 Jess F. Kraus, Ph.D. (*Community Health*)
 Bo M. T. Lantz, M.D. (*Radiology*)
 Ruth M. Lawrence, M.D. (*Internal Medicine*)
 Thomas C. Lee, Ph.D. (*Human Physiology*)
 James S. Lieberman, M.D. (*Neurology*)
 Glynn E. McArn, Ph.D. (*Adjunct; Medical Education*)
 Stanley Meizel, Ph.D. (*Human Anatomy*)
 Constantine A. Michas, M.D. (*Surgery*)
 Richard R. Miller, M.D. (*in Residence; Internal Medicine*)
 John A. Reitan, M.D. (*Anesthesiology*)
 Don A. Rockwell, M.D. (*Psychiatry*)
 Alan M. Roth, M.D. (*Ophthalmology*)
 Antone F. Salel, M.D. (*in Residence; Internal Medicine*)
 Robert J. Scibienski, Ph.D. (*Medical Microbiology*)
 Robert P. Scobey, Ph.D. (*Behavioral Biology*)
 Bagher M. Sheikholislam, M.D. (*Pediatrics*)
 Larry G. Stark, Ph.D. (*Pharmacology*)
 Margaret S. Steward, Ph.D. (*in Residence; Psychiatry*)
 Michael J. Sullivan, M.D. (*Urology*)
 Jerold H. Theis, D.V.M., Ph.D. (*Medical Microbiology*)
 Frederic A. Troy, II, Ph.D. (*Biological Chemistry*)
 Zakauddin Vera, M.B. B.S. (*in Residence; Internal Medicine*)
 Nazhiyath Vijayan, M.D. (*in Residence; Neurology*)
 Vijaya K. Vijayan, Ph.D. (*Human Anatomy*)
 Louis A. Vismara, M.D. (*in Residence; Internal Medicine*)
 Thomas L. Volk, M.D. (*Pathology*)
 Donal A. Walsh, Ph.D. (*Biological Chemistry*)
 Richard F. Walters, Ph.D. (*Medical Education, Human Physiology*)

Craig E. Watson, Ph.D. (*in Residence; Human Anatomy*)
 Absalom M. Yellin, Ph.D., (*in Residence; Psychiatry*)

Lecturers:

Arthur L. Barry, Ph.D. (*Internal Medicine, Pathology*)
 Mary D. Fenley, R.N., M.S. (*Family Practice*)
 William R. Nesbitt, M.D. (*Family Practice*)
 Margaret Newmark, M.B. B.S. (*Family Practice*)
 Constance E. Roth, M.P.H. (*Family Practice*)
 James M. Stubblebine, M.D. (*Psychiatry*)
 Charles H. White, Ph.D. (*Medical Education, Regional Medical Program*)
 Jean A. Zellé, B.A., (*Physical Medicine and Rehabilitation*)

Instructor:

Lee-Jing Chen, Ph.D. (*Internal Medicine, Pathology*)



Admission Requirements and Professional Curriculum.—For details consult the *School of Medicine Bulletin*.

Departmental Courses

Anesthesiology

Professional Courses

420. Case Management Conference. (1) I, II, III, IV.

Discussion—1 hour. Prerequisite: interns and residents; advanced medical and veterinary students; consent of instructor. Informal discussion of current hospital case material presented by house officers, students and faculty. Clinical and research experience, combined with pertinent literature references, is brought to bear on the problems with emphasis on preventative, as well as corrective measures. (H/S/U grading only for medical students.)

The Staff (Mr. Davis in charge)

421. Basic Science Conference. (1) I, II, III, IV.

Discussion—1½ hours. Prerequisite: advanced medical, veterinary, and graduate students; consent of instructor. Discussion of basic science material related directly to anesthesiology particularly in the areas of physiology and pharmacology. Selected reading assignments are given

in advance and utilized by the instructor to encourage discussion. In selected instances, the topics are organized and presented by the students and residents. (H/S/U grading only for medical students.) Mr. Eisele

490. Resident Seminar. (1) I, II, III, IV.

Lecture—1 hour. Prerequisite: degree in medicine or veterinary medicine or consent of instructor. A series of lectures covering a spectrum of anesthesia and related topics in depth, primarily clinically oriented but also including relevant research material. Presented by faculty, residents, and visiting professors. Pertinent reference lists are circulated in advance of seminars. (H/S/U grading only for medical students.) The Staff (Mr. Eisele in charge)

499. Anesthesiology Research. (4-18) I, II, III, IV.

Laboratory—3-15 hours. Prerequisite: third or fourth year medical students or consent of instructor; open to graduate and Veterinary Medicine students. Problems in clinical and/or laboratory research. (H/S/U grading only for medical students.) The Staff (Mr. Eisele in charge)

Behavioral Biology

Lower Division Courses

98. Directed Group Study. (1-3) I, II, III, IV.

Discussion—1-3 hours. Prerequisite: consent of instructor. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research.

Departmental Staff (Mr. Chapman in charge)

99. Special Study for Undergraduates. (1-3) I, II, III, IV.

Discussion—1 hour; laboratory—2-4 hours. Prerequisite: consent of instructor. Laboratory research on selected topics relating to the biological bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problems.

Departmental Staff (Mr. Chapman in charge)

Upper Division Courses

198. Directed Group Study. (1-3) I, II, III, IV.

Discussion—1-3 hours. Prerequisite: consent of instructor. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research.

The Staff (Mr. Chapman in charge)

NOTE: For key to footnote symbols, see page 191.

199. Special Study for Advanced Undergraduates.

(1-3) I, II, III, IV.

Discussion—1 hour; laboratory—2-4 hours. Prerequisite: consent of instructor. Laboratory research on selected topics relating to the biological bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problem. The Staff (Mr. Chapman in charge)

Graduate Courses**235. Mood, Motivation, Arousal and Sleep. (3)**

I, II, III, IV.

Lecture—3 hours. Prerequisite: consent of instructor; open to graduate students. Critical examination of the current concepts and research on the physiological and biochemical correlates of these behavior processes.

Mr. Polidora

290. Seminar. (2) I, II, III, IV.

Seminar—2 hours. Prerequisite: consent of instructor; open to graduate students. Group discussion and critique of current topics of importance and relevance to Behavioral Biology. The Staff (Mr. Chapman in charge)

298. Group Study. (1-5) I, II, III, IV.

Discussion—1-5 hours. Prerequisite: consent of instructor; open to graduate students. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research. The Staff (Mr. Chapman in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students. Laboratory research on selected topics relating to the physiological and biochemical bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problem. The Staff (Mr. Chapman in charge)

Biological Chemistry**Upper Division Course****199. Special Study for Advanced Undergraduates.**

(1-5) I, II, III, IV.

Prerequisite: consent of instructor. The Staff (Mr. Krebs in charge)

Graduate Courses**213. Principles of Comparative Biochemistry. (3) I.**

Lecture—3 hours. Prerequisite: Biochemistry 201C or consent of instructor; open to graduate students. An advanced treatment of comparative biochemistry. Comparisons of living systems, their structures and functions on a molecular basis, biochemical unity and diversity; protein

structures and organized enzyme systems. Comparison of biochemical processes related to photobiology, metabolism, and excretion. Offered in odd-numbered years. (Same course as Biochemistry 213.) Mr. Benisek, Mr. Feeney

220. Molecular Biology Laboratory. (4) I.

Lecture—1 hour; laboratory—9 hours. Prerequisite: medical and graduate students with consent of instructors. A variety of laboratory techniques will be used to repeat significant experiments in the formation of our present concept of information transfer from gene to protein. Preparation of a protein synthesizing system; analysis of enzymic, nucleic acid and ribosomal components. (H/S/U for medical students; S/U grading only for graduate students.) Mr. Traut, Mr. Hershey

290. Current Topics in Biological Chemistry.

(1) I, II, III.

Seminar—1 hour. Prerequisite: previous course in biochemistry; open to graduate students. Biochemical topics of current research interest will be discussed. Students will participate in presentation of papers and/or reviews of laboratory work in progress.

The Staff (Mr. Krebs in charge)

298. Group Study. (1-5) I, II, III, IV.

Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved. The Staff (Mr. Krebs in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students. The Staff (Mr. Krebs in charge)

Community Health**Upper Division Course****101. Perspectives in Community Health. (2) I, II, III.**

Lecture—1 hour; discussion—1 hour. Prerequisite: undergraduate standing. Lectures and discussions to consider in a comprehensive manner the responsibilities, obligations, and role and professional activities of various disciplines of health manpower in the community, and to orient the students with perspectives of medicine in society. Mr. Borhani

Professional Courses**401. Medical and Environmental Epidemiology.**

(3) I, II, III, IV.

Lecture—2 hours; discussion—1 hour; laboratory—1 hour. Prerequisite: medical and veterinary medicine students with consent of instructor. Lectures, group discussions and laboratory exercises on the basic concepts of medical and environmental epidemiology as related to se-

lected infectious, non-infectious or environmental disease processes including applications to: community health, environmental control, medical ecology, and prevention and disease control. (H/S/U grading only for medical students.)
Mr. Borhani, Mr. Kraus

**402. Community and Preventive Medicine. (1-9)
I, II, III, IV.**

Lecture-discussion-laboratory — 1-9 hours. Prerequisite: medical and veterinary medical students with consent of instructor. Basic principles of preventive medicine and actual participation in community health programs utilizing both specific community models of primary and secondary prevention dealing with specific disease entities in the populations at risk. (H/S/U grading only for medical students.)

Mr. Borhani, Mr. Kraus and Staff

403. Medicine and the Environment. (2) I.

Lecture—1 hour; discussion—2 hours. Prerequisite: medical and graduate students, and consent of instructor. Lecture and seminar-type open discussions and directed readings led by residence and guest lecturers on issues of environmental health as they relate to changing patterns or accelerated onset of disease. (H/S/U grading only for medical students.)

Mr. Borhani, Mr. Kraus

**404. Medical and Health Care Delivery Patterns.
(3) II.**

Lecture—2 hours; discussion—2 hours. Prerequisite: medical and graduate students and consent of instructor. Lectures and seminar-type open discussions led by resident and guest lecturers on current problems and practices in medical health care practice; delivery organization and financing systems. (H/S/U grading only for medical students.)

Mr. Bauer, Mr. Kraus

405. Issues in Community Health. (3) I, III.

Lecture—2 hours; discussion—2 hours. Prerequisite: medical students and consent of instructor. Seminar-type discussions and lecture on selected topics and problems in community health including population control, drug abuse, malnutrition, abortion, suicide, and health problems of certain population groups. (H/S/U grading only for medical students.)

Mr. Borhani, Mr. Kraus

406. Nutrition and Health. (3) II.

Lecture—1 hour; seminar—2 hours. Prerequisite: medical students: graduate students with consent of instructor. Lectures and selected reading assignments on nutrition. Preselected literature as related to specific organ systems and functions. These topics to be subject of

seminars conducted under faculty supervision by students themselves. (H/S/U grading only for medical students.) Mr. Borhani, Mr. Hodges

**498. Group Study in Community Health. (1-9)
I, II, III, IV.**

Prerequisite: medical and graduate students and consent of instructor. Directed readings, discussions or community investigations in issues or problems of community health. (H/S/U grading only for medical students.) The Staff

**499. Research in Community Health. (1-8)
I, II, III, IV.**

Prerequisite: medical and graduate students and consent of instructor. Directed population and community based research in selected topics in community health. (H/S/U grading only for medical students.) The Staff

Family Practice

Upper Division Courses

127. Health Sciences Practicum. (5) I, II, III, IV.

Lecture—1 hour; laboratory—12 hours. Prerequisite: consent of instructor. Introduction to the health professions and health care delivery system through lecture and experience in clinical settings. Mr. Andrus

**198. Special Study for Advanced Undergraduates.
(1-5) I, II, III, IV.**

Hours to be arranged. Prerequisite: consent of instructor. Special study for advanced undergraduates interested in the health care delivery system. The Staff (Mr. Andrus in charge)

Graduate Courses

**298. Group Study for Graduate Students. (1-5)
I, II, III, IV.**

Hours to be arranged. Prerequisite: consent of instructor; open to graduate students. Special study for graduate students to explain selected areas of primary care and the health care delivery system. The Staff (Mr. Andrus in charge)

Professional Courses

404. Family Advocate. (2) I, II, III, IV.

Variable time-patient contact in nonclinical role. Prerequisite: first- or second-year medical, graduate, applied behavioral, and family nurse practitioner students. Student to be assigned a family for whom he serves as an advocate interpreting the health care system, facilitating services, advising as to health care needs, being a source of emotional support, and working with family physician when practical. (H/S/U grading only for medical students; P/NP grading only for undergraduate students.) Mr. Andrus

NOTE: For key to footnote symbols, see page 191.

420A. Fundamentals of Medicine for Family Nurse Practitioners. (7) I.

Lecture—3 hours; laboratory—12 hours. Prerequisite: graduate standing and consent of instructor. Instruction and practice in medical history taking; use of tools of the physical examination; and examination of the head, neck and respiratory systems, including implications of abnormal findings. Mr. Andrus and Staff

420B. Fundamentals of Medicine for Family Nurse Practitioners. (7) II.

Lecture—3 hours; laboratory—12 hours. Prerequisite: course 420A; graduate standing and consent of instructor. Instruction and practice in examination of the thorax and respiratory system including diagnostic procedures; examination and study of abnormal conditions of the cardiovascular system; examination of the abdomen as it relates to the gastro-intestinal system. Mr. Andrus

420C. Fundamentals of Medicine for Family Nurse Practitioners. (7) III.

Lecture—3 hours; laboratory—12 hours. Prerequisite: course 420B; graduate standing and consent of instructor. Instruction and practice in the examination of the genito-urinary system, examination of the neuro-muscular-skeletal system, and the areas of pre- and post-natal care and pediatrics. Selected patient problem solving situations in the framework of organ systems. Mr. Andrus

420D. Fundamentals of Medicine for Family Nurse Practitioners. (7) IV.

Lecture—3 hours; laboratory—12 hours. Prerequisite: course 420C; graduate standing and consent of instructor. Instruction and practice in provision of primary health care services, including obtaining a complete history, performing a physical examination and making recommendations and/or referrals for care of assigned patients. Focus is on use of a problem solving approach. Mr. Andrus

421A-421B-421C-421D. Seminar for Family Nurse Practitioners. (2) I, II, III, IV.

Seminar—2 hours. Prerequisite: Limited to students enrolled in the family nurse practitioner program. Group discussion of selected topics relevant to the role of family nurse practitioner. (S/U grading only.) Mr. Andrus

Human Anatomy**Upper Division Courses****100. Functional Anatomy of the Human Body. (5) I.**

Lecture—3 hours; laboratory—6 hours. Prerequisite: open to all undergraduates with consent of instructor. The gross structure and function of the human body. Limited enrollment. Mr. Watson

102. Development and Structure of the Human Body. (4) III.

Lecture—4 hours. Prerequisite: Biological Sciences 1 or 10; Physiology 2, 2L or Zoology 2 recommended. Development and structure of the human body. (H/S/U grading only for medical students.)

The Staff (Mrs. Vijayan in charge)

102L. Development and Structure of the Human Body. (3) III.

Laboratory—6 hours. Prerequisite: course 102 (may be taken concurrently). Laboratory analysis of the structure of the human body. (H/S/U grading only for medical students.)

Mrs. Vijayan

198. Directed Group Study. (1-5) I, II, III, IV.

Discussion—1-10 hours. Prerequisite: consent of instructor. Directed reading, discussion, and/or laboratory experience on selected topics. The Staff (Mr. Hunter in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III, IV.

Prerequisite: consent of instructor.

The Staff (Mr. Hunter in charge)

Graduate Courses**205. Biochemical and Morphological Aspects of Animal Gametogenesis and Fertilization. (2) II.**

Discussion—2 hours. Prerequisite: consent of instructor; open to graduate students. Emphasis on the molecular and ultrastructural mechanisms of gamete development and gamete maturation and fertilization. Critical reading and discussion of current and background papers. Limited enrollment. (H/S/U grading only for medical students.)

Mr. Meizel

280. Human Surgical Anatomy. (4) III.

Discussion—2 hours; laboratory—4 hours. Prerequisite: human gross anatomy or completion of second-year medical curriculum, and consent of instructor; open to graduate students. Regional and radiological anatomy as applied to the clinical sciences. Offered in odd-numbered years. Mr. Zappala

290. Seminar. (1) I, II, III, IV.

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only for graduate students. H/S/U grading only for medical students.) Mr. Meizel

298. Advanced Group Study. (1-5) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students.

The Staff (Mr. Hunter in charge)

299. Research. (2-12) I, II, III, IV.

Laboratory—6-36 hours. Prerequisite: consent of instructor.

The Staff (Mr. Hunter in charge)

Professional Courses

400. Topographical Anatomy of the Brain, Spinal Cord and Their Coverings. (3) I.

Lecture—1 hour; discussion—1 hour; laboratory—2 hours. Prerequisite: consent of instructor. Course is designed to provide the student with an understanding of the human skull, vertebrae, and their contents. Special emphasis will be placed on structural relationships and their functional or clinical importance. It will include study of brain sections and demonstration specimens prepared by orange stick dissection techniques. (H/S/U grading only for medical students.) Mrs. Vijayar and Staff

401. Functional Neuroanatomy. (3) II.

Lecture—2 hours; laboratory—2 hours. Prerequisite: consent of instructor. The microscopic anatomy of the nervous system. Emphasis on spinal and cranial pathways to and from cortical and subcortical levels while stressing human neuroanatomy and basic neurology. (H/S/U grading only for medical students.) Mr. Brownson and Staff

402. Functional Anatomy of the Autonomic Nervous System. (3) III.

Discussion—2 hours; laboratory—2 hours. Prerequisite: open to undergraduate, graduate, and medical students with consent of instructor. Integrative approach to the functional gross and neuroanatomy of the autonomic nervous system. (H/S/U grading only for medical students.) Mr. Watson and Staff

406. Brain Reconstruction. (4) III.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: consent of instructor; open to graduate students. Building a human brain model in three dimension using wire, wood, plastics and precut forms as the basis for teaching clinical neuroanatomy and neurophysiology to all qualified students. Also includes human wet specimens and slides. Limited enrollment. (H/S/U grading only for medical students.) Mr. Brownson

***421. Anatomy of Integumentary, Musculoskeletal and Peripheral Nervous System. (1) III.**

First two weeks of quarter—6 hours; individual laboratory project—2 hours. Prerequisite: medical students and/or consent of instructor; open to graduate students. Microscopic, gross, and developmental anatomy of the specific organ systems. (H/S/U grading only for medical students.) Mr. Chacko and Staff

***422. Anatomy of Cardiovascular, Respiratory, Hematopoietic, and Lymphoreticular Systems. (1) III.**

First two weeks of quarter—6 hours; individual

laboratory project—2 hours. Prerequisite: medical students and/or consent of instructor; open to graduate students. Microscopic, gross, and developmental anatomy of the specific organ systems. (H/S/U grading only for medical students.) Mr. Barry and Staff

***423. Anatomy of Digestive, Reproductive, and Urinary Systems. (1) III.**

First two weeks of quarter—6 hours; individual laboratory project—2 hours. Prerequisite: medical students and/or consent of instructor; open to graduate students. Microscopic, gross, and developmental anatomy of the specific organ systems. (H/S/U grading only for medical students.) Mr. Meizel and Staff

***424. Anatomy of Nervous and Endocrine Systems. (1) III.**

First three weeks of quarter—6 hours; individual laboratory project—1 hour. Prerequisite: medical and graduate students and/or consent of instructor. Microscopic, gross, and developmental anatomy of the specific organ systems. (H/S/U grading only for medical students.) Mr. Brownson and Staff

Human Physiology

Upper Division Courses

151. Information Systems: Design and Analysis of Computerized Information Systems. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: programming desirable; consent of instructor. Basic storage devices; organization of information; design of information systems, on-line, off-line and multilevel; relation of systems design to retrieval requirements and storage elements. Laboratory in preparation of modest information system. Mr. Walters

198. Directed Group Study. (1-5) I, II, III, IV.

Prerequisite: consent of instructor. Directed reading, discussion and/or laboratory experience on selected topics.

The Staff (Mr. Hsieh in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III, IV.

Laboratory—1-15 hours; undergraduate research project. Prerequisite: senior standing in biology, chemistry, physics, psychology, or engineering. The Staff (Mr. Hsieh in charge)

Graduate Courses

***200D. Advanced General Physiology. (3) I.**

Lecture—3 hours. Prerequisite: Biochemistry 101B, Chemistry 110B, Physiology 100B; graduate standing and consent of instructor. Physio-

NOTE: For key to footnote symbols, see page 191.

chemical basis of living systems with emphasis on membrane permeability characteristics at both the cellular and tissue level. Offered in odd-numbered years. Mr. Goldner

221. Surgical Approaches to Physiology. (2) I, II, III, IV.

Discussion—1 hour; laboratory—3 hours. Prerequisite: Physiology 210B or Medical Sciences 411A–411B. A practical laboratory experience in the classical surgical techniques used to obtain physiological information.

The Staff (Mr. R. El. Smith in charge)

231. Renal Physiology. (3) I.

Lecture—3 hours. Prerequisite: Physiology 110B or the equivalent; graduate standing and consent of instructor. Topics in mammalian renal physiology and related areas of biological transport, fluid and electrolyte homeostasis comparative renal physiology, and pathophysiology of the kidney in man. Offered in odd-numbered years. Mr. Rabinowitz

*231L. Renal Physiology Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: Physiology 110B or equivalent; graduate standing and consent of instructor. Experimental study of renal function in mammals including measurement of renal blood flow, filtration rate, concentrating ability, excretion of ions and the action of hormones and drugs. Offered in odd-numbered years. Mr. Rabinowitz

260. Physiological Systems Analysis. (5) I.

Lecture—4 hours; discussion—1 hour. Prerequisite: Mathematics 22B or Physiology 108, and Physiology 110B; or consent of instructor; open to graduate students. The quantitative analysis of physiological control systems; mathematical models and analytic methods appropriate for the study of different types of physiological control; the application of these techniques to investigations of homeostasis.

Mr. R. El. Smith

270. Cardiovascular Research Conference.

(2) I, II, III, IV.

Discussion—1½ hours. Prerequisite: mammalian physiology or freshman medical year. Weekly conference led by staff on specific topics in cardiovascular research and cardiovascular disease mechanisms. (S/U grading only for graduate students; H/S/U grading only for medical students.) Mr. Mason, Mr. Zelis

280. Pulmonary Function Evaluation. (4) I, II, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Medical Sciences 411B or Physiological Sciences 140A–140B; open to graduate students. Clinical laboratory, physiological evaluations of pulmonary function.

The Staff (Mr. Cross in charge)

282. Comparative Pulmonary Physiology. (3) I, II, III.

Laboratory—8 hours. Prerequisite: Medical Sciences 411B or Physiological Sciences 140A–140B; open to graduate students. Comparative studies of pulmonary function.

The Staff (Mr. Cross in charge)

298. Group Study. (1–5) I, II, III, IV.

Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved. The Staff (Mr. Hsieh in charge)

299. Research. (1–12) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students.

The Staff (Mr. Hsieh in charge)

Internal Medicine

Professional Course

490. Clinical Aspects of Human Nutrition. (1) II, III.

Discussion—1 hour; seminar—1 hour. Prerequisite: one year of graduate work and/or consent of instructor. Each student selects and presents seminar topic dealing with some aspect of nutrition as applied to clinical medicine. Basic principles emphasized, especially when applying to therapeutic problems or to preventive medicine. Limited enrollment. (H/S/U grading only for medical students.) Mr. Hodges

Internal Medicine—Hematology

Graduate Course

298. Topics in Hematology. (1–4) I, II, III, IV.

Prerequisite: one year of graduate work and consent of instructors. Basic concepts of the physiology of the hematopoietic organ, the pathophysiology of hematopoietic disease, and concepts of therapeutics will be offered for study. The specific topics to be dictated by the interest and background of the students. (H/S/U grading only for medical students.)

The Staff (Mr. Bolt in charge)

Professional Courses

400. Blood and Marrow Morphology in Disease.

(1–2) I, II, III, IV.

Discussion—1–2 hours; laboratory—1–4 hours. Prerequisite: one year of human or veterinary medicine and consent of instructor; open to graduate students. Study of the morphologic changes in hematological disease presented through case description and including review of pathophysiology and appropriate therapeutics. Limited enrollment. (H/S/U grading only for medical students.) Miss O'Grady

402. Topics in Medical Immunology. (1) I, II, III, IV.

Discussion—1 hour; library work. Prerequisite: one year of post-baccalaureate work and consent of instructor. Outside reading and discussion of current advances in medical immunology with emphasis on application of laboratory studies to clinical disease. (H/S/U grading only for medical students.) Mr. MacKenzie

Internal Medicine—Infectious Diseases

Graduate Course

292. Topics in Infectious Diseases, Medical Microbiology and Immunology. (1) I, II, III, IV.

Seminar—1 hour. Prerequisite: consent of instructor. Assigned reading and discussion on recent advances in infectious diseases and immunology, medical microbiology. Offered in odd-numbered years. (S/U grading only.) (Same course as Medical Microbiology 292.)

Mr. Pappagianis, Mr. Hoeplich

Professional Courses

498. Pulmonary Bacterial Infections. (2) I, II, III, IV.

Seminar—1 hour; laboratory—4 hours. Prerequisite: consent of instructor. Weekly seminar and research project in the field of pulmonary infection. Seminars and research projects concerned with bacterial virulence; host mechanisms of bacterial resistance and the role of exogenous agents in interfering with the "normal" host-parasite interrelationships. Limited enrollment. (H/S/U grading only for medical students.) Mr. Goldstein

499. Research Topics in Infectious Disease. (2-12) I, II, III, IV.

Prerequisite: successful completion of the first year of study in School of Medicine, graduate students, and/or consent of instructor. Discrete problem requiring reading and actual manual effort in solution will be assigned to each student. Progress and results to be reviewed at intervals with instructor and via seminar presentation. (H/S/U grading only for medical students.) Messrs. Hoeplich, Goldstein, Barry

Medical Education

Upper Division Courses

155. Biomedical Applications of Computers. (2) III.

Lecture—2 hours; computer demonstrations. Prerequisite: consent of instructor. Survey of computer applications in patient monitoring, simulation of biological systems, data acquisition and reduction systems, interpretation of electrocardiograms, and the use of analytical programs for research purposes. (H/S/U grading only for medical students.) Mr. Walters

160. Instructional Media in Biomedical Education. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: Medical Sciences 410 and 411A or equivalent; consent of instructor. Didactic and practical experience in the variety, operation and uses of instructional aids in the presentation of instruction in biology and medicine.

Mr. West, Mr. Walters

Graduate Courses

220. Evaluation in the Medical Curriculum. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisites: Medical Sciences 410 and 411A or equivalent; consent of instructor; open to graduate students. Development of educational goals and objectives; criteria for measurement of results as related to stated objectives; evaluation of instructional methodology; evaluation of learning achieved; comparative evaluation of alternate instructional pathways.

Mr. West, Mr. Walters

262. Computers in Instruction. (2) III.

Lecture—1 hour; laboratory—3 hours. Open to graduate students. Survey of techniques and languages for computer support of instruction. Includes computer-assisted and computer-managed instruction, simulation, and use of data bases. Projects in implementing specific learning blocks.

Mr. Walters

Medical Microbiology

Upper Division Courses

198. Group Study. (1-5) I, II, III, IV.

Hours to be arranged. Prerequisite: upper division standing and consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics.

The Staff (Mr. Pappagianis in charge)

199. Research in Medical Microbiology. (1-5) I, II, III, IV.

Hours to be arranged. Prerequisite: upper division standing and consent of instructor. Individual research.

The Staff (Mr. Pappagianis in charge)

Graduate Courses

215. Medical Parasitology. (2) III, IV.

Discussion—2 hours. Prerequisite: graduate student with consent of instructor. Clinical, epidemiological, laboratory study of protozoan, helminthic and arthropods of medical importance.

Mr. Theis

215L. Medical Parasitology Laboratory. (1-2) III, IV.

Laboratory—3-6 hours. Prerequisite: graduate student with consent of instructor. Laboratory aspects to accompany course 215.

Mr. Theis

NOTE: For key to footnote symbols, see page 191.

292. Topics in Medical Microbiology, Infectious Diseases and Immunology. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor; open to graduate students. Assigned reading and discussion on recent advances in medical microbiology, infectious diseases, and immunology. (Same course as Infectious Diseases 292.) (S/U grading only.)

Mr. Pappagianis, Mr. Hoerprich

298. Group Study in Medical Microbiology and Immunology. (1-5) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students. Directed reading and discussion and/or laboratory investigation on selected topics.

The Staff (Mr. Pappagianis in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students. Laboratory investigation contributing to the dissertation for a graduate degree.

The Staff (Mr. Pappagianis in charge)

Professional Courses**401. Medical Virology. (2) II.**

Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Sciences 410 and consent of instructor. Deals with the clinical epidemiological, and experimental aspects of viral diseases of man. (H/S/U grading only for medical students.)

Mr. Chang

405. Clinical Immunology. (2) III.

Lecture—2 hours. Prerequisite: third-year medical student status and/or consent of instructor. The bases of immunization practices and immunoserologic diagnostic procedures particularly related to diseases of man. (H/S/U grading only for medical students.)

Mr. Pappagianis

415. Medical Parasitology. (1-12) II, IV.

Discussion—1-6 hours; laboratory—0-12 hours. Prerequisite: medical or graduate students with consent of instructor. Clinical, epidemiological, laboratory study of protozoan, helminthic, and arthropods of medical importance. (H/S/U grading only for medical students.)

Mr. Theis

Neurosurgery**Graduate Course****286. Diseases of the Nervous System. (3) I, II, III, IV.**

Lecture—1 hour; discussion—1 hour; seminar—1 hour. Prerequisite: general pathology or special training in pathology and neurological sciences; consent of instructor. Reaction of the nervous system to injury and infection; degenerative and vascular diseases of the nervous sys-

tem; neoplasia in the nervous system. Given jointly with Departments of Neurology and Pathology.

Mr. Youmans

Professional Course**423. Brain-Cutting Conference. (1) I, II, III, IV.**

Seminar—1 hour. Prerequisite: for medical and veterinary students, interns and residents; consent of instructor. Current specimens are sectioned and discussed. Given jointly with Departments of Neurology and Pathology. (H/S/U grading only for medical students; same course as Pathology 405, Medicine.)

Mr. Youmans

Orthopaedic Surgery**Professional Course****499. Orthopaedic Research. (1-12) I, II, III, IV.**

Prerequisite: graduate, undergraduate, and medical students; consent of instructor. Laboratory or clinical investigation on selected topics. (H/S/U grading only for medical students.)

Mr. Riggins, Mr. D'Ambrosia

Pathology**Graduate Courses****210. Introduction to Human Pathology. (6) IV.**

Lecture—2 hours; discussion—2 hours; laboratory—4 hours. Prerequisite: open to upper division undergraduate, graduate, and veterinary students with an adequate background in gross anatomy, histology, physiology, and biochemistry. Study of the processes, causes, and effects of disease, including inflammation, neoplasia, immunology, parasitism, degeneration, abnormalities of growth, injuries due to environmental and toxic agents. Offered in even-numbered years.

Mr. Ruebner and Staff

298. Advanced Group Study. (1-5) I, II, III, IV.

Lecture—1-2 hours; discussion—1-2 hours; laboratory—2 hours. Prerequisite: consent of instructor; open to graduate students. Group study in a variety of advanced topics in general and special pathology.

The Staff (Mr. Wellings in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students. Research in the mechanisms of disease, the effects and causes of injury, neoplasia, neuropathology and comparative pathology.

The Staff (Mr. Wellings in charge)

Professional Courses**400. Ultrastructure of Disease. (3) III.**

Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor; open to graduate students. The contribution of ultrastructure to the understanding of disease processes. Limited enrollment. (H/S/U grading only for medical students.)

Mr. Volk and Staff

401. Conference in Primate Pathology. (1) I, II, III.

Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Discussion of selected topics in primate pathology based on currently available material. Given jointly by the Department of Pathology in the Medical and Veterinary Schools, and the National Center for Primate Biology. Limited enrollment. (H/S/U grading only for medical students.)

Mr. Ruebner and Staff

402. Current Topics in Tumor Biology. (1) I, II, III.

Seminar—2 hours. Prerequisite: graduate students and medical students. A discussion of current topics in tumor biology by invited speakers and members of the class. A forum for presentation of proposed and completed experiments by persons interested in tumor biology. (H/S/U grading only for medical students.)

Messrs. Wellings, Bustad, Faulkin

403. Gross Autopsy Review. (1) I, II, III.

Discussion-seminar—1 hour. Prerequisite: medical students or consent of instructor; open to graduate students. Current autopsies are reviewed in detail with clinicopathological correlation. Limited enrollment. (H/S/U grading only for medical students.)

Mr. Ruebner and Staff

404. Forensic Pathology. (2) I.

Lecture—1 hour; laboratory—1 hour. Prerequisite: medical students or consent of instructor; open to graduate students. Systemic study of current forensic cases with emphasis on differential diagnosis, preservation of evidence, and medicolegal procedure. Includes introduction to histopathologic diagnosis and toxicology. Limited enrollment. (H/S/U grading only for medical students.)

Mr. Rooney and Staff

405. Brain-cutting Conference. (1) I, II, III.

Seminar—1 hour. Prerequisite: medical student or consent of instructor; open to graduate students. Current specimens are sectioned and discussed. Limited enrollment. (H/S/U grading only for medical students.)

The Staff (Mr. McDonald in charge)

406. Histopathologic Diagnosis. (1) II.

Seminar—1 hour. Prerequisite: medical student or consent of instructor; open to graduate students. Intensive and detailed histopathologic diagnosis. Material covered varies. Limited enrollment. (H/S/U grading only for medical students.)

The Staff (Mr. Volk in charge)

407. Diseases of the Nervous System. (3) III.

Lecture—1 hour; discussion—1 hour; seminar—1 hour. Prerequisite: general pathology or special training in pathology and neurological

sciences; consent of instructor; open to graduate students. Reaction of the nervous system to injury and infection; degenerative and vascular diseases of the nervous system; neoplasia in the nervous system. Given jointly with the Departments of Neurology and Neurosurgery. Limited enrollment. (H/S/U grading only for medical students.) The Staff (Mr. McDonald in charge)

408. Autopsy Case Studies. (1-12) I, II, III, IV.

Discussion—1-4 hours; laboratory—3-24 hours. Prerequisite: medical and veterinary students; consent of instructor; open to graduate students. Participation and performance under supervision of complete autopsies with correlative studies of clinical material, gross, microscopic, and laboratory findings. (H/S/U grading only for medical students.) Mr. Ruebner and Staff

409. Neuropathology Conference. (1) I, II, III.

Seminar—1 hour. Prerequisite: medical students or consent of instructor; open to graduate students. Neuropathological findings are correlated with clinical findings. Given jointly with Departments of Neurology and Neurosurgery. Limited enrollment. (H/S/U grading only for medical students.) Mr. McDonald and Staff

490. Seminar in Pathology. (2) I, II, III.

Seminar—2 hours. Prerequisite: consent of instructor; open to graduate students. Student participation course in the mechanisms of disease. Given jointly by the Departments of Pathology in the Medical and Veterinary Schools. Limited enrollment. (H/S/U grading only for medical students.)

The Staff (Mr. Ruebner in charge)

491. Surgical Pathology Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisites: medical students or consent of instructor; open to graduate students. Gross and microscopic pathology of current surgical specimens and study sets with clinicopathological correlation. Limited enrollment. (H/S/U grading only for medical students.)

Mr. Tesluk and Staff

492. Ultrastructure Seminar. (1) I, III.

Seminar—1 hour. Prerequisites: medical, veterinary, and graduate students; or consent of instructor. Electron micrograph and methodology; workshop participants are encouraged to bring their own material and problems for discussion. Limited enrollment. (H/S/U grading only for medical students.) Mr. Jensen and Staff

Pediatrics**Upper Division Course****199. Special Study in Pediatric Research. (1-5) I, II, III, IV.**

Laboratory—3-15 hours. Prerequisite: limited to undergraduates with consent of instructor,

NOTE: For key to footnote symbols, see page 191.

based on adequate preparation in chemistry and/or physiology. Problems related to growth and development including the functions of different organ systems. Also learn different laboratory techniques and use of different laboratory equipment. The Staff (Mr. Stempfel in charge)

Pharmacology

Upper Division Courses

100. Pharmacology for Educators. (2) I, II.

Lecture—2 hours. Prerequisite: consent of instructor. Survey of the principles underlying the action of drugs; consideration of the pharmacology of prescription and nonprescription drugs commonly used to treat medical conditions in children of school age; pharmacological aspects of drug dependency and related topics.

Mr. Stark, Mrs. Killam

101. Principles of Pharmacology. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Sciences 410 or equivalent. Drug-enzyme interactions; receptor sites and characteristics; absorption, distribution, metabolism and excretion of drugs; drug tolerance, dependence, addiction and abuse; special toxicities; allergy, behavioral toxicity and teratology, and drug alteration of subcellular function.

Mr. Hollinger, Mr. Stark

102. Pharmacodynamics A. (2) I.

Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Sciences 410 and 411B or equivalent. Pharmacology of the autonomic system; pharmacology of the cardiovascular system; renal pharmacology and pharmacology of nerve and neuromuscular junction.

Mr. Hance, Mr. West

103. Pharmacodynamics B. (2) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Sciences 410, 411B, and 413A-413B-413C, or equivalent. Pharmacology of general anesthetics, hypnotics, sedatives, analgesics and antipyretics; narcotic analgesics; convulsants and stimulants, anticonvulsants and drug altering behavior.

Mrs. E. K. Killam, Mr. K. F. Killam

104. Pharmacology Laboratory A: Pharmacodynamics. (2) I.

Discussion—1 hour; laboratory—4 hours. Prerequisite: courses 102 and 103 or equivalent. Laboratory techniques used to evaluate the action of drugs. Offered in even-numbered years.

Mr. Hollinger, Mr. West

105. Pharmacology Laboratory B: Neuropharmacology. (2) II.

Discussion—1 hour; laboratory—4 hours. Prerequisite: Medical Sciences 410, 411B, and 413A-413B-413C, or equivalent. Specialized

laboratory techniques used to evaluate centrally acting drugs. Offered in odd-numbered years.

Mr. Hance, Mrs. Killam

106. Pharmacology Laboratory C: Psychopharmacology. (2) III.

Discussion—1 hour; laboratory—4 hours. Prerequisite: Medical Sciences 410, 411B and 413A-413B-413C, or equivalent. Specialized laboratory techniques used to evaluate drugs altering behavior. Offered in odd-numbered years.

Mr. Killam, Mr. Stark

199. Special Study for Advanced Undergraduates.

(1-3) I, II, III, IV.

Laboratory—3-9 hours. Prerequisite: consent of instructor. The Staff (Mr. Killam in charge)

Graduate Courses

201. Pharmacology of the Nervous System I: Transmitter Substances. (1-3) I.

Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101, 102 and 103 or Medical Sciences 410, 411B and 413A-413B-413C, or equivalent; open to graduate students. Pharmacology of substances affecting nervous transmission. Offered in odd-numbered years.

Mr. Hance

202. Pharmacology of the Nervous System II: Hypnotics, Sedatives, and Anesthetics. (1-3) I.

Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101, 102, 103 or Medical Sciences 410, 411B and 413A-413B-413C, or equivalent; open to graduate students. Pharmacology of centrally acting sedative, hypnotic and anesthetic agents with emphasis on alterations in brain function. Offered in even-numbered years.

Mrs. Killam

203. Pharmacology of the Nervous System III: Stimulants and Anticonvulsants. (1-3) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101, 102, 103 or Medical Sciences 410 and 411B, or equivalent; open to graduate students. Pharmacology of stimulant and convulsant agents, anticonvulsant agents and their evaluation in animal models. Offered in even-numbered years.

Mr. Stark

204. Pharmacology of the Nervous System IV: Drug Alteration of Behavior. (1-3) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101, 102, 103 or Medical Sciences 410 and 411B, or equivalent; open to graduate students. Activity of drugs altering mood and behavior: psychopharmacologic agents, hallucinogens, antidepressants. Offered in odd-numbered years.

Mr. Killam

205. Drug Distribution and Metabolism. (1-3) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 101 or Medical Sciences 410

and 411B, or equivalent; open to graduate students. Evaluation of problems of drug distribution and metabolism with special reference to autoradiographic techniques. Offered in even-numbered years. Mr. Stark

207. Drug Alteration of Subcellular Function.

(1-3) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 101 or Medical Sciences 410 or equivalent; open to graduate students. The interaction of drugs and subcellular components with special emphasis on mechanism of action. Offered in odd-numbered years. Mr. Hollinger

208. Application of Computers to Pharmacology A.

(1) I, II, III, IV.

Lecture—1 hour. Prerequisite: consent of instructor; open to graduate students. Presentation of basic concepts and problems.

Messrs. Hance, Killam, Stark

209. Application of Computers to Pharmacology B.

(1-2) I, II, III, IV.

Lecture—1 hour. Prerequisite: course 208; open to graduate students. Use of laboratory based devices employed in data reduction.

Mr. Killam

210. Application of Computers to Pharmacology C.

(1-3) I, II, III, IV.

Lecture—1 hour. Prerequisite: course 209; open to graduate students. Advanced applications and programming.

Mr. Hance

298. Group Study. (1-5) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students. Directed reading and discussion of topics in modern pharmacology.

The Staff (Mr. Killam in charge)

299. Research. (1-12) I, II, III, IV.

Prerequisite: consent of instructor; open to graduate students.

The Staff (Mr. Killam in charge)

Physical Medicine and Rehabilitation

Upper Division Courses

198. Directed Group Study. (1-5) I, II, III, IV.

Prerequisite: advanced standing and consent of instructor. Reading, conferences, field trips, laboratory experiences for upper division or master's degree candidates covering selected topics in rehabilitation and physical medicine, including biomechanics and biomedical engineering. (S/U grading only.) The Staff (Mr. Sterling)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III, IV.

Prerequisite: advanced standing and consent of instructor. Supervised independent study project and research for upper division students or graduate students. (S/U grading only.)

Mr. Sterling

Professional Courses

470. Rehabilitation Medicine for Allied Health

Sciences. (2) I, II, III, IV.

Lecture—1 hour; laboratory—3 hours. Prerequisite: open to allied health students and graduate students. Designed to acquaint the allied health sciences student in the clinical application of the physical modalities and the principles of medical and vocational rehabilitation including the physical, psychosocial and occupational aspects.

Mr. Zellé

499. Research in Physical Medicine. (2) I, II, III, IV.

Seminar—1 hour; laboratory—7 hours. Prerequisite: completion of fourth year Medical School; open to graduate students. Individual research under the direction of a staff member. (H/S/U grading only for medical students.)

Mr. Waring

Psychiatry

Graduate Courses

220. Interdisciplinary Research Seminar in Family

Psychology. (3) I, II, III, IV.

Seminar—3 hours. Prerequisite: medical, law, or social sciences graduate student; consent of instructor. Participation in research project designed to study the relationship between family structures and communication processes and normal and abnormal behavior. Families will be selected from patient and "normal" populations, ethnic groups, and a variety of socioeconomic classes. The Staff (Mr. Langsley in charge)

222. Sociology of Mental Illness. (4) I, II, III, IV.

Lecture—2 hours; discussion—4 hours. Prerequisite: medical student or social sciences graduate student; consent of instructor. Social and cultural aspects of mental illness; theories of "mental illness," mental illness as deviance, exploration of social and organizational responses, sociologic studies of the mental hospital. (H/S/U grading only for medical students.)

Mr. Rockwell

Professional Courses

401. Family and Marital Counseling. (2) III.

Lecture—1 hour; discussion—2 hours. Prerequisite: enrollment as medical student or consent of instructor; open to professional school students with consent of instructor. Principles

and techniques of family and marital counseling as conducted by the practicing physician. Cases will be presented. Videotaped clinical examples of marriage counseling. (H/S/U grading only for medical students.) Mr. Langsley

402. Psychosomatic Problems. (1-6) I, II, III, IV.

Discussion—1-6 hours. Prerequisite: medical students who have completed first year and graduate students or consent of instructor. Ward rounds, case discussions of patients hospitalized on medical and surgical wards seen in psychiatric consultation. Focus will be on psychosocial events related to alteration of body function and the impact of physical disease on psychosocial function. (H/S/U grading only for medical students.) Mr. Tupin

403. Medical Aspects of Human Sexuality. (2) I, II.

Lecture—2 hours. Prerequisite: completion of the first year of medical school, graduate students, or consent of instructor. An integrated multidisciplinary study of human sexuality in its normal patterns and dysfunctional variations. Basic techniques of diagnosis and therapy for general physician. Participating faculty from Departments of Obstetrics and Gynecology, Urology, and Psychiatry. (H/S/U grading only for medical students.)

420. Grand Rounds for Department of Psychiatry. (1) I, II, III, IV.

Prerequisite: student or staff School of Medicine or other qualified mental health professionals with consent of instructor. One and one-half hour weekly conference at the Sacramento Medical Center of UCD for presentation of selected clinical cases, presentation of lecture and research reports. (H/S/U grading only for medical students.) Mr. Langsley

473. Anti-Social Behavior. (19) I, II, III, IV.

To be arranged—variable time experience and clinical assignment and selected conferences.

Prerequisite: medical students, graduate students, or consent of instructor. Primary focus will be work with juvenile and adult offenders in one of several settings: Sacramento County Jail, Juvenile Center for Sacramento County, or California Medical Facility. May be repeated for credit with consent of instructor. (H/S/U grading only for medical students.) Mr. Tupin

498. Directed Group Study. (1-5) I, II, III, IV.

Hours to be arranged. Prerequisite: consent of instructor. For medical students desiring to explore particular topics in depth. Lectures, conferences, and seminars may be involved. (H/S/U grading only for medical students; S/U grading only for graduate students.)

The Staff (Mr. Langsley in charge)

499. Research. (1-12) I, II, III, IV.

Hours to be arranged. Individual research on selected topics or research projects. (H/S/U grading only for medical students; S/U grading only for graduate students.)

The Staff (Mr. Langsley in charge)

Radiology

Professional Courses

498. Group Study. (1-12) I, II, III, IV.

Hours to be arranged. Prerequisite: consent of instructor; open to graduate students. Group study on selected topics. (H/S/U grading only for medical students.)

The Staff (Mr. Raventos in charge)

499. Research in Radiology. (1-12) I, II, III, IV.

Hours to be arranged. Prerequisite: consent of instructor; open to graduate students. Individual research on selected topics. (H/S/U grading only for medical students.)

The Staff (Mr. Raventos in charge)

MEDICINE (a department in the School of Veterinary Medicine)

Murray E. Fowler, D.V.M., *Chairman of the Department*

Department Office, 1321A Haring Hall

Professors:

John F. Christensen, D.V.M., Ph.D.
(*Emeritus*)

Murray E. Fowler, D.V.M.

Blaine McGowan, Jr., D.V.M.

William R. Pritchard, D.V.M., Ph.D., J.D.

Edward A. Rhode, D.V.M.

Associate Professor:

Charles A. Hjerpe, D.V.M.

Assistant Professors:

Alexander A. Ardans, D.V.M.

Humphrey D. Knight, D.V.M., Ph.D.

Gerald V. Ling, D.V.M.

Anthony A. Stannard, D.V.M., Ph.D.

Lecturers:

Dale L. Brooks, D.V.M.

Laurence R. Enos, Pharm.D.

Stephen J. Ettinger, D.V.M.

James R. Head, D.V.M.
Sigmund T. Rich, D.V.M.

Upper Division Courses

102. Recognition and Identification of Poisonous Plants. (1) III.

Lecture-discussion—1 hour. Prerequisite: sophomore standing in School of Veterinary Medicine or consent of instructor. General introduction to plant nomenclature and principles of taxonomy. Poisonous plant species will be discussed systematically according to families. The use of keys and other devices will be used to teach recognition of these species. Mr. Fowler

103. Introductory Medicine. (4) III.

Lecture—4 hours; laboratory—3 hours. Prerequisite: sophomore standing in School of Veterinary Medicine. Principles of clinical diagnosis of animal diseases, with special emphasis on history taking and identification and interpretation of symptoms. Laboratory practice in physical examination of normal and abnormal animals. (P/NP grading only.) Mr. Ling

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Mr. Fowler in charge)

Graduate Courses

202. Laboratory Animal Preventive Medicine. (2) III.

Lecture—2 hours; discussion—optional. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Lectures and discussion of the principles of animal facility design, husbandry, and legal aspects of laboratory animal care.

The Staff (Mr. Brooks in charge)

204A. Medicine (3) I.

Lecture—3 hours. Prerequisite: course 103. A study of the medical diseases of domestic animals. The Staff (Mr. Ling in charge)

204B. Medicine. (4) II.

Lecture—4 hours. Prerequisite: course 204A. A study of the medical diseases of domestic animals. The Staff (Mr. Howarth in charge)

204C. Medicine. (3) III.

Lecture—3 hours. Prerequisite: course 204B. A study of the medical diseases of domestic animals. The Staff (Mr. Hjerpe in charge)

204D. Medicine. (5) I.

Lecture—5 hours. Prerequisite: course 204C. A study of the medical diseases of domestic animals. The Staff (Mr. Stannard in charge)

204E. Medicine. (3) II.

Lecture—3 hours. Prerequisite: course 204D. A study of the medical diseases of domestic animals. The Staff (Mr. Ardans in charge)

204F. Medicine. (3) III.

Lecture—3 hours. Prerequisite: course 204E. A study of the medical diseases of domestic animals. The Staff (Mr. Ling in charge)

210A. Medical Rounds. (1) I.

Laboratory—2 hours. Prerequisite: course 103. Discussion of selected cases from the clinic. (S/U grading only.)

The Staff (Mr. Holliday in charge)

210B. Medical Rounds. (1) II.

Laboratory—2 hours. Prerequisite: course 204A. Discussion of selected cases from the clinic. (S/U grading only.)

The Staff (Mr. Holliday in charge)

210C. Medical Rounds. (1) III.

Laboratory—2 hours. Prerequisite: course 204B. Discussion of selected cases from the clinic. (S/U grading only.)

The Staff (Mr. Holliday in charge)

211A. Medical Rounds in Laboratory Animal Medicine. (1) I.

Laboratory—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Cases from the campus Experimental Animal Resource Facility as well as the Primate Center and Radiobiology Laboratory will be selected for discussion of history, interpretation of symptoms, treatment, and disposition. The Staff (Mr. Brooks in charge)

211B. Medical Rounds in Laboratory Animal Medicine. (1) II.

Laboratory—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Cases from the campus Experimental Animal Resource Facility as well as the Primate Center and Radiobiology Laboratory will be selected for discussion of history, interpretation of symptoms, treatment and disposition. The Staff (Mr. Brooks in charge)

211C. Medical Rounds in Laboratory Animal Medicine. (1) III.

Laboratory—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Cases from the campus Experimental Animal Resource Facility as well as the Primate Center and Radiobiology Laboratory will be selected for discussion of history, interpretation of symptoms, treatment and disposition. The Staff (Mr. Brooks in charge)

215. Selected Topics in Zoo Medicine. (2) III.

Lecture—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Lectures or selected topics related to the health of zoo animals. These will include nutritional requirements, housing, sanitation, restraint, anesthesia, surgery, and specific disease problems. Mr. Fowler

NOTE: For key to footnote symbols, see page 191.

216. Primate Medicine. (2) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: senior standing in School of Veterinary Medicine, or consent of instructor. Introduction to primate medicine and primatology with emphasis on practical aspects of handling, husbandry, nutrition, reproduction, diseases, and anesthesia in nonhuman primates. Appropriate demonstrations at the National Center for Primate Biology will be included.

The Staff (Mr. Brooks in charge)

217. Caged Bird Medicine and Surgery. (1) I.

Lecture—1 hour. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Medical and surgical problems of caged birds: handling and restraint, feeding, nutritional and infectious diseases, anesthesia and surgery, plus problems of organ systems.

Mr. Fowler

218. Diseases of Free-Living Wild Animals. (2) II.

Lecture—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Diseases of free-living wild animals. Effects of these diseases on the wild population itself, domestic animals and man. Infectious, nutritional, toxic (pollution) and parasitic diseases will be considered.

Mr. Fowler

240. Herd Health Management. (2) II.

Lecture—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Principles of animal health management are explored at the herd level. Specific discussions are limited to cattle feeding and dairy enterprises.

Mr. Hjerpe

241. Ecological Factors of Animal Disease. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Relationship of animal environment to control and prevention of disease. Application of nutrition, genetics, husbandry, and management to disease control. Emphasis will be on sheep and beef cattle operations.

Mr. McGowan

270. Jurisprudence and Law for the Veterinarian.

(1) II.

Lecture—1 hour. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Introduction to principles of veterinary medical jurisprudence and legal concepts pertinent to professional activities. (S/U grading only.)

Mr. Pritchard

***280. Advanced Pulmonary Physiology. (3) II.**

Lecture—3 hours. Prerequisite: Physiology 120B, Physiology 210B or Physiological Sciences 141B. Advanced study of physiology of mammalian respiration with emphasis on mechanisms of ventilation, gas distribution, diffusion and blood perfusion.

Mr. Gillespie, Mr. Cross

***280L. Advanced Pulmonary Physiology. (1) II.**

Laboratory—4 hours. Prerequisite: Physiology 120B, Physiology 210B or Physiological Sciences 141B. Advanced study of physiology of mammalian respiration with emphasis on mechanisms of ventilation, gas distribution, diffusion and blood perfusion. Laboratory exercises illustrate modern functional concepts and procedures.

Mr. Gillespie, Mr. Cross

***285. Clinical Applications of Body Acid-Base Physiology. (2) III.**

Lecture—2 hours. Prerequisite: Physiological Sciences 101B, 102B; or consent of instructor. Examination of the buffer systems in the mammalian body. Effects on the buffer systems and organ functions of adding endogenous or exogenous acid or basic products to the body fluids. Control mechanisms and body fluid relationships to the buffer systems.

Mr. Gillespie, Mr. Cross

***290. Seminar in Veterinary Medicine. (1) I, II, III.**

The Staff (Mr. Fowler in charge)

298. Group Study. (1-2) I, II, III.

The Staff (Mr. Fowler in charge)

299. Research. (1-9) I, II, III.

The Staff

Professional Courses**401. Small Animal Clinics. (1½ per week) I, II, III.**

Laboratory—50 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for diagnoses, medical and surgical treatment of animals in the wards and outpatient clinic, including history taking, physical examinations, laboratory tests, special diagnostic and therapeutic procedures, and consultations, under the direction of the senior staff. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Ling in charge)

402. Large Animal Medicine. (1½ per week) I, II, III.

Laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns and residents responsible for the medical care of patients in the VMTH and outpatient clinics under the direction of the senior staff of the hospital. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Knight in charge)

403. Small Animal Medicine. (1½ per week) I, II, III.

Laboratory—50 hours. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for the medical care of animals in the wards and outpatient clinic including physical examinations, history taking, laboratory tests, and consultations under the

supervision of the senior staff. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Ling in charge)

404. Herd Health Management. (1½ per week)
I, II, III.

Laboratory—50 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns apply their knowledge of veterinary medicine, animal nutrition, genetics, husbandry, management, and economics on a herd basis toward the improvement of food animal production efficiency through control and prevention of disease. (S/U grading only.)

(Mr. Hjerpe and Mr. McGowan in charge)

421. Veterinary Dermatology. (¾ per week) I, II, III

Laboratory—25 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for patient care in the hospital and outpatient clinic including history taking, physical examinations, and diagnostic procedures under the direction of the staff dermatologist. (S/U grading only.)

Mr. Stannard

***423. Pulmonary Diseases. (¾ per week) I, II, III.**

Laboratory—25 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. New and advanced techniques for the detection and characterization of respiratory and cardiac diseases in animals demonstrated and discussed. Interns assist in assessment of respiratory dysfunction of patients and correlation of the dysfunction and the clinical signs. (S/U grading only.)

Mr. Gillespie

425. Zoo and Wildlife Medicine. (¾ per week)

I, II, III.

Laboratory—25 hours. Prerequisite: profes-

sional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for assisting in handling and treatment of clinic cases and for learning the techniques of manual and chemical restraint of a wide variety of mammals, birds, reptiles, and fish. Medication problems, anesthetic techniques and surgical procedures will be discussed and practiced. (S/U grading only.)

Mr. Fowler

491. Small Animal Grand Rounds. (½) I, II, III.

Discussion—1 hour. Prerequisite: professional standing; intern or resident in Veterinary Medical Teaching Hospital or consent of instructor. Interns and residents take an active part in the presentation and discussion of selected cases from the small animal clinic. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Ling in charge)

492. Large Animal Grand Rounds. (½) I, II, III.

Discussion—1 hour. Prerequisite: professional standing; intern or resident in Veterinary Medical Teaching Hospital or consent of instructor. Interns and residents take an active part in the presentation and discussion of selected cases from the large animal and ambulatory clinics. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Knight in charge)

493. Seminar in Veterinary Medicine. (1) I, II, III.

Seminar—2 hours. Prerequisite: professional standing; intern or resident in Veterinary Medical Teaching Hospital or consent of instructor. Seminars given by the faculty of the School of Veterinary Medicine in topics relating directly to the practice of clinical medicine and surgery. Interns and residents will assist in the presentation of seminar material. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Ling in charge)

MEXICAN-AMERICAN (CHICANO) STUDIES

Guillermo Rojas, Ph.D., *Chairman of the Committee*

Program Office, 210 East Hall

Committee in Charge:

José R. Juárez, Ph.D. (*History*)

Jess Leyba (*ex officio*)

Robert Merideth, Ph.D. (*American Studies*)

Adaljza S. Riddell, M.A. (*Political Science*)

Guillermo Rojas, Ph.D. (*Spanish*)



Objectives of Program

The program objectives are to generate research on the bilingual-bicultural mode of living of the Chicano, and to develop academic courses, both for and about the Chicano, with respect to education, history, literature, linguistics, sociology, psychology, politics, and economics.

Inquiries about this program should be directed to members of the Committee.

MICROBIOLOGY—See Also Veterinary Microbiology

NOTE: For key to footnote symbols, see page 191.

MICROBIOLOGY (A Graduate Group)

Robert E. Hungate, Ph.D., *Chairman of the Group*
Group Office, 156 Hutchison Hall

Graduate Courses**290. Seminar. (1) I, II, III.**

Seminar—1 hour. One seminar offered each quarter. One weekly meeting is held. (S/U grading only.)
The Staff

299. Research. (1-12) I, II, III.

Laboratory—variable. Research under the guidance of dissertation committee. (S/U grading only.)
The Staff

MILITARY SCIENCE

Bruce M. Carswell, Colonel, *Chairman of the Department*
Department Office, 125 Gymnasium

Professor:

Bruce M. Carswell, Colonel

Associate Professors:

Jay C. Cook, Major
George W. Crofoot, Major
James R. Ramos, Major

Assistant Professor:

Justin R. Hughes, Captain



The Military Science Department extends the educational opportunities and provides extra-curricular activities which, when combined with a baccalaureate degree, qualifies a student for a commission in the Army Reserve. The objective of the ROTC program is to educate young men to become officers who are capable of further development through active duty training and service in the Reserves. The program assists qualified men in all academic fields to prepare for positions of leadership in a military or civilian career. A continuing effort is made to assign graduates to military career fields aligned with their major field of study, individual capabilities and preferences. Active duty obligation for upper division ROTC will not exceed two years.

Department Programs

Students are enrolled in military science under one of two programs.

Four-Year Program.—Students are enrolled in lower division for the first two years on a voluntary basis. No military obligation is accrued during completion of the lower division courses. Admission to the upper division is by application from those second-year lower division students who meet the academic, physical, and military aptitude requirements.

Upper division students receive \$100 subsistence per month after executing a contract

agreeing to complete the course and accept a commission if offered. The commission must be obtained prior to the student's 28th birthday. During the course all military science textbooks, uniforms and equipment are provided without cost to the student. Students are trained at summer camp between their third and fourth advanced years of the course. Camp training stresses the evaluation and practical application of tactical, technical and administrative procedures with particular emphasis on individual participation, leadership development and the capability to function effectively in positions of significant responsibility. Each cadet is paid half of a Second Lieutenant's pay during the period of the camp, plus travel expenses.

Breadth Requirements for Commissioning.—

In addition to the first and second year, students must complete 9 units of course work in the Humanities which will provide them the opportunity to think creatively and to write and speak effectively. In cases where such course work has been waived by their college, the Chairman of Military Science may accept such waivers as a fulfillment of this requirement.

Third- and fourth-year students are required to complete 9 units in the Humanities, Natural Sciences, or Social Sciences outside of their major academic discipline.

The breadth requirements as established by each of the colleges normally satisfies the above requirements for Commissioning. In the case of a student who is pursuing a highly specialized discipline with restricted opportunity to take electives, waivers may be granted.

Two-Year Program.—This program is primarily designed for the student who has not had the opportunity to pursue lower division ROTC. Applications are accepted during the winter term of the year preceeding enrollment in the two-year program. In lieu of lower division courses the applicant must successfully complete a six-week summer camp conducted

during the summer preceeding enrollment in the upper division program. All other provisions explained above regarding upper division apply to the two-year program.

Flight Training Program.—Flight Instruction is offered to students in the second year of the Advanced Course. Under this program the Army will pay for flight training for selected qualified ROTC students. To qualify, the student must have an aptitude for flying and meet required physical standards.

Scholarship Program.—Four-year scholarship students are selected by nationwide competitive examination. Successful candidates receive all tuition, fees, books, uniforms and \$100 subsistence per month. One-, two- and three-year scholarships with similar benefits are awarded by the department to outstanding students enrolled in the ROTC program.

Leadership Laboratory.—Students enrolled in ROTC for the purpose of pursuing a commission are required to participate in approximately 10 hours of leadership laboratory per quarter in addition to classroom instruction. No academic credit will be given for leadership laboratory. In addition, these students are required to take ½ unit of Physical Education 1 (rifle marksmanship) during any quarter of their freshman or sophomore years, and 1 unit of Physical Education 10 (physical conditioning) during the spring quarter preceeding attendance at ROTC Advanced Summer Camp.

Academic Credit

College of Letters and Science.—The Bachelor of Arts degree requires the completion of 180 units, of which at least 150 units shall be in courses given by teaching departments in the College of Letters and Science. Military Science courses do not fall within this category and must be counted in the 30-unit allowance indicated above.

College of Agricultural and Environmental Sciences.—The Bachelor of Science degree in agriculture requires the completion of 180 units. All units of upper and lower division military science courses combined may be accredited toward this requirement.

College of Engineering.—Up to six units of military science may be accredited as free electives toward the requirement of the College of Engineering for the Bachelor of Science degree.

School of Veterinary Medicine.—The number of Military Science units acceptable toward the Bachelor of Science degree in Veterinary Medicine is on an individual program basis approved by the Dean of the School. Graduates with the D.V.M. degree may apply for direct commission in the United States Army Veterinary Corps.

Lower Division Courses

2. Introduction to Military Science. (1) I.

Lecture—1 hour. Discussion of the nature of armed conflict, traditions of the military service, and principles of warfare, with emphasis on examples drawn from both classical and contemporary conflicts. The Staff

3. Growth and Development of the U. S. Army. (1) II.

Lecture—1 hour. Examination of the growth, development, and magnitude of management of the present-day Army, with emphasis on evolution of current personnel, logistical, and operational organization and policies. The Staff

4. Principles of Basic Tactics. (1) II.

Lecture—1 hour. Principles of basic operations, tactics, and military combat formations, with emphasis on the individual and small unit. Relationship between the small unit and parent organization. The Staff

21. Fundamentals of Military Communications Systems. (1) I.

Lecture—2 hours (course taken first five weeks of quarter). Introduction to the elements of military communications systems and their application to civil and military operations. The Staff

22. Military Maps and Aerial Photograph Interpretation. (1) I.

Lecture—2 hours (course taken last five weeks of quarter). Military map systems and aerial photography; interpretation and application of the military grid system, including terrain evaluation, basic map data, military and civil map symbols, methods of orientation, and use of grid references. The Staff

23. Introduction to Military Operations. (1) I.

Lecture—1 hour. Prerequisite: course 4 or consent of instructor. Analysis and application of the principles of offensive and defensive combat as applied to small tactical units. The Staff

26. Military History. (3) II.

Lecture—3 hours. Analysis of selected military battles of history, with emphasis on the strategical and tactical concepts employed. The Staff

Upper Division Courses

131. Principles of Military Instruction. (2) I.

Lecture—2 hours. Principles and practice in fundamentals applicable to military instruction, briefings and staff studies, to include those used in planning, presenting and evaluating. Student's presentation exemplifying lecture material. The Staff

NOTE: For key to footnote symbols, see page 191.

132. Theory of Leadership. (2) II.

Lecture—2 hours. Principles and theory of leadership; individual and group solution of leadership problems common to small groups.

The Staff

133. Advanced Military Operations. (2) III.

Lecture—2 hours. Prerequisite: course 23 or consent of instructor. Advanced study of military operations, to include an analysis of the functions of primary and supporting branches and commands.

The Staff

141. The Military Team. (2) I.

Lecture—2 hours. Prerequisite: course 133. Fundamentals and dynamics of the military team to include command and staff structures, functions and operations at division and lower levels. Analysis of logistical operations and intelligence collection and collation.

The Staff

142. Managerial Principles and Theories. (2) II.

Lecture—2 hours. Military administrative principles and personnel management theories, including the military occupational structure, and the administration of military justice.

The Staff

143. Unconventional Warfare. (2) III.

Lecture—2 hours. Prerequisite: course 141. Analysis of unconventional warfare, to include an examination of insurgency and counter-insurgency operations in the world arena.

The Staff

150. The Development and Control of Nuclear Weapons. (3) III.

Lecture—3 hours; term paper. A survey of the development of nuclear weapons and post-war attempts at arms control, including the Baruch Plan, strategic weapons control, test ban treaty, nonproliferation treaty, and problems of verification in arms control.

Mr. K. Kreith

MUSIC

Theodore C. Karp, Ph.D., *Chairman of the Department*

Department Office, 112 Music Building

Professors:

Theodore C. Karp, Ph.D.

Jerome W. Rosen, M.A.

Richard G. Swift, M.A.

Associate Professors:

Sydney R. Charles, Ph.D.

Albert J. McNeil, M.S.

Assistant Professors:

Duyong Chung, M.M.

Andrew D. Frank, M.A.

Dallas K. Holoman, M.A. (*Acting*)

William E. Valente, M.A.

◇ ◇ ◇

Major Subject Advisers.—Mr. Swift, Mr. Karp.

The Major Program

Preparation for the major—required: first year, Music 4A–4B–4C; second year, 5A–5B–5C and 21A–21B–21C; one year of Music 30. Beginning and transfer students must take an examination in piano playing. Those showing deficiencies will be required to take Music 405. Sufficient pianistic ability to perform four-part chorales and compositions comparable in difficulty with *The Little Preludes* of Bach is prerequisite to upper division courses in the major. Students transferring from other colleges should take the Placement Examination and consult with departmental major advisers before enrolling in any music course.

The major—required: Music 104A–104B–104C, one year of Music 130, and at least

20 units selected from the following courses: 107, 108A–108B, 111, 112, 114, 115, 116, 117, 118, 119, 120, 198, and 199. In addition, a total of at least 14 units in performance courses is required of all music majors. These courses include Music 41, 42, 43, 44, 45, 46, 141, 142, 143, 144, 145, 146.

Attention is called to the requirements in foreign languages for higher degrees in music: a reading knowledge of French or German for the M.A. degree in both composition and musicology. Undergraduates contemplating advanced study in music should prepare to satisfy these requirements as they proceed to the bachelor's degree.

Individual Group Major.—Individual group majors may be established by combining the work offered in this department with courses in allied fields. The major subject adviser should be consulted for details.

Graduate Study.—The Department of Music offers programs of study and research leading to the M.A. degree in composition or musicology. Detailed information regarding graduate study may be obtained from the Graduate Adviser for Music, Mrs. Charles.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major. In addition, teaching methods courses (Music 321A–321B, 322, 323A–323B) are required. Music 300 or 301 recommended.

Teaching Minor.—Required: courses 4A–4B–4C, 5A–5B–5C, 108A–108B, 405A–405B–405C or equivalent, and either 111 or 112. In addition, students are advised to enroll in at least two

quarters of performance courses. Music 300 is recommended. Students must consult with the subject representative.

Subject Representative: Mr. McNeil.

Lower Division Courses

4A-4B-4C. Elementary Theory. (5-5-5) I-II-III.

Lecture—5 hours. Development of writing and listening techniques through the study of music fundamentals; ear training; beginning tonal counterpoint and harmony; keyboard harmony, score reading; analysis of repertory.

Mr. Swift, Mr. Valente

5A-5B-5C. Intermediate Theory. (4-4-4) I-II-III.

Lecture—4 hours. Prerequisite: course 4C. Intermediate tonal counterpoint and harmony.

Mr. Frank

10. Basic Musicianship. (2) I, II, III.

Lecture—3 hours. Fundamentals of music, singing, ear-training, and conducting for the general student.

The Staff (Mr. McNeil in charge)

21A-21B-21C. History and Literature of Music.

(4-4-4) I-II-III.

Lecture—3 hours; listening section—1 hour. Prerequisite: course 4C.

Mrs. Charles

27A. Introduction to Musical Literature. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Lectures, guided listening and readings designed to furnish the student with an understanding of basic music concepts. Intended primarily for non-majors.

Messrs. Holoman, Chung, Frank

27B. Introduction to Musical Literature. (4) II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 27A or consent of instructor. Survey of the history of musical styles from antiquity to the present. Lectures, guided listening and readings. Intended primarily for non-majors.

Mr. Holoman, Mr. Karp

28. Introduction to Afro-American Music. (4) II.

Lecture—3 hours; listening and discussion—1 hour. Historical and stylistic survey of Afro-American music.

Mr. McNeil

30. Applied Study of Music Literature: Intermediate.

(1) I, II, III.

Performance instruction—1 hour. Prerequisite: admission by audition only. Student must perform before authorized faculty member of the committee in charge. Ability to perform scales and small compositions required. Class instruction in individual wind, brass, string, keyboard instruments, or voice. Required for music majors; recommended for the music minor. Course may be repeated for credit. Auditors not accepted.

The Staff (Mr. Karp in charge)

41. University Symphony. (2) I, II, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal, and performance of music from the orchestra literature.

Mr. Chung

42. Repertory Band. (2) I, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for wind ensembles.

Mr. Valente

43. University Concert Band. (2) II.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for band.

Mr. Valente

44. University Chorus. (2) I, II, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music.

Mr. McNeil

45. Madrigal Singers. (1) I, II, III.

Rehearsal—2 hours per week. Prerequisite: course 44 (may be taken concurrently); consent of instructor. Rehearsal and performance of music for vocal chamber ensemble.

Mr. Karp

46. Chamber Music Ensemble. (2) I, II, III.

Rehearsal—3 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Study, rehearsal, and performance of ensemble music for strings, winds, piano, harpsichord, and organ.

Mr. Holoman

99. Special Study for Undergraduates. (1-5)

I, II, III.

The Staff (Mr. Karp in charge)

Upper Division Courses

104A-104B-104C. Advanced Theory.

(4-4-4) I-II-III.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 5C. Continuation of course 5.

Mr. Rosen

107. Electronic Music. (2) I, II, III.

Laboratory—6 hours. Prerequisite: consent of instructor; enrollment limited to 10 students with priority to music majors. Composition of electronic music using the Moog and Buchla synthesizers. May be repeated for credit. (Only 2 units count toward the music major.)

Mr. Rosen

NOTE: For key to footnote symbols, see page 191.

108A-108B. Orchestration. (2-2) II-III.

Lecture—2 hours. Prerequisite: course 5C. Techniques of orchestration from study of basic instrumental techniques to analysis of orchestral scores and scoring for various instrumental combinations.

Mr. Chung

***111. Choral Conducting. (2) III.**

Lecture—2 hours. Prerequisite: course 5C. Study of the principles and techniques of conducting choral ensembles.

Mr. McNeil

112. Instrumental Conducting. (2) I.

Lecture—2 hours. Prerequisite: course 108B. Study of the principles and techniques of conducting instrumental ensembles.

Mr. Chung

***114. Music of the Middle Ages. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the middle ages.

Mr. Karp

115. Music of the Renaissance. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the period from 1430-1600.

Mrs. Charles

116. Music of the Baroque Period. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the period from Monteverdi to Handel and J. S. Bach.

Mr. Karp

117. Music of the Classical Period. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the eighteenth century.

Mr. Swift

***118. Music of the Romantic Period. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the nineteenth century.

Mrs. Charles

***119. Music of the Twentieth Century. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the twentieth century.

Mr. Swift

120. Introduction to Musical Analysis. (2) III.

Lecture—2 hours. Prerequisite: course 4C. Introduction to modes of analyzing music of all style periods.

Mr. Holoman

***127A. Musical Literature: The Opera. (3) I.**

Lecture—3 hours. Prerequisite: course 27B or consent of instructor. Study of selected operas such as Monteverdi's *Orfeo*, Mozart's *Don Giovanni*, Wagner's *Tristan und Isolde*, Verdi's *Otello*, Debussy's *Pelleas et Mélisande*, and Berg's *Wozzeck*. Intended primarily for non-majors.

Mr. Holoman

127B. Musical Literature: The Symphony. (3) III.

Lecture—3 hours. Prerequisite: course 27B or consent of instructor. Study of selected symphonies by composers such as Haydn, Mozart, Beethoven, Schubert, Brahms, and Stravinsky, emphasizing form and style. Intended primarily for non-majors.

Mr. Holoman

130. Applied Study of Music Literature: Advanced.

(1) I, II, III.

Performance instruction—1 hour. Prerequisite: admission by audition only. Student must perform before authorized faculty member of the committee in charge. Ability to perform scales and small compositions required. Class instruction in individual wind, brass, string, keyboard instruments, or voice. Required for music major; recommended for the music minor. Course may be repeated for credit. Auditors not accepted.

The Staff (Mr. Karp in charge)

141. University Symphony. (2) I, II, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal and performance of music from the orchestra literature.

Mr. Chung

142. Repertory Band. (2) I, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for wind ensembles.

Mr. Valente

143. University Concert Band. (2) II.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for band.

Mr. Valente

144. University Chorus. (2) I, II, III.

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music.

Mr. McNeil

145. Madrigal Singers. (1) I, II, III.

Rehearsal—2 hours per week. Prerequisite: course 45; consent of instructor. Rehearsal and performance of music for vocal chamber ensemble.

Mr. Karp

146. Chamber Music Ensemble. (2) I, II, III.

Rehearsal—3 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose

proficiency meets the requirements of concert performance. Study, rehearsal, and performance of ensemble music for strings, winds, piano, harpsicord, and organ. Mr. Holoman

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Karp in charge)

199. Special Study for Advanced Undergraduates.

(2-4) I, II, III.
The Staff (Mr. Karp in charge)

Graduate Courses

200A-200B. Music Research. (4-4) I, II.

Seminar—3 hours. Survey of basic materials for music research. Selected projects.

Mrs. Charles

***200C. Notation. (4) III.**

Seminar—3 hours. Study of selected notation practices.

Mr. Karp

203A-203B-203C. Composition. (4-4-4) I-II-III.

Seminar—3 hours. Technical projects and free composition.

Mr. Swift

240A-240B-240C. Techniques of Analysis.

(4-4-4) I-II-III.

Seminar—3 hours. Analysis and analytical techniques as applied to music of all historical style periods.

Mr. Frank, Mr. Rosen, Mrs. Charles

***291A-291B-291C. Seminar: Topics in Music History. (4-4-4) I-II-III.**

Seminar—3 hours. Studies in selected areas of music history and theory.

Mrs. Charles

***297. Topics in Twentieth Century Music. (4) III.**

Seminar—3 hours. Analytical approaches to musical thought of the twentieth century.

Mr. Swift

299. Individual Study. (2-5) I, II, III.

Special studies and projects in musical composition or music history.

The Staff (Mr. Karp in charge)

Teaching Methods Courses

Instrumental Methods

The courses in this series consider methods of teaching orchestra and band instruments, and include repertory and program planning for secondary schools.

300. The Teaching of Music. (3) II, III.

Lecture—3 hours. Prerequisite: course 10 or equivalent. Methods of teaching music in grades K-6.

The Staff (Mr. McNeil in charge)

301. The Teaching of Music. (3) III.

Lecture—3 hours. Prerequisite: course 5C or equivalent. Methods of teaching music in grades 7-12.

Mr. McNeil

***321A-321B. Stringed Instruments. (1-1) I-II.**

Discussion—2 hours. Prerequisite: course 4C.

322. Brass Instruments. (2) I.

Discussion—2 hours. Prerequisite: course 4C.

323A-323B. Woodwind Instruments. (1-1) II-III.

Discussion—2 hours. Prerequisite: course 4C.

Professional Course

405A-405B-405C. Elementary Piano.

(1-1-1) I-II-III.

Laboratory—2 hours. Prerequisite: open to music majors and candidates for the general secondary credential with a minor in music.

NATIVE AMERICAN STUDIES

Related Undergraduate Major.—See page 77.

Questions pertaining to the following courses should be directed to the instructor or to the Chairman of the Applied Economic and Behavioral Sciences Teaching Division, 165 Everson Hall. Concentration in Native American Studies is available through an Applied Behavioral Sciences major.

Lower Division Courses

1. Introduction to Native American Studies. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Introduction to U.S. Indian tribal-reservation culture; relationship of Native American Studies to other academic disciplines.

Mr. Risling

20. The Native American Experience. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. An introduction to American Indian historical and socio-cultural development with emphasis upon the U. S. area and upon those processes, such as relations with non-Indians which have contributed to the current condition of Indian people. (Same course as Anthropology 20.)

Ms. Hutchison

26. Native American Traditional Governments. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive study of selected Native American Tribal Governments, confederations, leagues, and alliance systems.

NOTE: For key to footnote symbols, see page 191.

32A. Native American Music and Dance. (4) I.

Lecture—1 hour; discussion—3 hours. Prerequisite: course 1 or 20 or consent of instructor. Introduction to the music and dance of the native peoples of the U.S. Students will study appropriate nonreligious songs and dances.

Mr. Risling

32B. Native American Music and Dance. (4) III.

Lecture—1 hour; discussion—3 hours. Prerequisite: course 1 or 20 or consent of instructor. Continuation of course 32A. Introduction to music and dance of the native peoples of California and the west. Students will study appropriate nonreligious songs and dances. Mr. Risling

33. Native American Art in the U. S. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Introduction to the cultural-historical significance and practical application of Native American art in the U. S. area, with emphasis on the Southwest.

34A. Native American Art Workshop. (4) I.

Lecture—1 hour; laboratory—6 hours; 3 hours to be arranged. Prerequisite: consent of instructor; course 33 recommended. Studio projects in Native American Art.

34B. Native American Art Workshop. (4) II.

Lecture—1 hour; laboratory—6 hours; 3 hours to be arranged. Prerequisite: consent of instructor; course 33 recommended. Studio projects in Native American design in textiles, weaving, and weaving apparel.

34C. Native American Art Workshop. (4) III.

Lecture—1 hour; laboratory—6 hours; 3 hours to be arranged. Prerequisite: consent of instructor; course 33 recommended. Studio projects in Native American design in leather, beadwork, miscellaneous crafts.

99. Special Study for Undergraduates. (1-5)

I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Risling in charge)

Upper Division Courses**106. Native Cultures of the Northern Plains. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 20 or consent of instructor. Introduction to the cultures and history of the Indian Nations of the Northern Plains region with emphasis upon the area from Alberta to Colorado. Intertribal relations and white-Indian relations will be considered.

110. Fundamentals of Native American Education.

(4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor.

Introduction to major issues relating to American Indian education including pupil-teacher relationships, teacher-community relationships, curriculum, and school organization. Mr. Risling

113. Navajo History and Culture. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Introduction to the history and life-way of the DINEH (Navajo) people and taught from the Navajo perspective. Attention will be given to both ancient and modern time periods.

124. Contemporary Affairs of Native Americans in California. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive survey of the contemporary problems, issues, and developments involving Native Americans, both urban and rural, in California.

Mr. Risling

***130A. Native American Ethno-Historical Development. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive survey of Native American Ethno-History in the United States, Canada, Greenland, and Northern Mexico in the years before 1770. Offered in even-numbered years.

Mr. Forbes

***130B. Native American Ethno-Historical Development. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive survey of Native American Ethno-History in the United States, Canada, Greenland, and Northern Mexico in the years 1770-1890. Offered in odd-numbered years.

Mr. Forbes

***130C. Native American Ethno-Historical Development. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. Intensive survey of Native American Ethno-History in the United States, Canada, Greenland, and Northern Mexico in the years after 1890. Offered in odd-numbered years.

Mr. Forbes

161A. Native American Community Development. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 or consent of instructor. An intensive application of community development theory and techniques to the development problems of American Indian reservations and communities under the control of one or more governing bodies.

161B. Native American Economic Development and Planning. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course I and/or 20, 161A, Anthropology 108. Planning in economic development from the reservation standpoint, concentrating on using those institutions located on Indian reservations.

197T. Tutoring in Native American Studies. (1-5) I, II, III.

Prerequisite: consent of major committee; upper division standing with major in Native American Studies. Leading of small voluntary discussion groups.

The Staff (Mr. Risling in charge)

197TC. Community Tutoring in Native American Studies. (1-5) I, II, III.

Prerequisite: consent of major committee; upper division standing with major in Native American Studies. Supervised tutoring in community. The Staff (Mr. Risling in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: upper division standing; consent of instructor.

The Staff (Mr. Risling in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Risling in charge)

NEMATOLOGY

Related Undergraduate Major.—See pages 84 and 98.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Upper Division Courses**100. General Plant Nematology. (4) I.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1 or 10. An introduction to the classification, morphology, biology, and control of the nematodes attacking cultivated crops. Mr. Lownsbery

110. Introduction to Nematology. (2) II.

Lecture—2 hours. The relationship of nematodes to man's environment. Classification, morphology, ecology, distribution, and importance of nematodes occurring in water and soil and as parasites of plants and invertebrate animals. Mr. Allen

130. Principles of Nematode Control. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100; Chemistry 8B and Mathematics 13 recommended. Principles and techniques used for derivation of data and their interpretation as the basis for control of plant parasitic nematodes. The biological, physical, and chemical factors influencing nematodes and their control are studied in laboratory and greenhouse. Some field trips required. Mr. Lear

Graduate Courses**220. Principles and Techniques of Nematode Taxonomy and Morphology. (4) I.**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100. Analysis and evaluation of the techniques used in the collection, extraction, and preparation of specimens, free-hand and histologic sections; presentation of illustrative material. Mr. Maggenti

***222. Nematode Pathogenicity to Plants. (3) II.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 100. Investigations of problems in proving nematode pathogenicity; the role of nematodes in plant diseases. Offered in odd-numbered years only. Mr. Lownsbery

225. Nematode Taxonomy and Comparative Morphology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 220. The taxonomy, morphology, and comparative morphology of soil, freshwater, and marine nematodes. Offered in even-numbered years only. Mr. Allen

290. Seminar. (1) II.

Seminar—1 hour. (S/U grading only.)

The Staff (Mr. Raski in charge)

299. Research. (1-9) I, II, III.

(S/U grading only.)

The Staff (Mr. Raski in charge)

NEUROLOGY—See Medicine**NEUROSURGERY—See Medicine**

NOTE: For key to footnote symbols, see page 191.

NUTRITION

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 82, 96, and 182.

Related Courses. See *Avian Sciences 150* (comparative nutrition of avian species); *Institution Management; Wildlife and Fisheries Biology 108* (comparative nutrition of wildlife and fish).

Questions pertaining to the following courses should be directed to the instructor or the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

10. Discoveries and Concepts in Nutrition. (3) II.

Lecture—3 hours. Nutrition as a science; historical development of nutrition concepts; properties of nutrients and foods. Not open for credit to students who have taken an upper division course in nutrition. Mr. Hill

99. Individual Study for Undergraduates. (1-5)

I, II, III.

Prerequisite: consent of instructor. To provide opportunity for students to undertake individual projects in library study, laboratory study, field study, and information analysis in nutrition.

The Staff (Mr. Hill in charge)

Upper Division Courses

102A-102B. General Nutrition. (4-4) I-III.

Lecture—4 hours. Prerequisite: Chemistry 8B; Physiology 101 or 2; not open for credit to students who have taken Nutrition 110 and 111. Introduction to the principles of nutrition; study of the nutrients and their chemical and physiological roles in metabolism; nutrient requirements of man.

102L. General Nutrition Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 102A; course 102B (should be taken concurrently). Laboratory study of the principles of nutrition; study of the nutrients and their chemical and physiological roles in metabolism. Not open for credit to students who have taken 111L.

103. Animal Nutrition and Feeding. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 8B. The basic principles of animal nutrition as they are applied to livestock feeding; the composition and uses of feedstuffs in their relation to the feeding of farm animals and poultry; the balancing of rations. Not open for credit to animal science majors. Mr. Garrett

109. Nutritional Principles of Livestock

Feeding. (3) I.

Lecture—3 hours. Prerequisite: second-year standing in School of Veterinary Medicine or

consent of instructor. Principles of nutrition and their application to the solution of problems in animal feeding. Nutritive requirements for maintenance and productive functions, nutritional disorders, composition and use of feedstuffs. Mr. Morris

110. Principles of Nutrition. (5) II, III.

Lecture—5 hours. Prerequisite: Biochemistry 101B (may be taken concurrently); a course in physiology or zoology. Fundamental principles of the nutrition of man and other animals. The nutrients in relation to physiological processes of growth, maintenance, and reproduction. Nutritional disorders. Mr. Robinson, Mr. Rucker

111. Human Nutrition. (4) III.

Lecture—4 hours. Prerequisite: course 110. Nutrition of man; critical study of nutrient requirements at various phases of the life cycle. Mr. Rucker

111L. Nutrition Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: course 110. Laboratory study of the chemical and physiological roles of nutrients in metabolism; use of experimental animals in determining the essentiality and function of nutrients.

Mr. Rucker

*114. Nutrition and Development. (4) III.

Lecture—4 hours. Prerequisite: course 110 or 102B. Role of nutritional factors in embryonic and postnatal development. Offered in odd-numbered years. Mrs. Hurley

116A-116B. Diet Therapy. (3-3) I-II.

Lecture—3 hours. Prerequisite: course 111 or 102B; Physiology 101 or equivalent. Biochemical and physiological bases for therapeutic diets. Problems in planning diets for normal and pathological conditions. Ms. Zeman, Mr. Clifford

117. Experimental Nutrition. (5) I.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 111 or 102B; Biochemistry 101B or Physiological Sciences 101B; a laboratory course in nutrition or biochemistry. Methods of assessing nutritional status. Application of chemical, microbiological, chromatographic and enzymatic techniques to current problems in nutrition. Mr. Clifford

118. Community Nutrition. (3) II.

Lecture—3 hours. Prerequisite: course 102B or 111. Examination of nutrition problems in contemporary communities. Consideration of social, political, and economic forces in development and implementation of community nutrition programs. Principles and methods of nutrition education. Evaluation of community nutrition programs and resources.

118L. Laboratory in Community Nutrition. (1) II.

Laboratory—3 hours. Prerequisite: course 118 (must be taken concurrently). Observation and evaluation of various community nutrition programs.

119. Field Work in Community Nutrition. (3) III.

Discussion—1 hour; laboratory—6 hours. Prerequisite: courses 118, 118L; consent of instructor. Student participation in community nutrition programs in public, private, and volunteer agencies and in citizens' groups with active nutrition programs. Analysis of the methods used and evaluation of the effectiveness of the programs. Restricted opportunity for field study may limit enrollment.

121. Animal Nutrition Laboratory. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 110. Studies, demonstrations, and exercises in the measurement of nutritional values of feeds, nutrient requirements for physiological functions, and ration formulation. Students who have completed course 123 may only receive 1 unit of credit for this course.

Mr. Heitman

122. Ruminant Nutrition and Digestive Physiology. (3) III.

Lecture—3 hours. Prerequisite: course 110; Bacteriology 2; Physiology 110B. Study of nutrient utilization as influenced by the unique aspects of digestion and fermentation in the ruminant.

Mr. Morris

123. Nutrition of Non-Ruminant Animals. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110. Application of nutrition principles to the feeding of non-ruminant species, including swine, poultry and laboratory animals. Students who have completed course 121 may only receive 2 units of credit for this course.

Mr. Robinson, Mr. Kratzer

190. Proseminar in Nutrition. (1) I, II, III.

Seminar—1 hour. Prerequisite: senior standing, course 102B or 111. Discussion of human nutrition problems. Each term will involve a different emphasis among experimental, clinical, and dietetic problems of community, national and international scope. May be repeated for credit with consent of instructor.

The Staff (Mr. Hill in charge)

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Hill in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III. The Staff (Mr. Hill in charge)

Graduate Courses**201. Advanced Protein and Amino Acid Nutrition. (4) I.**

Lecture—4 hours. Prerequisite: course 110, Bacteriology 2, Biochemistry 101B, Physiology 110B. Nutritional significance of protein and amino acids, including studies of the influence of dietary protein on digestion, absorption, metabolism, resistance to disease and food intake. Study of dietary requirements and interrelationships among amino acids.

The Staff (Mr. Rogers in charge)

202. Advanced Animal Energetics and Energy Metabolism. (3) II.

Lecture—3 hours. Prerequisite: course 110, Bacteriology 2, Biochemistry 101B, Physiology 110B. History of nutritional energetics; evaluation of energy transformations associated with food utilization by animals; energy expenditures at cellular, tissue and animal levels as affected by physiological and nutritional states and functions.

The Staff (Mr. Baldwin in charge)

203. Advanced Vitamin and Mineral Nutrition. (3) III.

Lecture—3 hours. Prerequisite: course 110, Bacteriology 2, Biochemistry 101B, Physiology 110B. Advanced studies of metabolic function and nutritional interrelationships of vitamins and minerals. Comparative aspects.

The Staff (Mr. Kratzer in charge)

216. Advanced Diet Therapy. (3) III.

Lecture—3 hours. Prerequisite: graduate standing; Nutrition 116A, 116B; Physiology 110A, 110B. Nutrition and disease interrelationships at cellular, tissue, and whole body levels with emphasis on human disease. Critical evaluation of methodology in the study of nutrition in disease states.

Ms. Zeman

218. Advanced Field Work in Community Nutrition. (2-12) I, II, III.

Discussion—1 hour. Prerequisite: graduate standing; courses 118, 118L, 119; consent of instructor. Individual field projects in community nutrition. Organization and implementation of community programs in nutrition. May be repeated for a maximum of 12 units.

The Staff (Ms. Zeman in charge)

250. Concepts of Animal Nutrition. (3) II.

Lecture—3 hours. Prerequisite: courses 201, 202, 203. Dynamic interrelationships between food animals and environment including concepts in food intake, digestion, absorption, and utilization of nutrients.

NOTE: For key to footnote symbols, see page 191.

251. Single Carbon Metabolism in Nutrition. (2) I.

Lecture—2 hours. Prerequisite: course 203. Nutritional and metabolic interrelationships involved in the transfer of single carbon units in various animals; the involvement of the metabolic function of biotin, folic acid, vitamin B₁₂, pyridoxine, choline, methionine and other nutrients. Offered in odd-numbered years.

Mr. Vohra, Mr. Kratzer

252. Nutrition and Development. (3) II.

Lecture—3 hours. Prerequisite: courses 201, 202, 203. Relationship of nutrition to prenatal and early postnatal development. Offered in even-numbered years.

Mrs. Hurley

253. Control of Food Intake. (3) III.

Lecture—2 hours; discussion—1 hour; 2 or 3 laboratory demonstrations. Prerequisite: courses 201, 202 or Physiology 210B or consent of instructor. Comprehensive study of the biochemical, nutritional, behavioral, and physiological mechanisms controlling food intake. Subject matter will be approached through lectures, laboratory demonstration and discussions where students and staff will critically evaluate the literature. Offered in even-numbered years. Messrs. Rogers, Robinson, Mendel

***254. Ruminant Digestion and Metabolism. (3) I.**

Lecture—3 hours. Recommended: courses 122, 201, 202, 203. Qualitative and quantitative aspects of ruminant digestive and metabolic processes; nutrient requirements; rumen microbiology and biochemistry; digestive physiology; nutrient absorption; patterns, rates and mechanisms of nutrient utilization; regulatory processes. Offered in even-numbered years.

Mr. Morris, Mr. Baldwin

***255. Natural Toxicants in Foods. (2) II.**

Lecture—2 hours. Prerequisite: courses 201, 202, 203. Occurrence, mode of action and alleviation of several natural toxicants in foods and feeds. Offered in odd-numbered years.

Mr. Vohra, Mr. Kratzer

***256. Nutritional and Hormonal Control of Animal Metabolic Function. (3) III.**

Lecture—3 hours. Prerequisite: courses 201, 202, 203; Physiological Sciences 205A, 205B. Significance and interpretation of enzyme, metabolite, *in vitro* and *in vivo* isotope tracer, ener-

getic and other data. Critical evaluation of methodology and limitations in evaluation of animal metabolism. Diet-hormone interactions in carbohydrate, amino acid and lipid metabolism will be discussed. Offered in odd-numbered years.

Mr. Baldwin, Mr. Freedland

280. Supervised Teaching in Dietetics. (10-12)

I, II, III, IV.

Lecture—3 hours; seminar—1 hour; laboratory—9 hours; discussion periods and supervised research. Prerequisite: graduate standing; consent of instructor. Directed teaching in approved dietetic internships.

Ms. Henderson, Ms. Hopkins

290. Beginning Nutrition Seminar. (1) I, II, III.

Discussion—1 hour; seminar—1 hour. Prerequisite: first-year graduate standing. Discussion and critical evaluation of topics in nutrition with emphasis on literature review and evaluation in this field. Limited enrollment.

The Staff (Mr. Peterson in charge)

291. Advanced Nutrition Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: second-year graduate standing. Discussion and critical evaluation of advanced topics in nutrition research. (S/U grading only.)

The Staff (Mr. Hodges in charge)

292. Seminar in Dietetics. (1) I.

Seminar—1 hour. Prerequisite: graduate standing. Selected topics related to problems in dietetics-oriented research.

The Staff (Ms. Zeman in charge)

297. Supervised Teaching in Nutrition. (2) I, II, III.

Teaching under supervision of members of Nutrition Graduate Group—6 hours. Prerequisite: graduate status in nutrition. Practical experience in teaching nutrition at the university level; curriculum design and evaluation; preparation and presentation of material. Assistance in laboratories, discussion sections, and evaluation of student work. (S/U grading only, and an evaluation letter to the Graduate Adviser with copy to the student.)

Mr. Weir

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Weir in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Weir in charge)

ORIENTAL LANGUAGES**(Department of Anthropology)**

Department Office, 328 Young Hall

Professor:

Benjamin E. Wallacker, Ph.D.

Assistant Professor:

Marian B. Ury, Ph.D.

Lecturers:

Key H. Kim, M.A.

Peter Leung, E.D.

San-pao Li, M.A.

The Major Program

Emphasis in Chinese.

Lower Division Courses.—Required: courses 1M–2M–3M, 4M–5M–6M. Recommended: elementary Japanese; Art 1D; History 9A–9B.

Upper Division Courses.—Required: Courses 100, 123A, 123B, 123C; at least 12 units of courses 101–102; courses from the following list to bring the total upper division units to 45: Anthropology 190; History 191A, 191B, 191C, 192A, 192B, 193; Political Science 148A, 148B.

Emphasis in Japanese.

Lower Division Courses.—Required: courses 1J–2J–3J, 4J–5J–6J. Recommended: elementary Modern Mandarin, courses 35A, 35B; Art 1D; History 9A–9B.

Upper Division Courses.—Required: course 100 or other course in linguistics; 12 units from courses 121, 131, 132A, 132B. Choose from the following to bring the total upper division units to 45: Anthropology 191; History 194A, 194B; Political Science 148A, 148B.

Lower Division Courses

1C–2C–3C. Elementary Standard Cantonese.

(4–4–4) I–II–III.

Lecture—3 hours; laboratory—2 hours. (Same course as Asian American Studies 1C–2C–3C.) Mr. Leung

1J–2J–3J. Elementary Modern Japanese.

(4–4–4) I–II–III.

Lecture—3 hours; laboratory—2 hours. Mr. Kim

1M–2M–3M. Elementary Modern Mandarin.

(4–4–4) I–II–III.

Lecture—3 hours; laboratory—2 hours. Introduction to the "National Language" (Kuo Yü) of China. Mr. Li

4C–5C–6C. Intermediate Standard Cantonese.

(3–3–3) I–II–III.

Lecture—3 hours; laboratory—1 hour. Prerequisite: course 3C or Asian American Studies 3C. Continuation of course 1C–2C–3C. (Same course as Asian American Studies 4C–5C–6C.) Mr. Leung

4J–5J–6J. Intermediate Modern Japanese.

(4–4–4) I–II–III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 3J. Continuation of course 3J. Mr. Kim

4M–5M–6M. Intermediate Modern Mandarin.

(4–4–4) I–II–III.

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 3M. Continuation of course 3M. Mr. Li

***22. Indonesian Civilization. (4) III.**

Lecture—3 hours; discussion—1 hour. Survey of Indonesian civilization and the effects of contacts with Indian, Islamic, and Western cultures. Emphasis on Hinduism, Buddhism, and Islam.

35A–35B. Great Books of Eastern Asia. (2–2) I–II.

Lecture—1½ hours; readings and term paper. Knowledge of an oriental language not required. Lectures and readings on the great classics of Eastern Asia, in English translation, such as Confucian *Analects*, Mencius, Lao-Tzu, the *Book of Poetry*, Kojiki, and *The Tale of Genji*. Mr. Wallacker, Mrs. Ury

98. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor. Primarily for lower division students. The Staff (Chairman in charge)

99. Special Study for Undergraduates. (1–5) I, II, III.

Prerequisite: consent of instructor. The Staff (Chairman in charge)

Upper Division Courses

100. Languages of Eastern Asia. (4) II.

Lecture—3 hours; discussion—1 hour. Survey course on the nature and distribution of the main languages of Eastern Asia. Mr. Wallacker

101. Classical Chinese. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6M. Readings in selected texts. May be repeated twice for credit. Mr. Wallacker

102. Chinese Fiction. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6M. Readings in selected texts. May be repeated twice for credit. Offered in quarters when course 101 is not being given. Mr. Wallacker

121. Advanced Japanese. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6J. Practice in reading modern Japanese, and introduction to classical Japanese. May be repeated twice for credit. Mrs. Ury

***123A. Chinese Phonology. (4) I.**

Lecture—3 hours. Prerequisite: consent of instructor. Offered if sufficient number of students enroll.

***123B. Chinese Morphology. (4) II.**

Lecture—3 hours. Prerequisite: consent of instructor. Offered if sufficient number of students enroll.

NOTE: For key to footnote symbols, see page 191.

***123C. Chinese Syntax. (4) III.**

Lecture—3 hours. Prerequisite: consent of instructor. Offered if sufficient number of students enroll.

***131. Research and Bibliography: Japanese. (5) I.**

Lecture—3 hours; discussion—2 hours. Prerequisite: open also to qualified graduate students in history. Students are introduced to the reference aids available in libraries and to the methods and aims of research in Japanese. Emphasis will be on research—history and literature. Mrs. Ury

132A–132B. History of Japanese Literature. (4–4) II–III.

Lecture—3 hours; discussion—1 hour. Major themes of Japanese literature, in the contexts of Asian thought and world literature. From the beginning to modern times. Mrs. Ury

***142. Civilization of Eastern Asia: Japan. (4) I.**

Lecture—3 hours; discussion—1 hour. Broad survey of Japanese civilization dealing with cultural, literary, religious, and social developments. Mrs. Ury

170. Chinese and Japanese Buddhism. (3) III.

Lecture—2 hours; discussion—1 hour. Lectures and related readings on development of Buddhism in China and Japan from the earliest

time to the present day. The influence of Buddhism on various Far Eastern art forms.

Mrs. Ury

***174. Chinese Folk Religion. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Knowledge of Chinese not required. Exploration of the eclectic but unsystematic religious beliefs common in varying forms and degrees to nearly all Chinese and discussion of the influence of this form of religion on various aspects of Chinese society.

197T. Tutoring in Oriental Languages. (1–5) I, II, III.

Tutorial—1–5 hours. Prerequisite: consent of Department Chairman. Leading of small voluntary discussion groups affiliated with one of department's regular courses. May be repeated for credit. The Staff (Mr. Wallacker in charge)

198. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor. The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1–3) I, II, III.

The Staff (Chairman in charge)

Graduate Courses**201. Proseminar in Sinological Methods. (4) III.**

Seminar—3 hours. Prerequisite: knowledge of classical Chinese. Mr. Wallacker

299. Research. (1–12) I, II, III. Mr. Wallacker**ORIENTATION**

Questions pertaining to the following course should be directed to the Dean of Resident Instruction, Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall. See also. *Class Schedule* course listing.

ORTHOPAEDIC SURGERY—See Medicine**PARK AND RECREATION ADMINISTRATION**

—See Environmental Planning and Management

PATHOLOGY—Veterinary Medicine, this page; Medicine, see page 384**PATHOLOGY**

Donald L. Dungworth, B.V.Sc., Ph.D., *Chairman of the Department*

Department Office, 1126 Haring Hall

Professors:

Donald R. Cordy, D.V.M., Ph.D.
Donald L. Dungworth, B.V.Sc., Ph.D.
Richard A. Griesemer, D.V.M., Ph.D.
(*Adjunct*)

Peter C. Kennedy, D.V.M., Ph.D.
Jack E. Moulton, D.V.M., Ph.D.

Associate Professors:

Thomas G. Kawakami, Ph.D. (*Adjunct*)
Bennie I. Osburn, D.V.M., Ph.D.

Assistant Professors:

David H. Gribble, D.V.M., Ph.D.
 Mack I. Johnson, D.V.M., Ph.D.
 Roy R. Pool, Jr., D.V.M., Ph.D.
 L. Thomas Pulley, D.V.M., Ph.D.
 Anthony A. Stannard, D.V.M., Ph.D.
 (Clinical Sciences)

Lecturer:

Lynn A. Griner, D.V.M., Ph.D.

**Upper Division Courses****122A. Veterinary Pathology. (5) I.**

Lecture—3 hours; laboratory—6 hours. Prerequisite: second-year standing in the School of Veterinary Medicine or consent of instructor. The fundamental degenerative, vascular, and inflammatory processes, disturbances of cell growth, including oncology.

Messrs. Cordy, Moulton, Pool, Osburn

122B. Veterinary Pathology. (5) II.

Lecture—4 hours; laboratory—3 hours. Prerequisite: course 122A. Special pathology of organ systems and related communicable diseases.

Messrs. Dungworth, Kennedy, Pool, Osburn

122C. Veterinary Pathology. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 122A. Special pathology of organ systems and related communicable diseases.

Messrs. Cordy, Gribble, Griesemer, Moulton

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III. The Staff (Chairman in charge)

Graduate Courses**282. Tumor Pathology. (3) II.**

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 122A-122B-122C; graduate student standing or final year veterinary student and consent of instructor. The histogenesis, incidence, geographical distribution, etiology, transmission, immunity, host response, gross and microscopic structure, and metastasis of the neoplasms of domestic animals. Offered in even-numbered years. Mr. Moulton, Mr. Dungworth

283. Tumor Biology. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Growth, invasion and metastasis of tumors; mechanisms of carcinogenesis; intrinsic and extrinsic etiologic factors. Offered in odd-numbered years.

Messrs. Dungworth, Faulkin, Kawakami, Theilen

284. Pathology of Reproductive Failure. (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 122A-122B-122C; graduate student standing or final year veterinary student and consent of instructor. Selected topics on cause and effects of fetal disease. Offered in odd-numbered years.

Mr. Kennedy, Mr. Osburn

285. Neuropathology. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 122C and 295C; graduate student standing or final year veterinary student and consent of instructor. Patterns of nervous tissue reaction in disease. Offered in odd-numbered years.

Mr. Cordy

290. Seminar in Veterinary Pathology. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)

The Staff (Mr. Osburn in charge)

291. Histopathology Conference. (1) I, II, III.

Discussion—1 hour. Prerequisite: course 295C. Discussion of selected cases based on records and slides. Defense of diagnoses. (S/U grading only.) The Staff (Mr. Gribble in charge)

292. Surgical Pathology Conference. (1) I, II, III.

Discussion—1 hour. Prerequisite: course 295C. Diagnosis and discussion of current surgical pathology cases based on clinical records and microscopic study. (S/U grading only.)

Mr. Gribble, Mr. Moulton

293. Necropsy and Surgical Pathology.

(1-4) I, II, III.

Discussion—1 hour; laboratory—32 hours. Prerequisite: course 295C. Responsible diagnostic casework. Performance of necropsies, slide reading, and case reporting. (S/U grading only.)

The Staff (Mr. Kennedy in charge)

294. Primate Pathology Conference. (1) I, II, III.

Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Discussion of selected topics in primate pathology based on currently available material. Given jointly by Departments of Pathology in the Medical and Veterinary Schools, and the National Center for Primate Biology. (S/U grading only.) (Same course as Pathology-Medicine 401.)

Mr. Gribble, Mr. Griesemer

295A-295B-295C. Necropsy Laboratory. (1-1-1)

I-II-III.

Laboratory—33 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Supervised experience in necropsy diagnosis, including techniques and interpretation. (S/U grading only.)

The Staff (Mr. Kennedy in charge)

NOTE: For key to footnote symbols, see page 191.

298. Group Study. (1-4) I, II, III.

Group Study of advanced topics in pathology.
The Staff

299. Research in Veterinary Pathology.

(1-9) I, II, III, (Summer).
(S/U grading only.)

The Staff

PEDIATRICS—See Medicine**PHARMACOLOGY—See Medicine****PHILOSOPHY**

William H. Bossart, Ph.D., *Chairman of the Department*
Department Office, 308 Voorhies Hall

Professors:

William H. Bossart, Ph.D.
Arthur Child, Ph.D.
*Neal W. Gilbert, Ph.D.
Marjorie Grene, Ph.D.

Associate Professors:

Ronald A. Arbini, Ph.D.
John F. Malcolm, Ph.D.

Assistant Professors:

Melvin W. Beal, Ph.D.
*Fred R. Berger, Ph.D.
*Joel I. Friedman, Ph.D.
Vernon E. Wedin, Ph.D.

**The Major Program**

Lower Division Courses.—Required: courses 12A and 20A-20B-20C.

Upper Division Courses.—Required: 36 units of upper division courses in philosophy, selected with the approval of the departmental major adviser.

Graduate Study.—The Department of Philosophy offers programs of study leading to the M.A. and Ph.D. Degrees. Detailed information may be obtained by writing to the Graduate Adviser.

Lower Division Courses**6. Introduction to Philosophy. (4) I, II, III.**

Lecture—3 hours; discussion—1 hour. Political, aesthetic, religious, metaphysical, and other concerns of philosophy, as exemplified in major works from various periods. The Staff

***6F. Freshman Seminar in Philosophy. (4) III.**

Seminar—4 hours. Prerequisite: consent of instructor. Intensive introduction to philosophical inquiry. Open only to freshmen with strong interest or background in philosophy. The Staff

12A. Introduction to Logic. (4) I, II.

Lecture—3 hours; discussion—1 hour. Theorems and principles of inference of formal

deductive systems; propositional calculus and predicate calculus; translation of English into symbolic formulas. Mr. Berger, Mr. Gilbert

12B. Introduction to Logic. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 12A or consent of instructor. Development of the full predicate calculus; identity and description calculus; decision procedures; more advanced translation of English; elementary theory of classes and relations. Mr. Friedman

15. Basic Religious Concepts. (4) I.

Lecture—3 hours; discussion—1 hour. An introductory philosophical examination of certain central religious themes, such as sin, guilt, suffering, sacrifice, mysticism, and salvation. Emphasis will be on the conceptual clarification of religious experience rather than on theological formulation or argument. Mr. Gilbert

20A. History of Philosophy. (4) I.

Lecture—3 hours; discussion—1 hour. Survey of Greek philosophy with special attention to the Pre-Socratics, Plato, and Aristotle. Mr. Malcolm

20B. History of Philosophy. (4) II.

Lecture—3 hours; discussion—1 hour. The seventeenth century and its background. Mrs. Grene

20C. History of Philosophy. (4) III.

Lecture—3 hours; discussion—1 hour. Eighteenth-century philosophy. Mr. Arbini

Upper Division Courses**101. Metaphysics. (4) II.**

Lecture—3 hours. Prerequisite: two courses in philosophy to be chosen from the 20A, 20B, 20C sequence and the upper division course list with the exception of 105, 114A, 114B, 117, 123. Theories of being. Such topics as reality, substance, universals, space, time, causality, becoming, body, experience, persons, freedom and determinism. Views of the nature and method of metaphysics. Anti-metaphysical arguments. Mr. Wedin

102. Theory of Knowledge. (4) II.

Lecture-discussion—3 hours. Prerequisite: two courses in philosophy to be chosen from the 20A, 20B, 20C sequence and the upper division course list with the exception of 105, 114A, 114B, 117, 123. Philosophical problems of perception and thought, memory and precognition, imagination, truth and error, belief and knowledge. Types of epistemology. Mr. Beal

103. Philosophy of Mind. (4) I.

Lecture-discussion—3 hours. The relation between mind and body, our knowledge of other minds, and the explanation of mental acts. Discussion of such concepts as action, intention, and causation. Offered in even-numbered years.

105. Philosophy of Religion. (4) I.

Lecture—3 hours. Prerequisite: two courses in philosophy. Logical, metaphysical, epistemological and existential aspects of selected religious concepts and problems. Mr. Child

107A. Philosophy of the Physical Sciences. (4) I.

Lecture-discussion—3 hours. Prerequisite: one philosophy course or a major in science. Introduction to the nature of scientific laws, theories, explanations, and models. Problems of causality, determinism and indeterminism, induction and probability. Mr. Wedin

107B. Philosophy of the Biological Sciences. (4) II.

Lecture-discussion—3 hours. Prerequisite: one philosophy course or a major in science. The relation of the biological to the physical sciences; the nature of theories, explanations, and models in biology and psychology. Problems of taxonomy, ethology, and evolutionary theory. Mrs. Grene

107C. Philosophy of the Social Sciences. (4) I.

Lecture-discussion—3 hours. Prerequisite: one philosophy course or a major in a social science. The nature of laws and explanations in the social sciences; their relation to mathematics and the physical sciences; the role of value judgments in the social sciences; theories of historical knowledge; theoretical problems of data-processing. Mr. Berger

114A. Introduction to Ethics. (4) II.

Lecture—3 hours; term paper. Prerequisite: one course in philosophy. An introduction to major writings of philosophers on central problems of right conduct; principles of obligation, responsibility, justice, the meaning of the basic terms of ethical language. Readings from such philosophers as Aristotle, Butler, Hume, Kant, Mill. Mr. Arbini

***114B. Problems of Ethical Theory and Practice. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 114A or consent of instructor. Discussion of important problems of ethical theory with application to contemporary moral problems. Examples: relativism, utility and justice, act and rule utilitarianism, concept of a right, justification of punishment, the death penalty, morality of civil disobedience, abortion, war. Mr. Berger

***117. Political Philosophy. (4) II.**

Lecture-discussion—3 hours. Recommended: course 6 or 6F. Intensive examination of some central concepts of political thought such as the state, sovereignty, rights, obligation, freedom, law, authority, and responsibility. Offered in even-numbered years. Mr. Berger

118. Philosophy of History. (4) III.

Lecture-discussion—3 hours; term paper. Survey of philosophical theories of history and an analysis of contemporary problems of historical explanation. Offered in odd-numbered years. Mr. Child

123. Aesthetics. (4) I.

Lecture—3 hours. Prerequisite: one course in philosophy; one course in music, the plastic arts, or literature. Nature of art, of artistic creation, of the work of art, and of aesthetic experience; nature and validity of criticism; relations of art to its environment. Mr. Beal

131. Philosophy of Logic and Mathematics. (4) III.

Lecture-discussion—3 hours; term paper. Prerequisite: course 12A or a major in mathematics. The nature of formal systems and mathematical theories, with selected topics from: logical and semantical paradoxes; set theory and type theory as foundations of mathematics; philosophy of geometry; heuristics and history of mathematics; non-standard logics (e.g., intuitionistic and modal logic). Mr. Friedman

132. History of Logic. (4) II.

Lecture-discussion—3 hours; term paper or conferences. Study of special problems or authors in the history of logic. Offered in even-numbered years. Mr. Malcolm

134. Metalogic. (4) II.

Lecture-discussion—3 hours. Prerequisite: course 12B or consent of instructor. Systematic treatment of formal languages and metalanguages; theorems about theorems of logic; consistency and completeness of formal systems; theory of models of formal systems. Offered in even-numbered years. Mr. Friedman

NOTE: For key to footnote symbols, see page 191.

137. Philosophy of Language. (4) III.

Lecture-discussion—3 hours. Recommended: course 20C, 156A, or Linguistics 35. Discussion of problems arising from consideration of the syntax and semantics of natural and formalized languages. Nature of linguistic rules and universals; theories of universal grammar; linguistic implications for theories of cognition. Mr. Arbini

***143. Hellenistic Philosophy. (4) III.**

Lecture-discussion—3 hours; term paper. Prerequisite: course 20A. Offered in even-numbered years. Mr. Gilbert

145. Medieval Philosophy. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 20A. Study of major philosophers in the medieval period. Mr. Malcolm

146. Renaissance Philosophy. (4) II.

Lecture-discussion—3 hours. Renaissance conceptions of man, as found in the writings of Valla, Ficino, Pico, Pomponazzi, Erasmus, Vives, and Montaigne. Some reference to current religious and social developments. Offered in even-numbered years. Mr. Gilbert

***151. Philosophy of the Nineteenth Century. (4) II.**

Lecture-discussion—3 hours. Recommended: courses 20A, 20B, or 20C. The idealism of Hegel, his contemporaries and his successors; Marxism; the positivism of Comte and Mill; the irrationalism of Kierkegaard and Nietzsche. Offered in even-numbered years. Mr. Bossart

155. American Philosophy. (4) II.

Lecture-discussion—3 hours. Recommended: course 6 or 6F. Study of such American thinkers as Peirce, James, Royce, Dewey, Santayana, Whitehead, and C. I. Lewis. Offered in odd-numbered years. Mr. Berger

156A. Contemporary British Philosophy. (4) I.

Lecture—3 hours; term paper. Recommended: course 20C or 151. Interpretation and analysis of the most influential work of Bertrand Russell, G. E. Moore, Wittgenstein, J. L. Austin, and G. Ryle. Offered in odd-numbered years. Mr. Arbini

156B. Special Topics in Contemporary British Philosophy. (4) III.

Lecture—3 hours; term paper. Recommended: course 155 or 156A. Intensive study of special topic or author in contemporary British or American philosophy. Mr. Wedin

157A. Contemporary European Philosophy. (4) III.

Lecture-discussion—3 hours. Recommended: course 20C, 151, 175A, or 175B. Study of contemporary directions in European philosophy, with particular attention to the development of phenomenology and *Existenzphilosophie* in Germany. Readings in Husserl, Heidegger,

Jaspers, and related philosophers. Offered in even-numbered years. Mr. Child

157B. Contemporary European Philosophy. (4) I.

Lecture-discussion—3 hours. Study of contemporary directions in European philosophy, paying particular attention to the development of phenomenology and existentialism in France. Readings in Sartre, Marcel, Merleau-Ponty, and related philosophers. Offered in odd-numbered years. Mrs. Grene

157C. Contemporary European Philosophy. (4) III.

Lecture—3 hours; term paper. Recommended: course 157A or 157B. Intensive study of special topic or author from the general field covered in 157A and 157B. Offered in odd-numbered years. Mr. Bossart

161. Plato. (4) I.

Lecture-discussion—3 hours. Prerequisite: course 20A. Offered in odd-numbered years. Mr. Malcolm

162. Aristotle. (4) I.

Lecture-discussion—3 hours. Prerequisite: course 20A or consent of instructor. Offered in even-numbered years. Mr. Gilbert

***168. Descartes. (4) II.**

Lecture-discussion—3 hours; term paper. Prerequisite: course 20B. Offered in even-numbered years. Mr. Arbini

169. Spinoza. (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course 20B. Offered in odd-numbered years. Mr. Friedman

170. Leibniz. (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course 20B. Offered in even-numbered years. Mr. Friedman

***171. Hobbes. (4) II.**

Lecture-discussion—3 hours; term paper. Recommended: course 20B. Offered in even-numbered years. Mr. Gilbert

***172. Locke. (4) I.**

Lecture-discussion—3 hours. Offered in odd-numbered years. Mr. Child

***173. Berkeley. (4) II.**

Lecture-discussion—3 hours; term paper. Prerequisite: course 20C. Offered in even-numbered years. Mr. Beal

174. Hume. (4) III.

Lecture-discussion—3 hours. Offered in even-numbered years. Mrs. Grene

175A. Kant. (4) I.

Lecture-discussion—3 hours. Prerequisite: course 20C. Offered in even-numbered years. Mr. Bossart

175B. Kant. (4) II.

Lecture-discussion—3 hours. Prerequisite: course 20C. Offered in odd-numbered years.

Mr. Bossart

176. Hegel. (4) II.

Lecture-discussion—3 hours. Recommended: courses 20C, 175A, 175B. Offered in even-numbered years.

Mr. Bossart

178. Kierkegaard. (4) I.

Lecture—3 hours. Prerequisite: course 20A; course 20C or 185. Offered in odd-numbered years.

Mr. Child

183. Russell. (4) II.

Lecture-discussion—3 hours. Recommended: course 12A or Mathematics 125. Offered in odd-numbered years.

Mr. Wedin

185. Founders of Modern Thought. (4) I.

Lecture-discussion—3 hours; term paper. Not open to philosophy majors or students who have had course 20B or 20C. Survey of modern philosophy from Descartes to Kant. Major emphasis upon problems still current today.

Mr. Gilbert

***190. Special Topics in the History of Philosophy.**

(4) I, II, III.

Lecture—3 hours; term paper. Intensive study of special topic, problem, or authors in the history of philosophy. May be repeated for credit.

The Staff

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Bossart in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Bossart in charge)

Graduate Courses

Graduate courses 201, 202, 207, 214, and 290 are offered every year by different instructors and may be repeated for credit with permission of the Graduate Adviser. The other graduate courses will be varied from year to year.

201. Metaphysics. (4) I.

Seminar—3 hours.

Mrs. Grene

202. Theory of Knowledge. (4) III.

Seminar—3 hours.

Mr. Bossart

***206. Philosophical Argumentation. (4) II.**

Seminar—3 hours. Prerequisite: graduate standing. Investigation and evaluation of philo-

sophical arguments. Critical discussion of student papers on various aspects of philosophical disputes.

***207. Philosophy of Science. (4) III.**

Seminar—3 hours.

Mr. Friedman

***209. Theory of History. (4) I.**

Seminar—3 hours. Offered in odd-numbered years.

214. Ethics. (4) I.

Seminar—3 hours.

Mr. Bossart

***223. Aesthetics. (4) II.**

Seminar—3 hours. Offered in even-numbered years.

261A. Plato. (4) I.

Lecture-discussion—3 hours. Offered in odd-numbered years.

Mr. Wedin

261B. Plato. (4) III.

Seminar—3 hours. Offered in odd-numbered years.

Mr. Wedin

262A. Aristotle. (4) I.

Lecture-discussion—3 hours. Offered in even-numbered years.

Mr. Wedin

262B. Aristotle. (4) II.

Seminar—3 hours. Offered in even-numbered years.

Mr. Malcolm

***274. Hume. (4) III.**

Lecture-discussion—3 hours. Offered in even-numbered years.

Mrs. Grene

275A. Kant. (4) I.

Lecture-discussion—3 hours. Offered in even-numbered years.

Mr. Bossart

275B. Kant. (4) II.

Lecture-discussion—3 hours. Prerequisite: course 275A. Offered in odd-numbered years.

Mr. Bossart

290. History of Philosophy. (4) II, III.

Seminar—3 hours. Special topics in the history of philosophy.

Mr. Beal, Mr. Child

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Bossart in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Bossart in charge)

299D. Dissertation Research. (1-8) I, II, III.

(S/U grading only.)

The Staff (Mr. Bossart in charge)

NOTE: For key to footnote symbols, see page 191.

PHYSICAL EDUCATIONE. Dean Ryan, Ed.D., *Chairman of the Department*

Department Office, 264 Gymnasium

Professors:Charles R. Kovacic, Ed.D.
Willard S. Lotter, Ed. D.
E. Dean Ryan, Ed.D.**Associate Professors:**William C. Adams, Ph.D.
Edmund M. Bernauer, Ph.D.**Assistant Professors:**Melvin R. Ramey (*Civil Engineering*)
Jack H. Wilmore, Ph.D.**Lecturer and Supervisor of Physical Education:**

George A. Stromgren, M.S.

Supervisors:Robert R. Brooks, M.A.
Robert I. Hamilton, M.S.
Herbert A. Schmalenberger, M.A.
Joe L. Singleton, M.A.
Marya Welch, Ed.D.**Associate Supervisors:**Joseph E. Carlson, M.A.
Jere H. Curry, M.A.
Jerry W. Hinsdale, A.B.
John W. Pappa, M.A.
James L. Sochor, Ed.D.
Phillip S. Swimley, M.A.**Assistant Supervisors:**Suzanne Cumnock, Ed.M.
Robert L. Foster, A.B.
Deanna Sciaraffa, A.B.

The incidental fee payable by all students at the time of registration, entitles students to the use of gymnasium, shower, towels, lockers, tennis courts, and the athletic fields. Certain equipment for games and sports is available for exercise and recreation, either with or without instruction. Courses may be elected with or without academic credit. Lockers will be turned in on the last day of class, before the final examination period.

Fines are imposed for each formal transaction necessitated by failure of the student to comply with the regulations of the department.

Major Advisers.—Mr. Bernauer, Mr. Kovacic, Mr. Lotter, Mr. Ryan, Mr. Schmalenberger, Miss Welch, Mr. Wilmore.

Minor Adviser.—Mr. Adams.

The Major Program

Students will specialize in one of two areas: biological aspects or psychosocial aspects of physical education.

Lower Division Courses.—Required of all students: Biological Sciences 1, Chemistry 1A, Mathematics 13, Physical Education 45, Physics 2A or 10, Psychology 1A. Students interested in the biological aspects of physical education will be required to take Chemistry 8A, 8B.

Upper Division Courses.— Required of all students: Human Anatomy 100, Physiology 101, Physical Education 103, 104A–104B, 110, 120, and 135. Required of students in the biological area: A minimum of 12 additional upper division units in Physiology or Zoology, selected in consultation with the major adviser. Required of students in the psychosocial area: Psychology 112 and three upper division psychology or sociology courses selected in consultation with the major adviser.

Teaching Major.—The teacher-training curriculum in physical education requires not only the departmental major, but also courses 130, 180, 380B, and 380C.

Teaching Minor.—The teaching minor consists of 34 quarter units of course work, including 12 lower division units, 16 upper division units, and 6 units for teacher certification. Course selection must be made in consultation with the minor adviser.

Graduate Study.—A program of study and research leading to the M.A. degree is available in physical education. For detailed information regarding graduate study, write to the Graduate Adviser, Department of Physical Education.

Lower Division Courses**1. Physical Education for Men and Women. (½)****I, II, III.**

Laboratory—2 hours. Sections in archery, badminton, dance (ballet, modern, social, folk and square), baseball, basketball, fencing, football, golf, trampolining, tumbling, wrestling, volleyball, handball, soccer, tennis, touch football, track, swimming. (Men qualified for athletics may enroll in any sport pursued at Davis, such as baseball, basketball, football and receive credit.) This course may be repeated for credit not to exceed a total of 6 units.

The Staff (Mr. Ryan in charge)

5. First Aid. (2) I, II, III.

Lecture—2 hours. Standard course. Upon successful completion of the course the Red Cross Certificate is awarded.

Messrs. Stromgren, Pappa, Sochor, Swimley

10. Professional Physical Education Activities:**Men and Women. (1) I, II, III.**

Lecture—1 hour; laboratory—2 hours. Fundamental skills in aquatics, aerobics, archery, badminton, baseball, basketball, field hockey, football, gymnastics, handball, rhythms, softball, tennis, track and field, trampoline, weightlifting, wrestling, and volleyball.

The Staff (Mr. Ryan in charge)

25. Theory of Lifesaving and Water Safety. (1)**I, II, III.**

Lecture—1 hour; laboratory—2 hours. Prerequisite: sound physical condition, no physical handicap that would render student unable to perform the required skills and ability to pass preliminary swimming test. Provides the student with the knowledge, organizational procedures, and skill development necessary to provide for water safety and save his own life or the life of another in an aquatic emergency. (American Red Cross Senior Lifesaving Certificate awarded upon successful completion of necessary requirements.)

Mr. Hinsdale

27A. Training Course for Water Safety Instructors.**(1) I, II.**

Lecture—1 hour; laboratory—2 hours. Prerequisite: current American Red Cross Senior Life Saving Certificate. Provides an opportunity for individuals to learn to perform, analyze, and evaluate beginning, intermediate, and advanced swimming and lifesaving skills which are mandatory for advancement to course 27B, regardless of ability or experience.

Mr. Hinsdale

27B. Training Course for Water Safety Instructors.**(1) II, III.**

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 27A. Provides students with the theoretical and practical knowledge and experience necessary for the organization and teaching of swimming, lifesaving, and water safety courses. (American Red Cross Water Safety Instructors Certificate awarded upon successful completion of necessary requirements.)

Mr. Hinsdale

29. Basic Scuba. (2) I, II, III.

Lecture—2 hours; laboratory—2 hours; two 8-hour field trips of ocean diving. Prerequisite: advanced swimming skills equivalent to course 25; diver medical examination; and consent of instructor. Development of physical skills and knowledge required for S.C.U.B.A. diving, viz., function and maintenance of equipment, physics and physiology of diving, safety and first aid, currents and wave action, marine life and underwater communication.

Mr. Bernauer

35A-35B. Dance Composition. (2-2) I-II.

Discussion-demonstration—3 hours. Prerequisite: intermediate dance. Principles of choreography for solo and group compositions.

Mr. Curry

36A-36B. History of Dance. (3-3) I-II.

Lecture—3 hours. Study of dance and its relation to culture from the primitive to the Renaissance periods. The development of dance as an art form from the Baroque period to the twentieth century.

Mr. Curry

***44. Principles of Healthful Living. (2) I.**

Lecture—2 hours. Use of scientific information, proper attitudes, knowledge, and health practices in daily living.

45. Foundations of Physical Education. (4) I, III.

Lecture—4 hours. An introduction to the historical, biological, psychological, sociological and philosophical foundations of physical education.

Mr. Adams

97T. Tutoring in Physical Education. (1-5) I, II, III.

Discussion—1 hour; laboratory—3 hours. Prerequisite: lower division standing and consent of Department Chairman. Tutoring of students in lower division physical activity courses. Weekly meetings with instructor in charge of courses. Written reports on methods and materials required. May be repeated once for credit.

The Staff (Chairman in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

Upper Division Courses**103. Analysis of Human Movement. (5) I, III.**

Lecture—4 hours; laboratory—3 hours. Prerequisite: Physics 2A; Human Anatomy 100; course 45 or consent of instructor. Anatomical and physiological concepts and physical laws as applied to human movement.

Mr. Kovacic

104A-104B. Physiology of Muscular Activity.**(3) I-II.**

Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1; Physiology 101; course 45 or consent of instructor. Circulatory-respiratory and metabolic response to exercise in man under various physiological and ambient conditions.

Mr. Bernauer

105A. Physical Education for the Handicapped.**(4) II.**

Lecture—4 hours. The role of exercise, physical retraining and remedial work in the improvement of movement for handicapped individuals.

Mr. Kovacic

NOTE: For key to footnote symbols, see page 191.

105B. Internship in Physical Education for the Handicapped. (3) III.

Laboratory—6 hours. Prerequisite: course 105A. Teaching-research projects at off-campus sites under departmental supervision. (P/NP grading only.) Mr. Kovacic

110. Psychosocial Factors in Motor Performance. (4) II, III.

Lecture—3 hours. Prerequisite: Psychology 1A; course 45 or consent of instructor. Analysis of various psychological and social factors affecting the development and use of motor skills. Mr. Ryan

115. Growth and Development in Human Performance. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1, Physiology 2, and Human Anatomy 102. Development of human performance potential from conception to old age, including influence of racial differences, exercise, athletic participation, and preventive medicine. Alterations in motor skill patterns, morphology and body composition, physiological capacities, coordination, and balance with aging. Mr. Wilmore

***120. Sports in American Society. (4) III.**

Lecture—4 hours. Prerequisite: History 17A. The interrelationships of sports with other aspects of society, including the family, church, school and government; consideration of the manner in which sports may be used to contribute to human welfare in our advanced technological society. Miss Welch

130. Principles and Theory of Physical Education. (4) II.

Lecture—4 hours. Prerequisite: course 45 or consent of instructor. Critical analysis of the assumptions underlying the physical education program. Mr. Lotter

135. Research Design and Instrumentation in Physical Education. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 13. Methods, techniques, and design of experimental research in physical education. Mr. Wilmore

140. Recreation in the Community. (3) III.

Lecture—3 hours. The nature, scope and significance of recreation with its implications for leisure. The development, organization, and purpose of public and voluntary agencies which serve the recreational needs of the community. Mr. Lotter

***145. School Health Education. (3) III.**

Lecture—3 hours. Prerequisite: course 44 or consent of instructor. Study of the school health program as an integral part of the

school curriculum; the underlying principles and functions of health instruction, health service, healthful school living and the contributing community health agencies.

171. Prevention and Care of Injuries. (2) III.

Lecture—2 hours. Prerequisite: advanced first aid card and consent of instructor. Study of current concepts in the care and prevention of accidents in all areas, including athletics, recreation, work, home, and highway. Analysis and evaluation of associated principles and teachings. (American Red Cross Instructor Certificate awarded upon successful completion of necessary requirements.) Mr. Stromgren

171L. Prevention and Care of Injuries: Laboratory. (1) I.

Laboratory—3 hours. Prerequisite: advanced first aid card and consent of instructor; primarily for physical education majors. Prevention and care of injuries; adhesive strapping, protective devices, and injury care therapies. Training and first aid room organization, equipment, and supplies. Mr. Stromgren

180. Physical Education in the Secondary School. (3) I.

Lecture—3 hours. Prerequisite: course 130 or consent of instructor. Analysis and study of the principles and methods basic to physical education in the secondary school.

Miss Sciaraffa, Mr. Schmalenberger

197T. Tutoring in Physical Education. (1-5) I, II, III.

Tutorial—1-5 hours. Prerequisite: consent of instructor. Tutoring of students in lower division physical activity courses. Weekly meetings with instructor in charge of courses. Written reports on methods and materials required. May be repeated once for credit.

The Staff (Chairman in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: consent of department.

The Staff (Chairman in charge)

Graduate Courses**200. Proseminar in Physical Education. (3) I.**

Seminar—3 hours. Prerequisite: course 135. The meaning, methods, and techniques of research procedure as applied to physical education; a critical review of selected studies, literature, practices, and procedures in the field; application to a particular problem in the field.

Mr. Bernauer, Mr. Ryan

210. Historical and Cultural Bases of Physical Education. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 120. An examination of political, economic, social, and religious factors which have influenced sports in various countries and cultures. Miss Welch

215. Growth and Development in Human Performance. (4) III.

Seminar—4 hours. Prerequisite: course 115. Graduate lecture-seminar investigating the interrelationships between growth and development, and physical activity. Alterations in body composition, motor performance and physiological function with age, and the special problem areas of sex, ethnic and racial differences, aging, athletes, and alteration of normal growth patterns. Mr. Wilmore

220. Kinesiology. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 103. Critical review of current literature and research in kinesiology; neurophysiological concepts and physical laws. Mr. Kovacic

221. Anthropometry in Relation to Physical Performance. (4) II.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 104B and 135. Consideration of physical constitution, body proportions, and body composition in man as they affect physical performance; measurement of selected structural and functional changes accompanying prolonged, systematic physical conditioning. Mr. Adams

222. Metabolic Functions in Exercise. (4) III.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 104B, Physiology 110B. Review of the current research literature on the metabolic responses to exercise in man; a laboratory survey of respiratory response, metabolic and water balances,

blood gas adjustments and acid-base balance with particular reference to the effect of environmental conditions. Mr. Bernauer

230. Motor Performance: Psychological Aspects. (4) II.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 110. Critical review of current literature on motor learning; coordination; kinesis; and reaction time; consideration of sensory-motor perception, motivation, and personality factors in relation to physical activities. Mr. Ryan

290. Physiological Basis of Physical Fitness. (2) II.

Seminar—2 hours. Prerequisite: graduate standing. Review and critical discussion of current research topics concerned with the physiological aspects of physical fitness. Mr. Bernauer

298. Group Study. (1-3) I, II, III.

Prerequisite: graduate study and consent of instructor. The Staff (Chairman in charge)

299. Research. (1-12) I, II, III.

The Staff (Chairman in charge)

Professional Courses

300. Physical Education Activities and Methods in the Elementary School. (2) II, III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: senior standing. Principles, theories, materials, and practices of the elementary school physical education program. Miss Cumnock

380A-380B-380C. Methods of Physical Education in the Secondary School. (3-3-3) I, II, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 180 and demonstrated competence in selected skills; consent of instructor. Methods of teaching group and individual activities in the secondary school; program planning; class management; organization of the intramural and extra-mural programs. Mr. Schmalenberger, Miss Sciaraffa

PHYSICAL MEDICINE AND REHABILITATION—See Medicine

PHYSICAL SCIENCES

Roderick V. Reid, Jr., Ph.D., *Chairman of the Committee*
Committee Office, 225 Physics-Geology Building

Committee in Charge:

- Ian D. MacGregor, Ph.D. (*Geology*)
- Roderick V. Reid, Jr., Ph.D. (*Physics*)
- Peter A. Rock, Ph.D. (*Chemistry*)

Major Adviser: See *Class Schedule*.

The program is designed to give a foundation in the principal physical science fields without requiring specialization in any one area. A strong major is an excellent base for later work in the newer interdisciplinary fields, e.g., in environmental sciences, geophysics, or geochemistry.

NOTE: For key to footnote symbols, see page 191.

The major is also appropriate for those who desire a general physical science background and for those who wish to obtain a general secondary teaching credential. The lower division course requirements are similar to those of the major in chemistry or physics. This major may lead to either the Bachelor of Arts or the Bachelor of Science degree.

Preparation for the Major

Required: Chemistry 1A, 1B, 1C; Physics 4A, 4C, 4D, 4E; Geology 1-1L or 60-60L, 105, 106, 107; Mathematics 21A, 21B, 21C. Recommended: Chemistry 5; Physics 4B; Mathematics 22A, 22B. The choice of recommended courses

will be governed by the field of specialization within the major.

The Major Program

A total of 36 units of upper division courses in the physical sciences, of which not less than 23 units must be taken of the physical sciences in either chemistry, physics, or geology.

Teaching Major.—Requirements for the teaching major are the same as for the undergraduate major.

Teaching Minor.—The teaching minor must take at least 30 quarter units in two of the physical science fields with at least 18 units in one of these two fields. The program must have the approval of the subject representative.

Subject Representative: Mr. Reid.

PHYSICS

William J. Knox, Ph.D., *Chairman of the Department*

Department Office, 225 Physics-Geology Building

Professors:

James E. Draper, Ph.D.
Milton E. Gardner, Ph.D. (*Emeritus*)
Kenneth R. Greider, Ph.D.
John A. Jungerman, Ph.D.
William J. Knox, Ph.D.
Richard L. Lander, Ph.D.
Charles G. Patten, Ph.D. (*Emeritus*)
William W. True, Ph.D.

Associate Professors:

Franklin P. Brady, Ph.D.
Thomas A. Cahill, Ph.D.
Glen W. Erickson, Ph.D.
Claude Garrod, Ph.D.
James P. Hurley, Ph.D.
Douglas W. McColm, Ph.D.

Assistant Professors:

Ching-Yao Fong, Ph.D.
Winston T. Ko, Ph.D.
Neal Peek, Ph.D.
David E. Pellett, Ph.D.
Wendell H. Potter, Ph.D.
Roderick V. Reid, Jr., Ph.D.
Philip M. Yager, Ph.D.

Lecturer:

Albert C. Cheung, M.A.



Major Subject Advisers. — Mr. Peek, Mr. Pellett.

The Major Program

Lower Division Courses.—Physics 4A, 4B, 4C, 4D, 4E; Mathematics 21A, 21B, 21C, 22A, 22B, 22C. Recommended for the Bachelor of

Arts and required for the Bachelor of Science degree: Chemistry 1A-1B-1C or 4A-4B-4C.

Upper Division Courses.—Both *Bachelor of Arts* and *Bachelor of Science* programs require the completion of the core program consisting of: Physics 104A-104B, 105A-105B, 115A, 110A-110B (-110C for B.S. only), one quarter of an upper division lab, Physics 112A. Additional upper division units are required to add up to the following requirement totals: Bachelor of Arts—38 upper division units total. Bachelor of Science—55 upper division units total. Any upper division physics courses open to majors satisfy the additional units requirement. Substitutions from other departments for these upper division units, as well as the core, may be made by written permission of the Undergraduate Curriculum Committee Chairman as approved by the Department Chairman. Upper division lab requirement satisfied by any one of the following: courses 116A, 116B, 122, or approved substitution. Recommended: Mathematics 24, 118, 119, 185; Mathematics 128 or Applied Science 115.

Honors and Honors Program.—The honors program in physics consists of 4 units of course 194H, open to seniors who qualify for the honors program. Students may be graduated with honors in physics on completion of the required major and this program.

Graduate Study.—The Department of Physics offers programs of study and research leading to the M.A. and Ph.D. degrees.

Lower Division Courses

Physics 4A, 4B, 4C, 4D, and 4E are for students whose major is physics and for students preparing for applications of physics in Engineering and Chemistry.

All students planning to take lower division courses (except course 10) should have completed trigonometry.

The Physics 2 series may be started in any quarter and completed without interruption since either sequence, 2A-2B-2C or 2A-2C-2B, is satisfactory. Also, 2B and 2C may be taken concurrently.

The Physics 4 series may be started in either winter or spring quarter and completed without interruption since either sequence, 4A-4B-4C-4D-4E or 4A-4C-4D-4B-4E, is satisfactory.

Upper Division Courses

Courses 4A, 4B, 4C, 4D, 4E, or their equivalent, and Mathematics 21A, 21B, 21C, and 22A, 22B, 22C or their equivalents are prerequisites to all upper division courses. Some prerequisites may be waived with consent of the instructor.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major for degree (A.B. or B.S.).

Teaching Minor.—The teaching minor must take Physics 4A, 4B, 4C, 4D, 4E, and any other upper division physics courses necessary to complete 30 quarter units.

Subject Representative: Mr. Reid.

Astronomy

Lower Division Courses

1A. Introduction to General Astronomy: The Solar System. (4) II.

Lecture—4 hours. Introduction to the celestial sphere, constellations of the seasons, effects of diurnal and annual motions of the Earth; planetary motions, phases and configurations, including study of Earth as a planet. Not intended for advanced physical science majors. (Courses 1A and 1B may be taken in either order.)

Mr. Cheung

1B. Introduction to General Astronomy: Stars and the Universe. (4) III.

Lecture—4 hours. Introduction to stellar motions, magnitudes and distances; distribution of stars in space; the sun; the galaxy. Not intended for advanced physical science majors. (Courses 1A and 1B may be taken in either order.)

Mr. Cheung

Physics

Note: Faculty listed for each course are well acquainted with the course, but may not teach it this year.

Lower Division Courses

2A. General Physics Lecture. (3) I, II, III.

Lecture—3 hours. Mechanics; introduction to electricity and magnetism.

Messrs. Potter, Erickson, Hurley, Peek, and Staff

2B. General Physics Lecture. (3) II, III.

Lecture—3 hours. Prerequisite: course 2A. Electricity and magnetism, heat, kinetic theory, and thermodynamics.

Messrs. Erickson, Potter, Peek, Hurley, and Staff

2C. General Physics Lecture. (3) I, III.

Lecture—3 hours. Prerequisite: course 2A. Wave motion, optics, modern physics.

Messrs. Hurley, Erickson, Potter, and Staff

3A. General Physics Laboratory. (1) I, II, III.

Laboratory—3 hours. Prerequisite: course 2A (may be taken concurrently). Mechanics, introduction to electricity and magnetism. Experimental work planned to accompany the lectures in course 2A. Recommended for all students who elect course 2A.

Mr. McColm and course 2A instructors

3B. General Physics Laboratory. (1) II, III.

Laboratory—3 hours. Prerequisite: course 2B (may be taken concurrently). Electricity and magnetism, heat, kinetic theory, and thermodynamics. Experimental work planned to accompany the lectures in course 2B. Recommended for all students who elect course 2B.

Mr. McColm and course 2B instructors

3C. General Physics Laboratory. (1) I, III.

Laboratory—3 hours. Prerequisite: course 2C (may be taken concurrently). Wave motion, optics, modern physics. Experimental work planned to accompany the lectures in course 2C. Recommended for all students who elect course 2C.

Mr. McColm and course 2C instructors

4A. General Physics. (4) II, III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 21B (may be taken concurrently). Mechanics.

Mr. Greider

4B. General Physics. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4A; Mathematics 21C (may be taken concurrently). Properties of many body systems; rigid body motion, hydrodynamics, kinetic theory, thermodynamics and statistical physics.

The Staff

4C. General Physics. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4A and Mathematics 21C; course 4B and Mathematics 22C recommended. Fundamentals of electromagnetic theory; Maxwell's equations.

Mr. Draper

4D. General Physics. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4C; Mathematics 22B recommended. Fundamentals of electromagnetic theory (continuation of course 4C), A.C. circuitry,

NOTE: For key to footnote symbols, see page 191.

electromagnetic waves, optics, electric and magnetic fields in matter. Mr. Yager

4E. General Physics. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4C; course 4D and Mathematics 22A recommended. Physics since 1900: special relativity, quantum mechanics and particle physics. Mr. Reid

10. Basic Concepts of Physics. (4) I, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra. Survey of the basic principles of physics and how they have evolved since the time of Copernicus. Includes lecture-demonstrations and problem solving using elementary algebra.

Messrs. Greider, Cahill, Knox, Powell

98. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor; primarily for lower division students.

The Staff (Chairman in charge)

99. Special Study for Undergraduates. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

Upper Division Courses

104A-104B. Introduction to Methods of

Mathematical Physics. (3-3) I-II.

Lecture—3 hours. Prerequisite: course 4C; Mathematics 22C. Elements of vector and tensor analysis, matrix methods, boundary value problems, integral transforms with applications to physics. Mr. Erickson

105A-105B-105C. Analytical Mechanics.

(3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 4A; Mathematics 22C. Principles and applications of Newtonian mechanics. Mr. Ko, Mr. Pellett

110A-110B-110C. Electricity and Magnetism.

(3-3-3) I-II-III.

Lecture—3 hours. Prerequisite: course 4D; Mathematics 22C. Theory of electrostatics, electromagnetism, Maxwell's equations, electromagnetic waves. Mr. Jungerman, Mr. Reid

112A-112B. Thermodynamics and Statistical

Physics. (3-4) I-II.

Lecture—3 hours; (4th unit) outside work—9 hours. Prerequisite: course 4; Mathematics 22C. Thermodynamics, kinetic theory, and introduction to statistical mechanics. Mr. Knox

115A-115B. Introduction to Quantum Mechanics.

(3-4) III, I.

Lecture—3 hours; (4th unit for 115B) problem sets. Prerequisite: courses 4E, 104B, 105B. The classical background, basic ideas, and meth-

ods of quantum mechanics, with applications to atomic physics. Mr. Yager

116A. Electronic Instrumentation. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4D, Mathematics 22C; course 104B and partial differential equations and Laplace transforms recommended. An experimental and theoretical study of important electronic circuits commonly used in physics.

Mr. Cahill

116B. Electronic Instrumentation. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 116A. Continuation of course 116A with special emphasis on recent developments in semiconductor circuitry. Mr. Cahill

121. Foundations of Atomic and Molecular Physics.

(4) III.

Lecture—3 hours; outside work—9 hours. Prerequisite: course 4E; Mathematics 21C. The phenomena of atomic physics; introduction to quantum phenomena and quantum mechanics; selected topics dealing with atoms, molecules, nuclei, and the solid state. Mr. McCole

122. Advanced Physics Laboratory. (2) II, III.

Laboratory—3-6 hours; outside work—0-3 hours. Prerequisite: course 4. Experimental techniques and measurements in atomic, nuclear, and solid-state physics. May be repeated for credit not to exceed a total of 4 units.

Mr. Pellett, Mr. Draper

129A. Nuclear Physics. (4) II.

Lecture—3 hours; outside work—9 hours. Prerequisite: course 4E; Mathematics 22C. Survey of basic nuclear properties and concepts requiring only rudimentary knowledge of quantum mechanics. Mr. Peek

129B. Nuclear Physics. (4) III.

Lecture—3 hours; outside work—9 hours. Prerequisite: courses 115B, 129A. Continuation of course 129A. Mr. Draper

140A. Introduction to Solid State Physics. (4) II.

Lecture—3 hours; outside work—9 hours. Prerequisite: course 115A. A survey of basic concepts and classification of experimental phenomena in solids. Introduction to band theory.

140B. Introduction to Solid State Physics. (4) III.

Lecture—3 hours; outside work—9 hours. Prerequisite: course 140A. A thorough treatment of one or more of the following: energy bands and fermi surfaces, transport phenomena, cooperative phenomena, magnetic resonance.

150. Topics in Current Research. (2) I, II, III.

Discussion—1 hour; outside work—5 hours. Prerequisite: consent of instructor. Discussion

of topics of current interest in physics. May be taken for credit not more than four times.

The Staff

194H. Special Study for Honors Students.

(4) I, II, III.

Prerequisite: open only to seniors who qualify for the honors program. Independent research and/or reading on selected topics.

The Staff (Chairman in charge)

195. Senior Thesis. (5) I, II, III.

Prerequisite: physics major of senior standing. Preparation of a senior thesis on a topic selected by the student with approval of the department. May be repeated for a total of 16 units and for no more than 5 units in any one quarter without Departmental approval.

The Staff (Chairman in charge)

197T. Tutoring in Physics and Astronomy. (1-5)

I, II, III.

Prerequisite: consent of instructor and department chairman. Tutoring of students in lower division course. Weekly meetings with instructor.

The Staff (Chairman in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III. The Staff (Chairman in charge)

Graduate Courses

200A. Theory of Mechanics and Electromagnetics.

(3) I.

Lecture—3 hours. Prerequisite: courses 105C and 110C or equivalent; Mathematics 220A concurrently. Special theory of relativity, covariant formulation of mechanics and electromagnetic theory, Lagrange's equations, variational principles for discrete and continuous mechanical and electromagnetic systems. Courses 200A, 200B, 200C, 200D, an integrated sequence, will emphasize physical content as they are coordinated with Mathematics 220A, 220B, 220C.

Mr. Garrod

200B. Theory of Mechanics and Electromagnetics.

(3) II.

Lecture—3 hours. Prerequisite: course 200A; Mathematics 220B concurrently. Hamilton's equations. Hamilton-Jacoby theory and contact transformations, action-angle variables and perturbation theory, selected topics in mechanics of continuous media; incompressible and compressible flow, gravity waves and shock theory.

Mr. Garrod

200C. Theory of Mechanics and Electromagnetics.

(3) III.

Lecture—3 hours. Prerequisite: course 200B, Mathematics 220C concurrently. Brief review of static electromagnetic fields; Maxwell's equations; plane waves in various media; magneto-hydrodynamics.

Mr. True

200D. Theory of Mechanics and Electromagnetics.

(3) I.

Lecture—3 hours. Prerequisite: course 200C. Diffraction theory. Radiating systems and electron theory.

Mr. True

215A. Quantum Mechanics. (3) I.

Lecture—3 hours. Prerequisite: course 115B. Nonrelativistic quantum mechanics. Formal development and interpretation of quantum mechanics, including the Schrödinger wave equation, matrix mechanics, and use of state vectors in describing a dynamical system.

Mr. Fong

215B. Quantum Mechanics. (3) II.

Lecture—3 hours. Prerequisite: course 215A. Wave packets, Wentzel-Kramers-Brillouin approximation, and perturbation methods applied to atomic, nuclear, molecular, and solid-state problems.

Mr. Fong

215C. Quantum Mechanics. (3) III.

Lecture—3 hours. Prerequisite: course 215B. Scattering theory, radiation theory, and a brief introduction to relativistic quantum mechanics and the Dirac equation.

Mr. Fong

219A. Statistical Mechanics. (3) I.

Lecture—3 hours. Prerequisite: courses 112B and 115B. Foundations of classical and quantum statistical mechanics.

Mr. Garrod, Mr. Hurley

219B. Statistical Mechanics. (3) II.

Lecture—3 hours. Prerequisite: course 219A. Applications to properties of solids, real gases, nuclear matter, fluctuations about the equilibrium state.

Mr. Hurley, Mr. Garrod

***221A-221B-221C. Atomic Physics. (3-3-3) I-II-III.**

Lecture—3 hours. Prerequisite: course 215C. Term structure of atoms using the angular momentum formalism; methods of computing wave functions and radial integrals; splitting in external fields; term structure in crystals; scattering and collisions.

Mr. McColm

224A. Nuclear Physics. (3) I.

Lecture—3 hours. Prerequisite: course 215B. Comprehensive study of the nucleon-nucleon interaction including the deuteron, nucleon-nucleon scattering, polarization, determination of real parameters of S-matrix, and related topics. Offered in even-numbered years.

Mr. Draper

NOTE: For key to footnote symbols, see page 191.

224B. Nuclear Physics. (3) II.

Lecture—3 hours. Prerequisite: course 224A. Study of nuclear models, including shell model, collective model, unified model. Energy level spectra, static momenta, and electromagnetic transition rates. Offered in odd-numbered years.
Mr. Draper

224C. Nuclear Physics. (3) III.

Lecture—3 hours. Prerequisite: course 224B. Study of nuclear scattering and reactions including the optical model and direct interactions. Beta decay and an introduction to weak interactions. Offered in odd-numbered years.
Mr. Draper

***229A. Advanced Nuclear Theory. (3) I.**

Lecture—3 hours. Prerequisite: course 224C. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for two-body scattering.
Mr. Reid

***229B. Advanced Nuclear Theory. (3) II.**

Lecture—3 hours. Prerequisite: course 229A. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for three-body scattering.
Mr. Reid

230A. Quantum Theory of Fields. (3) I.

Lecture—3 hours. Prerequisite: course 215C. Relativistic quantum mechanics of particles; techniques and applications of second quantization; Feynman diagrams; renormalization. Offered in even-numbered years. Mr. Erickson

230B. Quantum Theory of Fields. (3) II.

Lecture—3 hours. Prerequisite: course 230A. Continuation of 230A, with selected advanced topics, such as S-matrix theory, dispersion relations, axiomatic formulations. Offered in odd-numbered years. Mr. Erickson

***239A. Quantum Many-Body Systems. (3) II.**

Lecture—3 hours. Prerequisite: courses 215C and 219B. The quantum theory of many-particle systems. Theoretical analysis of superfluids, superconductors, and nuclear matter. Mr. Garrod

***239B. Quantum Many-Body Systems. (3) III.**

Lecture—3 hours. Prerequisite: course 239A. Perturbation and variation techniques in many-particle systems. Band theory of solids, electron-phonon interactions, and other topics.
Mr. Garrod

240A–240B. Solid State Physics. (3–3) I–II.

Lecture—3 hours. Prerequisite: course 221A–221B. One electron model of solids. Properties of lattice waves. Optical and magnetic proper-

ties of solids. Fermi surface. Superconductivity. Offered in even-numbered years.

————, Mr. Fong

245A–245B. High Energy Physics. (3–3) I–II.

Lecture—3 hours. Prerequisite: course 215A. Systematics of elementary particle interactions; determination of quantum numbers; interpretation of experiments; selected special topics in second quarter. Offered in even-numbered years.
Mr. Lander

251. Frontier Physics. (3) II.

Lecture—3 hours. Prerequisite: courses 200C, 215B; or consent of instructor. Provides an introduction to and summary of the types of research that are of current interest in physics and a detailed analysis of a particularly important recent discovery in each major area.
Mr. Reid

252. Techniques of Experimental Physics. (3) III.

Lecture—3 hours. Introduction to techniques and methods of designing and executing experiments. Problems and examples will be drawn from various fields of current experimental research—low temperature solid state to high energy scattering experiments. Mr. Draper

290. Seminar. (1–3) I, II, III.

Seminar—1–3 hours. (S/U grading only.)
The Staff (Chairman in charge)

291. Seminar in Nuclear Physics. (1–2) I, II, III.

(S/U grading only.)
The Staff (Chairman in charge)

292. Seminar in Theoretical Physics. (1–2) I, II, III.

(S/U grading only.)
The Staff (Chairman in charge)

293. Seminar in Solid State Physics. (1–2) I, II, III.

Seminar—1–2 hours. (S/U grading only.)
Mr. Fong, Mr. Potter

297. Techniques of Teaching Physics. (3) I, II, III.

Prerequisite: consent of instructor and Department Chairman. Study of devices and methods used to teach physics at the college level. Participation in presenting lectures and demonstrations in undergraduate classes. Preparation of new material for lectures and laboratories. (S/U grading only.)

The Staff (Chairman in charge)

298. Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Chairman in charge)

299. Research. (1–12) I, II, III.

(S/U grading only.)
The Staff (Chairman in charge)

PHYSIOLOGICAL SCIENCES

Arthur L. Black, Ph.D., *Chairman of the Department*
Department Office, 2163 Haring Hall

Professors:

Arthur L. Black, Ph.D.
Victor W. Burns, Ph.D.
Richard A. Freedland, Ph.D.
Stuart A. Peoples, M.D.
Robert E. Smith, Ph.D. (*Emeritus*)

Associate Professors:

Richard L. Bell, Ph.D. (*Chemical Engineering*)
Jerry R. Gillespie, D.V.M., Ph.D. (*Physiological Sciences and Human Physiology*)
Alfred A. Heusner, Ph.D.
James G. Morris, Ph.D. (*Physiological Sciences and Animal Science*)
Harold R. Parker, D.V.M., Ph.D.
Quinton R. Rogers, Ph.D.

Assistant Professors:

Gaylord M. Conzelman, Jr., Ph.D.
Donald L. Curry, Ph.D.
Shri N. Giri, B.V.Sc., A.H., Ph.D.
Robert J. Hansen, Ph.D.
Robert M. Joy, Ph.D.

Lecturers:

Allen C. Andersen, V.M.D., Ph.D.
Marvin Goldman, Ph.D.
Sally Huff, Ph.D.
Michael Momeni, Ph.D.

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Upper Division Courses**101A-101B. Physiological Chemistry. (4-3) I, II.**

Lecture—4-3 hours. Prerequisite: quantitative and organic chemistry. Recommended: a course in physiology (may be taken concurrently). Chemical and physical properties of substances comprising the animal body, with major emphasis on the changes during metabolism and factors influencing these reactions. Biochemistry of the endocrine glands and other specialized tissues and body fluids; energy metabolism and nutrition. (Deferred grading only, pending completion of sequence.)

Messrs. Black, Hansen, Rogers

***102A-102B. Physiological Chemistry Laboratory.**

(1-2) I-II.

Laboratory—3-6 hours. Prerequisite: course 101A-101B (should be taken concurrently); open to first-year Veterinary Medicine Students;

or consent of instructor. Laboratory practice to illustrate the chemical and physical properties of important constituents of animal cells including enzymes; blood and urine analysis; animal experiments on intermediary metabolism using isotopes. (Deferred grading only, pending completion of sequence.)

Sec. 1: Mr. Freedland; Sec. 2: Mr. Hansen

***123. Comparative Pharmacology. (5) I.**

Lecture—4 hours; laboratory—3 hours. Prerequisite: regular standing in the School of Veterinary Medicine or consent of instructor; physiological chemistry and physiology recommended. Action of drugs on the physiological mechanisms of domestic animals.

Messrs. Peoples, Giri, Conzelman, Joy

***124. Comparative Pharmacology. (4) II.**

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 123 or consent of instructor. Effect of drugs on organ systems of domestic animals and their application to the treatment of disease. Laboratory exercises to illustrate the principles of therapeutics and toxicology. Messrs. Peoples, Giri, Conzelman, Joy

***140A-140B. Mammalian Physiology. (4-4) II-III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: good standing in School of Veterinary Medicine or consent of instructor, based upon evidence of adequate preparation in mathematics and the physical and biological disciplines. A general survey of comparative mammalian physiology with emphasis on systematic mechanisms. (Deferred grading only, pending completion of sequence.)

The Staff (Mr. Gillespie in charge)

***141A-141B. Laboratory in Mammalian Physiology.**

(1-2) II-III.

Laboratory—3-6 hours. Prerequisite: courses 140A-140B (must be taken concurrently). Non-veterinary students must obtain consent of instructor. Laboratory exercises designed to illustrate physiological interactions among systems in different animal species. (Deferred grading only, pending completion of sequence.)

Physiology Staff

***180. Bioenvironmental Consequences of Nuclear Technology. (3) III.**

Lecture—1½ hours; discussion—½ hour; term paper; field trip to Nuclear Power Station. Prerequisite: consent of instructor; Physics 2A and Biological Sciences 1 or their equivalents. Discussion of biospheric implications of radionu-

NOTE: For key to footnote symbols, see page 191.

clide and thermal effluents generated by nuclear technology. Hazards evaluation based on predictions of the response of the most sensitive physiological systems. (Same course as Environmental Studies 180.) Mr. Goldman

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

200. Cell Physiology: Biophysical Aspects. (2) III.

Lecture—2 hours. Prerequisite: consent of instructor. Recommended: Physiology 100B or Bacteriology 130B; Biochemistry 101B and Chemistry 107B or 110C. Discussion of modern approaches to understanding the cell as an organized system. Topics include: analysis of regulation and coordination in the cell; energetic and statistical relations in the cell; tracer kinetics applied to cells; fluorescence of cells and constituents. Offered in even-numbered years.

Mr. Burns

205A. Intermediary Metabolism of Animals. (3) I.

Lecture—3 hours. Prerequisite: biochemistry and physiology or consent of instructor. General considerations in use of biochemical data as related to metabolism of intact animals. Pathways and control in biosynthesis and degradation of carbohydrates and lipids; including hormonal, nutritional, and genetic effects. Dynamics of animal metabolism including pools and turnover rates.

Messrs. Black, Hansen, Rogers

205B. Intermediary Metabolism of Animals. (3) II.

Lecture—3 hours. Prerequisite: course 205A or consent of instructor. Pathways and control in animals of the biosynthesis and degradation of amino acids, proteins, nucleotides and porphyrins; includes hormonal, nutritional, and genetic effects.

Messrs. Black, Hansen, Rogers

*225. Fundamentals of Radiation Biology. (5) I.

Lecture—5 hours. Prerequisite: one year of physics, biochemistry and physiology or consent of instructor. Radiation effects at atomic, molecular, cellular, tissue, and organism levels including genetic, immunologic, carcinogenic, and aging responses in terms of dose quality and quantity. Included also are discussions of dose-effect relationships, environmental radiation, radiation protection criteria and radiation therapy.

Mr. Bustad, Mr. Goldman

243A-243B. Use of Isotopes as Tracers in Biological Research. (2-2) I-II.

Lecture—2 hours. Prerequisite: biochemistry or physiological chemistry, elementary physics and calculus or consent of instructor. Discussion of the properties of isotopes and their use as tracers in biological systems.

Mr. Burns

243L. Laboratory in Use of Isotopes as Tracers in Biological Research. (2) II.

Laboratory—6 hours. Prerequisite: course 243B (concurrently). Study of radioisotope properties, uses and measurement methods relevant to the biological sciences.

Mr. Burns

253. Drug Metabolism. (2) II.

Lecture—2 hours. Prerequisite: courses 101A-101B, 140A-140B or Physiology 110A-110B; consent of instructor. General pathways of drug metabolism; and factors influencing the drug metabolism. Emphasis will be laid upon the species, age, and genetic differences affecting the biological disposition of the drugs. Offered in even-numbered years.

Mr. Giri

254. Applied and Clinical Pharmacology. (2) III.

Lecture—2 hours. Prerequisite: courses 123, 124; or consent of instructor. Course will be structured to reinforce and strengthen the students' knowledge of pharmacology. Some sessions will resemble therapeutic conferences in which clinicians and pharmacologists will discuss actions and dangers of drugs used in management of specific animal diseases.

Messrs. Conzelman, Giri, Peoples, Joy

255. Pharmacogenetics. (2) II.

Lecture—1 hour; laboratory—3 hours. Prerequisite: consent of instructors. The genetic basis of interspecific and intraspecific differences in animals to the action of drugs. The laboratory exercises are designed to illustrate these differences and their biological basis.

Mr. Peoples, Mr. Stormont

256. Medical Toxicology. (3) II.

Lecture—3 hours. Prerequisite: course in pharmacology or consent of instructor. Studies considered essential to preclinical evaluation of new drugs intended for use in human or veterinary medicine are discussed in depth. The following facets of toxicity tests are covered: hypersensitivity; blood dyscrasias; hepatotoxicity, nephrotoxicity, behavioral effects; addiction potential; teratogenicity; carcinogenicity.

Messrs. Peoples, Conzelman, Giri, Joy

257. Pharmacology Literature. (1) I.

Discussion—1 hour. Critique of selected papers in pharmacology with the objective of discerning those general principles, techniques, and guides for procedures which successful investigators have found helpful in the pursuit of their research. Offered in even-numbered years.

Mr. Conzelman

258. Physicochemical Relationships in Drug Action. (2) II.

Lecture—2 hours. Prerequisite: consent of instructor. Advanced graduate level coverage of major theories of drug activity and their kinetics. Emphasized are drug-receptor interac-

tions; protein binding; the transport of drugs across biological membranes; the uptake, distribution and elimination of drugs; and the specificity of drug responses. Mr. Joy, Mr. Giri

260. Comparative Bioenergetics. (4) II.

Lecture—2 hours; discussion—2 hours. Prerequisite: working knowledge of calculus; consent of instructor. Fundamentals of thermodynamics: first and second law, probability and information, entropy and information, Poikilothermy, heterothermy, homeothermy, dimensional analysis, theory of biological similarity applied to energy metabolism. Mr. Heusner

265. Experimental Physiology. (3) I.

Lecture—1 hour; laboratory—6 hours. Prerequisite: consent of instructor. Selected lectures and experiments on cardiovascular, renal and pulmonary mechanisms with emphasis on chronically maintained preparations and perinatal problems. Offered in odd-numbered years. Mr. Parker

290. Seminar. (1) I, II, III.

Seminar—1 hour.
The Staff (Chairman in charge)

298. Group Study. (1-4) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-12) I, II, III.

The Staff (Chairman in charge)

PHYSIOLOGY—Also see Zoology, page 478

PHYSIOLOGY

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 97 and 182.

Questions pertaining to the following courses should be directed to the instructor or the Division of Biological Sciences, 150 Mrak Hall.

Lower Division Courses

See Physiology 2, 2L, and 10 under Zoology course listing (see page 478).

Upper Division Courses

100A-100B. General Physiology. (3-3) I-II.

Lecture—3 hours. Prerequisite: Biological Sciences 1; Chemistry 8B; Physics 2C. Chemical, mathematical, and physical characteristics of the life process common to living things, with particular reference to the cell. Ms. Horwitz

100L. General Physiology Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 100B (may be taken concurrently). Laboratory in the physical and chemical processes of cells and tissues. Ms. Horwitz

101. Functions of Organ Systems. (4) III.

Lecture—4 hours. Prerequisite: Biological Sciences 1. Physiology of organ systems; concepts of integrative and homeostatic mechanisms, especially in adaptation, growth, and reproduction. Mr. Burger, Mr. Colvin, Mrs. Woolley

101L. Organ Function Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 101 (should be taken concurrently). Selected experiments to illustrate functional characteristics of organ systems discussed in course 101. Mr. Wagman

102. Physiology of Growth. (3) III.

Lecture—3 hours. Prerequisite: course 101, 101L, or their equivalents. Biological, physical, and chemical aspects of the growth of cells, organisms, and populations. Mr. Smith

103. Physiology of Animal Cells. (3) III.

Lecture—3 hours. Prerequisite: course 100B or Zoology 121B. Organization of metazoan systems at the cellular level. Life cycles of cells; regulation and development of specialized cell functions. Mr. B. W. Wilson

107. Avian Physiology. (3) III.

Lecture—3 hours. Prerequisite: courses 101 and 101L, or Zoology 2. Physiology of the various systems of birds with emphasis on digestion, respiration, excretion, and the nervous system. Mr. Ogasawara

107L. Avian Physiology Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 107 (may be taken concurrently); and consent of instructor. Selected problems in the physiology of birds. Mr. Ogasawara

108. Biodynamics. (4) III.

Lecture—4 hours. Prerequisite: course 110B; Mathematics 16B; Physics 2C. Rates and dynamics of physiological processes. Mr. Horowitz

110A-110B. Mammalian Physiology. (3-3) I-II.

Lecture—2 hours; discussion—1 hour (optional); directed self study—1 hour. Prerequisite: Biological Sciences 1; Chemistry 8B, Physics 2A-2B-2C, and Zoology 2 recommended. Physiology of the organ systems of mammals. Designed for students with a pre-professional interest in physiology. Physiology

NOTE: For key to footnote symbols, see page 191.

of the neuromuscular, central nervous, circulatory, respiratory, digestive, endocrine, reproductive, and excretory systems of mammals.

Messrs. Boda, Burger, Horowitz, Mendel

111A-111B. Mammalian Physiology Laboratory.
(2-2) I-II.

Discussion—1 hour; laboratory—3 hours including independent carrel instruction. Prerequisite: course 110A-110B (may be taken concurrently). Selected experiments in depth on the neural, cardiovascular, respiratory, renal, and endocrine systems. Emphasis on modern conceptual and methodological approaches using several species in demonstrating the physiology of organ systems. Mr. Burger, Mr. Mendel

120A. Comparative Physiology. (3) I.

Lecture—3 hours. Prerequisite: course 101 or 110A. Comparisons of physiological functions in the animal kingdom: neurophysiological mechanisms of integration including aspects of phylogenetic development at both neuronal and systemic levels. Mrs. Woolley

120B. Comparative Physiology. (3) II.

Lecture—3 hours. Prerequisite: courses 101 and 101L. Comparisons of physiological functions in the animal kingdom: respiration and circulation. Mr. Smith, Mr. Rhode

120C. Comparative Physiology. (3) III.

Lecture—3 hours. Prerequisite: courses 101 and 101L. Comparisons of physiological functions in the animal kingdom: digestion and excretion. Mr. Colvin, Mr. Boda

120D. Comparative Physiology. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 101. Comparisons of physiological functions in the animal kingdom: humoral integrative mechanisms.

121. Physiology of Reproduction. (3) III.

Lecture—3 hours. Prerequisite: course 110B. Physiological mechanisms related to reproduction, breeding efficiency, and fertility, with special reference to domestic animals. Mr. Cupps

121L. Physiology of Reproduction Laboratory.
(1) III.

Laboratory—3 hours. Recommended: course 121. Experiments on the reproductive systems of domestic animals including male and female gametes. Mr. Cupps

130. Physiology of the Endocrine Glands. (5) III.

Lecture—4 hours; discussion—1 hour. Prerequisite: course 110B. Control of endocrine secretion and the physiological effects of the hormones. Mr. Moberg

148. Principles of Environmental Physiology. (3) II.

Lecture—3 hours. Prerequisite: course 101 or 110B (may be taken concurrently). Intensive treatment of basic aspects of environmental physiology; introduction to physiological control mechanisms; special emphasis on adaptation to the environment. Mr. Evans

149. Environmental Physiology of Domestic Animals. (3) III.

Lecture—3 hours. Prerequisite: courses 101 and 101L, or Zoology 2. Influences of environmental factors on physiological processes related to domestic animals. Mr. W. O. Wilson

190. Proseminar in Physiology. (3) II.

Seminar—3 hours. Prerequisite: upper division standing. Relationships between form and function of living systems from the molecular to the organismal levels, with emphasis upon animal systems. Mr. B. W. Wilson

197T. Tutoring in Physiology. (4) III.

Lecture—4 hours; tutorial—1 hour. Prerequisite: course 110B with grade of B or better and consent of instructor. Intensive review of systemic physiology through leading a weekly tutorial session with a small group of students taking course 101. (Students will attend all course lectures plus a weekly discussion session with the course 101 instructors.)

The Staff (Mr. Boda in charge)

198. Directed Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.
(1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

***200A. Advanced General Physiology. (3) I.**

Lecture—3 hours. Prerequisite: course 100B or Zoology 120, Biochemistry 101B, and Chemistry 110B, or consent of instructor. Physicochemical bases of living systems with emphasis on recent investigations in membrane physiology. Offered in even-numbered years.

***200B. Advanced General Physiology. (3) II.**

Lecture—3 hours. Prerequisite: course 100B or Zoology 120, Biochemistry 101B, and Chemistry 110B, or consent of instructor. Physicochemical bases of living systems with emphasis on recent investigations in cellular dynamics. Offered in odd-numbered years.

Mr. B. W. Wilson

200L. Advanced General Physiology Laboratory.
(4) I.

Discussion—2 hours; laboratory—10 hours. Prerequisite: course 100B or Zoology 120, Biochemistry 101B or consent of instructor. The

design, performance and interpretation of experiments in cellular and general physiology. Emphasis on growth, division, differentiation, permeability, conduction and other physiological phenomena. Experimental materials include free-living and somatic animal cells and animal tissues. Mr. B. W. Wilson, Mr. Goldner

210A-210B. Advanced Systemic Physiology. (3-3) I-II.

Lecture—3 hours. Prerequisite: course 110B or consent of instructor. Advanced consideration of the physiology of the neuromuscular, circulatory, respiratory, digestive, endocrine, reproductive, and excretory systems.

Mr. Horowitz, Mr. Moberg

211. Advanced Systemic Physiology Laboratory. (5) III.

Lecture—2 hours; laboratory—9 hours. Prerequisite: course 110B. Advanced treatment of systemic physiology, with special emphasis on current developments; laboratory exercises illustrating modern physiological concepts and procedures. Mr. Horowitz

***214. Neurophysiology. (4) II.**

Lecture—4 hours. Prerequisite: courses 110B, 111B; course 210B recommended. Electrical activity of neurons and neuroeffector junctions; physiology of the nervous system as studied by its electrical activity. Offered in odd-numbered years. Mr. Wagman

***215. Neurophysiology Laboratory. (6) II.**

Discussion—2 hours; laboratory—12 hours. Prerequisite: course 214 (may be taken concurrently). Offered in odd-numbered years. Mr. Wagman

216. Neurophysiology Literature. (2) III.

Discussion—2 hours. Prerequisite: course 214. Critical reading and group discussion of current and classic original papers in neurophysiology. Mr. Wagman

220. General and Comparative Physiology of Reproduction. (3) I.

Lecture—3 hours. Prerequisite: course 110B; Biochemistry 101B; Genetics 100B. Basic phenomena of sexual and asexual reproduction and comparisons of processes in a wide variety of animals: gamete formation, structure, and metabolism; fertilization; neuroendocrine mechanisms in maturation and reproductive cycles; behavioral aspects. Mr. Ogasawara, Mr. Cupps

225. Physiology of Lactation. (3) III.

Lecture—3 hours. Prerequisite: course 110B; Biochemistry 101B. The physiology and biochemistry of milk formation, with special reference to the metabolic pathways leading to the synthesis of milk in various species of mammals. Offered in even-numbered years. Mr. Baldwin

231. Selected Topics in Neuroendocrinology. (2) II.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 130; or consent of instructor. Neural endocrine interactions; neuro-secretion; neural regulation of endocrine systems; hormonal modifications of neural development and activity. May be repeated once for credit. Offered in even-numbered years. Mrs. Woolley

242. Physiological Rhythmicity. (1) I.

Lecture—1 hour. General aspects and basic mechanisms of biological rhythms; the importance of rhythm desynchronization in areas of pharmacology and space medicine; telemetry; mathematical methods; chronometry; tidal, lunar, and annual periods; periodic desynchronization. Mr. Winget

290. Seminar. (1) I, II, III.

Seminar—1 hour. Discussion and critical evaluation of advanced topics and current trends in research. (S/U grading only.)

The Staff (Chairman in charge)

291. Seminar in General Physiology. (1) III.

Seminar—1 hour. Discussion of selected topics concerning the physical and chemical processes of cells and tissues.

The Staff (Chairman in charge)

297T. Tutoring in Physiology. (2) I, II.

Discussion—1 hour; tutorial—2 hours. Prerequisite: courses 110A-110B (with a grade of A), or course 210A-210B (may be taken concurrently), and consent of instructor. Advanced study of systemic physiology by preparation to lead small discussion groups in course 110A-110B (students are held for lecture material and specified modules of self-study in course 110A-110B). May be repeated for credit.

The Staff (Chairman in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-12) I, II, III.

The Staff (Chairman in charge)

PLANT PATHOLOGY

Related Undergraduate Majors and Graduate Study. See pages 84, 98, and 182.

Questions pertaining to the following courses

NOTE: For key to footnote symbols, see page 191.

should be directed to the instructor or the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Upper Division Courses

120. Introduction to Plant Pathology. (4) I, III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2; Bacteriology 2 recommended. The nature, cause, and control of plant diseases. I. Mr. Campbell; III. Mr. English

125. Diagnosis and Control of Plant Diseases. (4) III.

Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 120. Clinical plant pathology with emphasis on diagnosis, epidemiology, and control of diseases of economic plants. Students may specialize in diseases of fruits, vegetables, field crops, or ornamentals in the laboratory exercises. Mr. Nyland

199. Special Study for Advanced Undergraduates.

(1–5) I, II, III.

The Staff (Mr. Grogan in charge)

Graduate Courses

206A–206B. Diseases of Crop Plants. (5–4)

III—(Extra Session—Summer).

Lecture—3–1 hours; laboratory—6–9 hours. Prerequisite: course 120; Botany 119. A clinical study of plant diseases with emphasis on etiology, epidemiology, diagnosis, and control. (Deferred grading only, pending completion of sequence.) The Staff (Mr. Ogawa in charge)

208. Ecology of Plant Pathogens and Epidemiology of Plant Disease. (3) I.

Lecture—3 hours. Prerequisite: course 120 or equivalent. Interaction between higher plants, plant pathogens, and the environment which is important in the occurrence and severity of plant disease. Emphasis is placed on the population dynamics and ecology of plant pathogens in the aerial and soil environment. Mr. Duniway

210A–210B. Physiology and Biochemistry of Plant Pathogens and Diseases. (3–3) I–II.

Lecture—3 hours. Prerequisite: Biochemistry 101B or equivalent. Study of the fundamental concepts and current information on the physiology and biochemistry of plant pathogens and host-parasite relationships.

I. Mr. DeVay; II. Mr. Kosuge

215. Genetics of Plant Pathogens. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 120; Genetics 100B; Botany 119. Study of fundamental concepts, research techniques and current information on the genetics of plant pathogenic microorganisms; origin and determination of physiologic specialization, host resistance and virulence in the pathogen as related to the host-parasite interaction. Special emphasis on the fungi. Mr. Webster

224. Pathogenic Fungi. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: Botany 119. Morphology and taxonomy of plant pathogenic fungi. Mr. Butler

226. Plant Virology. (5) II.

Lecture—2 hours; laboratory—9 hours. Prerequisite: consent of instructor. Viruses as causal agents of plant diseases; chemical and physical properties of viruses; methods of transmission; procedures for assay and diagnosis; multiplication of viruses; pathological cytology and anatomy; application of equipment and techniques used in research. Mr. Shalla, Mr. Shepherd

228. Plant Bacteriology. (5) III.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 120; Bacteriology 2 or equivalent; Biochemistry 101A, 101B. Study of plant diseases caused by bacteria. Fundamentals on the mechanisms of disease development and the biology of plant bacteria. Mr. Kado

230. Advanced Plant Virology. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 226; Biochemistry 101B, 101L. Advanced study for research specialists in plant virology with emphasis on the physical-chemical nature of virus components and their role in the biology of viruses. Mr. Shepherd

235. Advanced Plant Pathology. (4) I.

Lecture—3 hours; discussion—3 hours. Prerequisite: consent of instructor. A study of the factors influencing pathogenicity and of the reaction of host plants to disease. Mr. Grogan

290. Seminar. (1) I, II, III.

Seminar—1 hour. (S/U grading only.)

I. Mr. English; II. Mr. Ogawa;
III. Mr. Grogan**291. Seminar in Host-Parasite Physiology. (1) I, II.**

Seminar—1 hour. Prerequisite: course 120. (S/U grading only.) I. Mr. Kado; II. Mr. DeVay

292. Seminar in Plant Virology. (1) II, III.

Seminar—1 hour. Prerequisite: course 226. Review and evaluation of current literature and research in virology. (S/U grading only.)

II. Mr. Shepherd; III. Mr. Shalla

295. Seminar in Mycology. (1) I, III.

Seminar—1 hour. Review and evaluation of current literature and research in mycology. (S/U grading only. Same course as Botany 295.)

I. Mr. Butler; III. Mr. Wells

298. Special Group Study. (1–4) I, II, III.

The Staff (Mr. Grogan in charge)

299. Research. (1–9) I, II, III.

(S/U grading only.)

The Staff (Mr. Grogan in charge)

PLANT PHYSIOLOGY (A Graduate Group)

Roger J. Romani, Ph.D., *Chairman of the Group*

Group Office, 2039 Wickson Hall

Graduate Courses

298. Group Study. (1-5) I, II, III.

Prerequisite: graduate standing. Organized

group study and discussion of topics relevant to the professional field of Plant Physiology.

The Staff (Mr. Romani in charge)

299. Research. (1-6) I, II, III.

Prerequisite: graduate standing.

The Staff (Mr. Romani in charge)

PLANT SCIENCE

Major Advisers.—See *Class Schedule* listing.
Major Program.—See page 98.

Related Courses. See *Agronomy and Range Science, Environmental Horticulture, Plant Pathology, Pomology, Vegetable Crops, Viticulture and Enology.*

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

1. Plants and Man. (3) I, II.

Lecture—3 hours. Plants as a basic resource for food, fiber, shelter, and recreation; their use and effect on man, past, present, and future.

Mr. Howard

2. Production of Cultivated Plants. (4) I, III.

Lecture—1 hour; discussion—1 hour; laboratory—3 hours; V.A.S.T.—2½ hours.

Principles of plant production, improvement, propagation, harvesting, preserving, processing and marketing. Course will proceed by the Video-Audio-Self-Tutorial method with students making use of the learning facilities at their own convenience.

Mr. Flocker, Mr. Lider

49. A Field Study of Agricultural Methods.

(2) I, III.

Lecture—1 hour; five alternate Saturday field trips—8 hours each. Inspection of various agricultural operations, such as rice culture, vegetable production, nursery production, grape production, almond production, forest production, etc. (P/NP grading only.)

Mr. Flocker, Mr. Lider

98. Directed Group Study. (1-5) I, II, III.

Group study of selected topics. Restricted to lower division students.

The Staff (Mr. Brown in charge)

Upper Division Courses

101. Ecology of Crop Systems. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Ecological processes governing the structure and behavior of managed ecosystems. Emphasis on

competition, adaptation, photosynthetic production and relations to radiant energy, nutrition, water and temperature and their control in crop production.

Mr. Loomis, Mr. Rains

102. Physiology of Cultivated Plants. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. The plant as a dynamic unit; physiological processes in the vegetative growth, development, flowering and fruiting of cultivated plants.

Mr. Sachs, Mr. Rappaport

109. Principles of Plant Propagation. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 2 or Botany 2; or consent of instructor. Principles and practices of propagating horticultural plants with emphasis on anatomical and physiological relationships.

Mr. Hartmann

112. Postharvest Physiology and Handling of Horticultural Commodities. (3) I.

Lecture—3 hours. Prerequisite: Botany 111B or consent of instructor. Course 112L is recommended to be taken concurrently. Physiological processes related to the maturation and senescence of fruits and vegetables; fundamentals involved in handling, transportation, storage, and marketing practices, e.g., temperature and humidity control, protective treatments, controlled atmospheres.

Messrs. Morris, Maxie, Nelson

112L. Postharvest Physiology and Handling Laboratory. (2) I.

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 112 (may be taken concurrently). Demonstrations and exercises following the subject matter of course 112. One or more field trips to observe commercial practices.

Messrs. Morris, Maxie, Nelson

113. Plant Breeding. (3) II.

Lecture—3 hours. Prerequisite: Genetics 100B. The principles of plant breeding.

Mr. Knowles, Mr. Hansche

NOTE: For key to footnote symbols, see page 191.

120. Introduction to Weed Science. (2) II.

Lecture—2 hours. Prerequisite: Botany 2; Chemistry 8B. A general course covering the principles underlying the control of weeds.

Mr. Ashton

190. Proseminar in Plant Science. (1) III.

Seminar—1 hour. Prerequisite: senior standing in Plant Science or consent of instructor. Reports and discussion of current developments

POLITICAL SCIENCE

Edmond Costantini, Ph.D., *Chairman of the Department*
Department Office, 228 Voorhies Hall

Professors:

Richard W. Gable, Ph.D.
Alexander J. Groth, Ph.D.
Charles M. Hardin, Ph.D.
Clyde E. Jacobs, Ph.D.
Lloyd D. Musolf, Ph.D.
John R. Owens, Ph.D.
Donald S. Rothchild, Ph.D.
Marvin Zetterbaum, Ph.D.
Paul E. Zinner, Ph.D.

Associate Professors:

Edmond Costantini, Ph.D.
Joyce K. Kallgren, Ph.D.
Robert J. Lieber, Ph.D.
Alvin D. Sokolow, Ph.D.
Larry L. Wade, Ph.D.

Assistant Professors:

Kenneth I. Hanf, Ph.D.
Alan M. Jones, Jr., Ph.D.
Larry I. Peterman, Ph.D.
Randolph M. Siverson, Ph.D.
William S. Tuohy, Ph.D.
Geoffrey A. Wandesforde-Smith, Ph.D.

Lecturers:

Shahrough Akhavi, Ph.D.
Adaljiza S. Riddell, M.A.

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Departmental Major Advisers.—Consult Departmental Office.

Graduate Adviser.—Consult departmental office.

The American History and Institutions Requirement may be satisfied by any one of the following courses: 1, 5, 5D, 100, 101, 102, 103, 104, 105, 106, 109A, 109B, 113, 127, 128, 160, 163. (See also page 38.)

The Political Science Major Program.

Lower Division Courses.—Required: choose three from courses 1, 2 or 2D, 3 or 3D, 4 or 4D, 5 or 5D, and two from History 4A, 4B, 4C.

in plant science and crop production. (P/NP grading only.) The Staff (Mr. Howard in charge)

Graduate Course**216. Principles of Plant Nutrition. (5) III.**

Lecture—3 hours; laboratory—6 hours. Prerequisite: Botany 111A or equivalent. Evolution and scope of plant nutrition; essential and other elements; mechanisms of absorption and translocation; mineral metabolism; deficiencies and toxicities; genetic and ecological aspects of plant nutrition.

Mr. Epstein

Upper Division Courses.—Required: 36 units in Political Science with a minimum of two courses in each of three fields, which must be selected from at least two of the following groups.

Group A. Political theory (courses 110–119).

Group B. American government (courses 100–109B); political parties (courses 160–169); public law (courses 150–159); public administration (courses 180–189).

Group C. Comparative government (courses 140–149, 170–179); international relations (courses 120–139).

Political Science students *must* maintain at least a grade C average in the major.

The Political Science/Public Service Major Program

Lower Division Courses.—Required: 12 units in Political Science courses including one course from 1, 5, and 5D and two from 2 or 2D, 3 or 3D, and 4 or 4D.

Upper Division Courses.—Required: 48 units in Political Science courses and/or related fields, including a (a) core program, (b) internship in Public Affairs, and (c) fields of concentration.

a) Core Program (8 units). Choose one course from 100, 101, 102, and 104 and one from 109A, 180, and 182.

b) Internship (12 units). Political Science 190A, 190B, and 190C, preferably taken in consecutive quarters. Students should apply for an internship shortly before the beginning of the quarter in which they expect to begin this part of the program, and preferably at the end of the junior year or beginning of the senior year. Courses 190A and 190B are the internship seminars, while 190C is a paper-writing seminar based on the internship experience. Grading in the 190 series is on a P/NP basis only.

c) Fields of Concentration (28 units with at least 20 in Political Science courses). The seven courses are distributed so that they

are taken in two or three of the following fields, with a minimum of two courses in each field (core courses cannot be counted toward fields of concentration):

1. Politics (courses 103, 104, 105, 106, 109A-109B, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 178)
2. Administration (courses 156, 180, 181, 182, 183, 185A-185B, 186, 187)
3. Urban Affairs (courses 100, 101, 102; Economics 125A-125B; Environmental Planning and Management 110; Environmental Studies 160, 162)
4. Environmental Quality Control (courses 107, 108; Economics 123; Environmental Studies 102, 112, 166, 168, 170)
5. Public/Pre-Law (courses 151, 152, 156, 157A-157B, 159)

Graduate Study.—The Department offers programs of graduate study leading to the M.A. and Ph.D. degrees. Information concerning admission to these programs and requirements for completion is available in the department office.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Thirty units of political science to be selected in consultation with the subject representative.

Subject Representative: Mr. Jones

Lower Division Courses

1. American National Government. (4) II.

Lecture—3 hours; discussion—1 hour. Survey of American National Government, including the constitutional system, political culture, parties, elections, the Presidency, Congress, and the courts. The Staff

2. Introduction to Comparative Politics. (4) II, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 2D. Introduction to basic concepts in political analysis and application of them in comparative studies of selected countries. Coverage is given to cultural and other informal dimensions of politics as well as to more formal political and governmental structures. The Staff

2D. Seminar in Comparative Politics. (4) I.

Seminar—2 hours; seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 2. Introduction to basic concepts in political analysis and application of them in comparative studies of selected countries. Individual or team research projects will be re-

quired and constitute a major part of the course. The Staff

3. International Relations. (4) I, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 3D. International conflict and cooperation, including the Cold War, nuclear weapons, and new techniques for understanding international politics. Mr. Siverson, Mr. Lieber

3D. Seminar in International Relations. (4) II.

Seminar—2 hours; seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 3. Selected problems in International Relations. Individual or team research projects will be required. The Staff

4. Basic Concepts in Political Theory. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 4D. Analysis of such concepts as the individual, community, liberty, equality, justice, and natural law as developed in the works of the major political philosophers. Mr. Peterman, Mr. Zetterbaum

***4D. Seminar in Basic Concepts of Political Theory. (4) III.**

Seminar—2 hours; seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 4. Analysis of such concepts as the individual, community, liberty, equality, justice, and natural law as developed in the works of major political philosophers. Individual or group research projects will be required. Mr. Peterman, Mr. Zetterbaum

5. Contemporary Problems of the American Political Systems. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 5D. In depth treatment of selected problems and issues of American politics, governmental institutions, and policies. The Staff

5D. Seminar in Contemporary Problems of the American Political Systems. (4) II.

Seminar—2 hours; seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 5. In depth treatment of selected problems and issues of American politics, governmental institutions, and policies. Individual or group research projects will be required. The Staff

NOTE: For key to footnote symbols, see page 191.

9C. Introduction to Contemporary Problems of Asia. (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: History 9B highly recommended. Introduction to modern dilemmas, such as imperialism and nationalism, population demands versus economic development, national liberation and Marxism, as reflected in Asia.

Mrs. Kallgren

Upper Division Courses**100. Local Government and Politics. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. The politics and government of local communities in the United States, including cities, counties, and special districts. The expression and resolution of political conflict in communities, local government structure and functions, municipal reform, and community power structures.

Mr. Sokolow

101. Urban Political Economy. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or consent of instructor. Historical development of urban political economies. Focuses on ways in which different groups have tried to use local government authority to achieve their objectives and why they succeeded or failed.

102. Urban Public Policy. (4) III.

Lecture—4 hours. Political and economic relationships among central cities, suburbs, and regional, state, and federal governments. Focuses upon policy areas such as poverty, transportation, welfare, and housing, and upon who governs and who benefits from the policies in these areas.

103. Comparative State Government and Politics. (4) III.

Lecture—3 hours; discussion—1 hour. The comparative study of the government and politics of American states, including their constitutional frameworks, their participation in the federal system, the dynamics of governmental institutions, and the behavior of parties and interest groups.

Mr. Sokolow

104. California State and Local Government. (4) II.

Lecture-discussion—4 hours. California's constitution, party system, legislature, executive agencies, administration, courts, major public programs and problems, state-local relations, county, city, school and special district governments.

***105. The Legislative Process. (4) I.**

Lecture—3 hours; discussion—1 hour. An analysis of the legislative process with emphasis on the United States Congress; legislative organization and procedures, legislative leadership

and policy making, legislators and constituents, relations between Congress and other agencies.

Mr. Owens

106. The Presidency. (4) II.

Lecture—3 hours; discussion—1 hour; optional term paper. The American presidency's origins and development; presidential power and influence as manifest in relationships with Congress, courts, parties, and the public in the formulation and administration of foreign and domestic policy; nominations, campaigns, and elections.

Mr. Hardin

107. Environmental Politics and Administration. (4) II.

Lecture—3 hours; discussion—1 hour. Introduction to the environment as a political issue in the United States and to the development of administrative mechanisms for handling environmental problems. Changing role of Congress, the presidency, the bureaucracy, and the courts in environmental policy formulation and implementation.

Mr. Wandesforde-Smith

108. Agricultural Policy and Politics. (4) III.

Lecture—3 hours; discussion—1 hour. Examination of the significance of agriculture in American politics. Analysis and interpretation of agricultural policy, including but not limited to price support-production control, environmental impact, farm labor, and relationship to foreign economic policy.

Mr. Hardin

109A. Public Policy and the Governmental Process. (4) II.

Lecture—3 hours; term paper. Prerequisite: course 5 (or 1A or 1B) or consent of instructor. Examination of the processes of formulating public policy. Methods of policy making by executive, legislative, judicial, interest groups, and parties with special emphasis upon socio-psychological approaches.

Mr. Wade

109B. Public Policy and the Governmental Process. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 5, 109A, or consent of instructor. Examination of the processes of formulating public policy. Methods of policy making through collective decision-making exchange, competition, bargaining, coalition-formation and the provision of public goods, resource transfers and social change.

Mr. Wade

***110. Contemporary Political Science. (4) II.**

Lecture-discussion—4 hours. History, nature, and methodology of the discipline; the problems, schools of thought, and trends within the field at present. Offered in even-numbered years.

111. Systematic Political Science. (4) III.

Lecture-discussion—4 hours. Philosophical basis of modern political science; major specific

approaches; selected concepts relevant to modern political concerns; and research design and execution.
Mr. Siverson

***112. Contemporary Democratic Theory. (4) II.**

Lecture—3 hours; discussion—1 hour. The major contemporary attempts to reformulate traditional democratic theory; attempts to replace traditional theory by conceptual models derived from modern social science findings. Offered in odd-numbered years. Mr. Zetterbaum

***113. American Political Thought. (4) III.**

Lecture—4 hours. Origins and nature of American political thought. The principles of American thought as they emerge from the founding period to the present. Offered in odd-numbered years. Mr. Peterman

115. Medieval Political Thought. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 118A. Offered in even-numbered years. Mr. Peterman

***116. Foundations of Political Thought: A Study in Depth of a Major Political Philosopher. (4) II.**

Lecture-discussion—3 hours; term paper. Intensive analysis and evaluation of the seminal works of a major political philosopher.

Mr. Peterman, Mr. Zetterbaum

***117. Marxism. (4) II.**

Lecture—3 hours; discussion—1 hour. Examination of the political and social philosophy of Karl Marx, with reference to the evolution of Marxism in the nineteenth and twentieth centuries.
The Staff

***118A. History of Political Theory. (4) I.**

Lecture—3 hours. Critical analyses of the works of major political philosophers. Classical and medieval political philosophy—Plato, Aristotle, Cicero, St. Thomas. Mr. Peterman

118B. History of Political Theory. (4) II.

Lecture—3 hours; special assignments. Critical analyses of the works of major political philosophers. Modern political philosophy—Machiavelli, Hobbes, Locke, Rousseau, Burke.
Mr. Zetterbaum

118C. History of Political Theory. (4) III.

Lecture—3 hours; term paper. Critical analyses of the works of major political philosophers. Nineteenth and twentieth centuries: Hegel, Tocqueville, Mill, Marx, Nietzsche, Sartre.
Mr. Zetterbaum

***119. Modern Political Thought. (4) III.**

Lecture-discussion—4 hours. The search for community from Marx to the present. Communism, fascism, capitalism, socialism, irrationalism, immoralism, and existentialism as re-

sponses to the decline of liberalism and the nature of modern problems. Offered in odd-numbered years.

121. War. (4) I.

Lecture—3 hours; discussion—1 hour. Recommended: course 3. An analysis of political processes involved in the initiation, conduct, and termination of modern international warfare.
Mr. Siverson

122. International Law. (4) III.

Lecture—4 hours. Selected topics in international law: territory, sovereign immunity, responsibility, the peaceful settlement or non-settlement of international disputes. Mr. Jacobs

123. Theories of International Politics. (4) II.

Lecture—4 hours. Major contemporary approaches to the study of international politics, including balance of power, game theory, Marxist-Leninist theory, systems theory, and decision-making analysis.
Mr. Lieber

***124. International Organization. (4) I.**

Lecture—3 hours; discussion—1 hour. The preservation of world peace through collective security arrangements. Analysis of the conditions under which international organizations can or cannot preserve peace, through examination of the record of the United Nations, League of Nations, and more restricted security organizations.
Mr. Jones

***125. National Security Policy. (4) II.**

Lecture—3 hours; research assignment. The development of American military policy since 1945. An analysis of the policy of deterrence and the assumptions upon which it is based. Effects of nuclear weapons upon the conduct of war, alliance systems, and the international system. The prospects of security and stability through arms control.
Mr. Siverson

126. Arms Control and Disarmament. (4) III.

Lecture—3 hours; discussion—1 hour. Recommended: course 3. Examination of the proposals, problems, and achievements of various efforts to limit the magnitude, type, possession and use of major weapons systems in the period since World War II.
Mr. Jones

127. Recent American Foreign Policy. (4) I.

Lecture—3 hours; discussion—1 hour. Development of American foreign policy in the twentieth century, with emphasis on the transformation of policy during and after World War II. Examination of the internal and international factors influencing policy adoption, retention, and change.
Mr. Jones

NOTE: For key to footnote symbols, see page 191.

128. Conduct of American Foreign Policy. (4) II.

Lecture—3 hours; discussion—1 hour. Examination of roles of individuals and organizations, in the process of U. S. foreign-policy formulation since World War II, relying extensively on case studies and memoirs to illuminate the nature of intra-governmental debate on policy.

Mr. Jones

129. Special Studies in International Relations. (4) I, II, III.

Lecture—3 hours; discussion—1 hour. An intensive examination of one or more special problems in International Relations.

The Staff

***131. Soviet Foreign Policy. (4) III.**

Lecture—3 hours; discussion—1 hour. The conduct of Soviet foreign relations in contemporary world affairs; ideology and power as mainsprings of policy; foreign policy as an instrument of revolution; the role of diplomacy, economic aid and nuclear armaments. Offered in odd-numbered years.

Mr. Zinner

132. The Role of the United States in the Far East. (4) I.

Lecture—4 hours. Recommended: course 3. Survey of the role the United States has played in the Far East through an examination of such topics as America's participation in Asiatic westernization, United States Far Eastern policy, Oriental attitudes toward the United States. An evaluation of present problems. Offered in odd-numbered years.

Mrs. Kallgren

***134. International Relations in Africa. (4) III.**

Lecture—3 hours; discussion—1 hour. Inter-African state relations, pan-Africanism, regional integration, policies toward South Africa, and relations between African and major non-African powers.

Mr. Rothchild

***137. Nationalism and Imperialism. (4) III.**

Lecture—4 hours. Recommended: course 3. The theory of nation building illustrated by Western and non-Western experience. Offered in even-numbered years.

Mrs. Kallgren

***138. Colonialism, Neocolonialism and Nationalism in Africa. (4) I.**

Lecture—4 hours. Analysis of colonial penetration; European political, social, economic, and administrative impact on African societies; the rise of African nationalism; and the continuing effect of the colonial relationship upon present-day Euro-African contacts. Mr. Rothchild

139. International Relations in Western Europe. (4) III.

Lecture—4 hours. Study of the emerging unity in Western Europe and its implications for the North Atlantic area. Offered in even-numbered years.

Mr. Lieber

140A. Comparative Politics: Ideology, Institutions and Political Process in the Modern State. (4) III.

Lecture—3 hours. Prerequisite: consent of instructor. Ideological orientations of democratic, socialist, communist, fascist, and other states as related to their institutions and political processes.

Mr. Groth

***140B. Comparative Politics: Political Systems and Public Policies. (4) II.**

Seminar—3 hours; special assignments. Prerequisite: course 140A or consent of instructor. Critical evaluation of the linkage between the framework and process of policy-making on the one hand, and the actual results of this process on the other; a comparative, cross-national perspective will be employed.

Mr. Groth

141. Communist Political Systems. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or 2D or consent of instructor. Systematic comparative analysis of the origin, structure and performance of communist political systems with emphasis on the Soviet Union and the states of Eastern Europe.

Mr. Zinner

142. Revolution and Political Change. (4) I.

Lecture—4 hours. The attributes, problems, means, and impact of political change through evolution and revolution in the twentieth century. Emphasis upon movements and systems representative of communism, fascism, and nationalism.

Mr. Groth

143. Latin American Politics. (4) I.

Lecture—4 hours. Survey of major issues in government and politics, with emphasis upon participation structures and decision making processes. Four nations receive intensive study: Mexico, Cuba, Chile, and Brazil.

Mr. Tuohy

***144. British Government and Politics. (4) II.**

Lecture—3 hours; discussion—1 hour. The British political system, party and pressure group politics, political culture, evolution of the British Commonwealth. Offered in odd-numbered years.

Mr. Lieber

***145. Government and Politics in Emergent Nations. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or 2D. Conceptual study of problems of political organization and procedure in the context of rapid change engendered by social revolution in "emergent countries" and liberation from colonial oppression. Offered in even-numbered years.

Mr. Zinner

146. Contemporary African Politics. (4) II.

Lecture—4 hours. Analysis of party systems, military coups, bureaucracy, regional integra-

tion, and disintegration, and economic development in Africa south of the Sahara. Mr. Rothchild

***147A. Western European Governments: France and Italy. (4) I.**

Lecture—4 hours. The evolution and contemporary nature of French and Italian political institutions. Mr. Groth

147B. Western European Government: Germany. (4) II.

Lecture—4 hours. Comparative study of the politics and institutions of constitutional and totalitarian government in Germany since 1930. Current problems of a divided Germany. Mr. Hanf

148A. Government and Politics in East Asia. (4) I.

Lecture—4 hours. The structure and evolution of political institutions in China, Japan, and Korea. Emphasis upon such topics as nationalism, political modernization, and ideology up to World War II. Mrs. Kallgren

148B. Government and Politics in East Asia. (4) II.

Lecture—4 hours. The structure and evolution of political institutions in China, Japan, and Korea since World War II, with emphasis upon political modernization, ideology, and nationalism. Mrs. Kallgren

149. International Communism. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 2 or 2D, or 3 or 3D, or consent of instructor. The international communist movement: ideology, organization, strategy. Relations among communist parties; problems of leadership and social composition; the Sino-Soviet conflict and its effects on revolutionary struggle. Offered in even-numbered years. Mr. Zinner

***150. Jurisprudence. (4) II.**

Lecture—4 hours. An analysis of the nature and functions of law. Particular attention will be directed to law as an instrument of social control and the relationship between law and morality. Offered in even-numbered years.

151. Civil Rights and the Constitution. (4) I.

Lecture—4 hours. Prerequisite: course 5 or 5D or consent of instructor. The constitutional rights of political possibilities of minority groups. Citizenship in the American federal system. Offered in even-numbered years.

152. The Politics of Justice. (4) III.

Lecture—3 hours; discussion—1 hour. Criminal and civil justice in America with emphasis upon such problems as legal representation for the poor, control of law enforcement processes, and problems in imprisonment and rehabilitation.

156. Administrative Law. (4) I.

Lecture—1 hour; discussion—3 hours. The political-legal factors in the decision-making processes of administrative legislation, adjudication and discretion; legal controls as an aspect of administrative responsibility; relationship of substance and procedure in regulatory action. Mr. Musolf

157A. American Constitutional Law. (4) I.

Lecture—1 hour; discussion—3 hours. Prerequisite: courses 5 or 5D; or consent of instructor. Judicial review, jurisdiction of the federal courts, interstate and foreign commerce, and taxation. Mr. Jacobs

157B. American Constitutional Law. (5) II.

Lecture—1 hour; discussion—3 hours. Prerequisite: course 157A. The Bill of Rights of the Federal Constitution. Students, either individually or in teams of two members, prepare a written argument in a hypothetical case raising current constitutional issues. In lieu of a standard final examination, an oral defense of his written argument is presented by each student. Mr. Jacobs

158. American Legal Thought and Institutions. (4) II.

Lecture—4 hours. Prerequisite: course 5 or 5D or consent of instructor. Topics in the development of American legal thought and institutions: reception of the common law; church-state controversies; the role of judge and jury; federalism and individual rights; natural law and economic regulation; law and the frontier. Offered in odd-numbered years.

***159. Judicial Behavior. (4) II.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or 5D or consent of instructor. Analysis of the behavior of judges and courts in the political process. Techniques of judicial decision-making. Relationships among courts and other decision-making bodies. Offered in even-numbered years.

160. American Political Parties. (4) II.

Lecture—3 hours; discussion—1 hour. Analysis of the structure and operations of the party system in the United States; party functions and organizations, nomination processes, campaigns and elections, party trends and reforms. Mr. Owens

***161. Comparative Political Parties. (4) III.**

Lecture—3 hours; discussion—1 hour. Organization, operation, governmental function and social bases of political parties especially in Great Britain and France but with some reference to other Western European countries. Mr. Hardin

162. Elections and Voting Behavior. (4) III.

Lecture—3 hours; discussion—1 hour. Recommended: course I. Analysis of American elections and partisan behavior; political socialization, political participation, partisanship and individual and group determinants of voting.

Mr. Owens

163. Group Politics. (4) I.

Lecture—3 hours; discussion—1 hour. Groups, institutions, and individuals, especially in American politics. Historical and analytical treatment of group theories as applied to interest groups (especially labor, business, agriculture, science, military); to racial, ethnic, and sectional groups; to parties, public and legislative groups, bureaucracies.

Mr. Hardin

164. Public Opinion. (4) II.

Lecture—3 hours; discussion—1 hour. The nature of public opinion in America, as it is "supposed to be" and as it is. The distribution of opinions among different publics. Apathy, extremism, and conformity. How children learn about politics.

Mr. Costantini

165. Mass Media and Politics. (4) III.

Lecture—3 hours; discussion—1 hour. The organization of and decision making within the media; media audiences and the effect of the media on attitudes and behavior; the relationship of the government to the media (censorship, secrecy, freedom of the press, government regulation); the media in election campaigns.

Mr. Costantini

***166. Women in Politics. (4) III.**

Lecture—3 hours; discussion—1 hour or seminar—1 hour. The role of women in American politics. Historical experiences; contemporary organizations and strategies; areas of legislative concern; the impact of differences in social class, race, and ethnicity upon the involvement of women in politics.

Mrs. Riddell

***167. The Black Man in American Politics. (4) III.**

Lecture—3 hours; discussion—1 hour. Prerequisite: junior, senior or graduate status. A critical review of the role of the black man in American politics; the rise of the black politician in the South; his role in the civil rights revolution; campaign techniques in the urban ghetto.

168. Chicano Politics. (4) I.

Lecture—3 hours; discussion—1 hour. Political aspects of Chicano life in America; examines the Chicano's political role as it has been historically defined by different groups in society and the Chicano's responses to his political environment.

Mrs. Riddell

169. Special Studies in Politics. (4) I, II, III.

Seminar—4 hours. Prerequisite: consent of instructor and upper division standing. Intensive examination of one or more special problems appropriate to American politics. The Staff

***170. Comparative Interethnic Relations. (4) II.**

Seminar—3 hours; term paper. Prerequisite: consent of instructor. Seminar on interethnic relations which compares and contrasts interactions between racial, linguistic, cultural, religious or regional groups. Intergroup cleavages and conflicts as well as processes and institutions fostering interaction are analyzed in comparative perspective.

Mr. Rothchild

***171. Politics Through the Novel. (4) I.**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or its equivalent or consent of instructor. A comparative analysis of the use of literature as a means of sociopolitical expression, perception, and portrayal of purposes in political action. European literature, especially British, French and Italian, from the Napoleonic to the present time.

***172. Politics and Processes of Foreign Aid. (4) I.**

Lecture—3 hours; discussion—1 hour. Comparative analysis of multilateral and bilateral assistance to developing nations; perspectives of donor and recipients; politics, types, and instruments of aid.

Mr. Gable

173. Modern Dictatorships. (4) I.

Lecture—4 hours. Selected political processes and institutions of dictatorships in Germany, Italy, Russia, Spain, Japan, and other states. Topics include executives, legislatures, parties, courts, bureaucracies, communication, and public opinion with comparisons to U. S. processes.

Mr. Groth

174. Political Thinking and Consciousness. (4) I, III.

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. How and why people think about phenomena as political, and what society does in order to shape that thinking and make "good citizens." The emphasis is on how social conditions influence political thinking and behavior; cases will be taken from the politics of minority groups, American youth, radical groups, attempts at achieving cultural revolutions.

Mr. Tuohy

***175. Government and the Economy. (4) I.**

Lecture—3 hours; discussion—1 hour. The legal and political environment of economic controls; types and techniques of regulating and assisting various sectors of the economy; policy alternatives and administrative processes; the search for the public interest.

Mr. Gable

176. Political Development in Modernizing Societies. (4) III.

Lecture—1 hour; discussion—3 hours. Nature and sequence of political development; its economic and social concomitants; role of elites, military, bureaucracy, and party systems; social stratification and group politics; social mobilization and political participation; instability, violence, and the politics of integration.

Mr. Gable

***178. Community Power and Change. (4) II.**

Lecture—3 hours; discussion—1 hour. Examination of the relationships between general community characteristics, the distribution of political power, and policy outputs in the United States. Alternative models of community political change are presented. Offered in odd-numbered years. Mrs. Riddell

179. Special Studies in Comparative Politics. (4)

I, II, III.

Seminar—4 hours. Prerequisite: consent of instructor and upper division standing. Intensive examination of one or more special problems appropriate to comparative politics. The Staff

180. Bureaucracy in Modern Society. (4) I.

Lecture—3 hours; special assignments. Role of bureaucracy in a complex society, with emphasis upon changing relationships between government and the economy; consequences of rapid technological and social change for bureaucratic structures and processes; the problems of reconciling expertise and democracy and increasing the responsiveness of public bureaucracy.

181. The American Administrative System. (4) II.

Lecture—3 hours; research assignment. Introduction to the development and organization of administrative institutions in the American federal system; focus on design and reorganization, and the relationship of structure to performance, at the national, subnational, and local levels. Mr. Hanf

***182. Administrative Decision Making and Public Policy. (4) II.**

Lecture—3 hours; special assignments. Approaches to and models of administrative decision making; techniques of substantive policy analysis; problems and developments in planning, budgeting, personnel, and administrative reform.

183. Administrative Behavior. (4) II.

Lecture—3 hours; discussion—1 hour. The implications for American public administration of evolving concepts about behavior in organizations. Mr. Musolf

185A. Comparative Administration: Developing Nations. (4) II.

Lecture—2 hours; discussion—2 hours. Theories and models of comparison; the setting of administrative systems; structure and functioning of administrative systems in newly developing nations; role of bureaucracy in social development and nation-building; foreign assistance to administrative development. Mr. Gable

***185B. Comparative Administration: Developed Nations. (4) III.**

Lecture—3 hours; research assignment. Analysis of the role of public bureaucracy in Communist and non-Communist political systems. Mr. Hanf

***186. Urban Administration. (4) III.**

Lecture—3 hours; discussion—1 hour. Role of the professional administrator in the urban political and social environment; application of modern management concepts to urban governmental organizations; and examination of persistent and emerging problems and issues.

187. Administrative Theory. (4) III.

Lecture—3 hours; discussion—1 hour. Historical and critical analysis of the principal theories of organization and management of public agencies in the light of such concepts as decision making, bureaucracy, authority and power, communication and control; an examination of the role of government bureaucracies in the total society. Mr. Hanf

190A. Internship in Public Affairs. (4) I, II, III.

Prerequisite: enrollment dependent on availability of intern positions, with priority to students with Political Science—Public Service major. Supervised internship and study in political, governmental, or related organizations. (P/NP grading only.) The Staff

190B. Internship in Public Affairs. (4) I, II, III.

Prerequisite: enrollment dependent on availability of intern positions, with priority to students with Political Science/Public Service major. Supervised internship and study in political, governmental, or related organizations. Not to be taken concurrently with 190A. (P/NP grading only.) The Staff

190C. Internship in Public Affairs. (4) I, II, III.

Prerequisite: required of and open only to students with Political Science/Public Service major; courses 190A and 190B (may be taken concurrently). Supervised internship and study in political, governmental, or related organizations. Extensive paper relating internship to course work. (P/NP grading only.) The Staff

192A–192B. International Relations. (4–4) II–III.

Seminar—4 hours. Prerequisite: consent of instructor. Selected problems of international relations evaluated in an interdisciplinary context. Readings, discussion, papers. Required of all international relations majors in their senior year. The Staff (Mr. Zinner in charge)

194H. Special Study for Honors Students. (1–5)

I–II–III.

Directed reading, research, and writing. Pre-

NOTE: For key to footnote symbols, see page 191.

requisite: selection of candidates by Department. Program of research, culminating in writing of a senior honors thesis, under direction of a faculty adviser. (Deferred grading only, pending completion of a 3-quarter sequence.)

Mr. Jones

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

202. American State and Local Government. (4) I.

Lecture—2 hours; discussion—2 hours. Prerequisite: courses 100, 101, 103, or consent of instructor. Analysis of American state and local government and politics. Special emphasis on community power structure, federalism, state legislatures, and state administration.

Mr. Wandesforde-Smith

203. American National Government. (4) III.

Seminar—4 hours. Survey and analysis of the literature in the field of American Government. Emphasis upon development of methodologies for the study of American Government, and on the development of theories and concepts for understanding the behavior and performance of major national institutions.

***205. Selected Problems in American Government.**

(4) II.

Seminar—4 hours. Intensive analysis of selected aspects of the problems facing the major institutions of American government. Students expected to undertake individual research in conjunction with discussion of selected literature.

The Staff

207. Environmental Public Policy. (4) III.

Seminar—4 hours. Analysis of the interface between the world of academic reflection about ecological and environmental problems and the world of political action. Evaluation of alternative approaches to policy analysis and recommendation. Individual research, including field research, will parallel discussion of the literature.

Mr. Wandesforde-Smith

209. The American Political System. (4) I.

Seminar—4 hours. Analysis of selected theoretical and empirical issues posed by contemporary research in American government and politics.

Mr. Wade

***213. Problems of Classical and Medieval Political Thought. (4) III.**

Seminar—3 hours. Prerequisite: consent of instructor. Concentrated study of the political

thought of selected political thinkers of classical and medieval periods.

Mr. Peterman

215. Basic Problems of Political Theory. (4) II.

Lecture—3 hours. Prerequisite: 4 units of political theory or consent of instructor. An examination of the fundamental assumptions underlying various approaches to an understanding of politics, emphasizing the scientific or value-free school, the historicist school, and the contributions of analytic philosophy. Offered in even-numbered years.

Mr. Zetterbaum

***218. Political Theory. (4) I.**

Seminar—3 hours.

Mr. Zetterbaum

223. International Relations. (4) II.

Seminar—3 hours.

Mr. Lieber

***224. International Organization. (4) I.**

Seminar—3 hours.

***225. The International System. (4) II.**

Seminar—3 hours. Analysis of the international system by means of theory formulation and integration; critique of research designs; use of various techniques of data generation and analysis.

Mr. Siverson

***230. American Foreign Policy. (4) I.**

Seminar—3 hours.

Mr. Jones

***240. Democracy and Dictatorship. (4) III.**

Lecture—3 hours. Prerequisite: one upper division course in comparative government, or consent of instructor. Analytical study of differences and similarities in the political process under democratic and dictatorial government. Offered in odd-numbered years.

Mr. Zinner

***241A. Communist Political Systems. (4) I.**

Seminar—3 hours. Prerequisite: course 141 or equivalent and consent of instructor. Systematic analysis of selected topics dealing with the political process of Communist political systems.

Mr. Zinner

***241B. Communist Political Systems. (4) II.**

Seminar—3 hours. Prerequisite: course 141 or equivalent and consent of instructor. Systematic analysis of selected topics dealing with the political process of Communist political systems.

Mr. Zinner

***242. Seminar in Comparative Politics. (4) II.**

Seminar—3 hours. Prerequisite: graduate status or consent of instructor. Systematic survey of theories and methods used in the study of Comparative Politics.

The Staff

***243. Latin American Politics. (4) III.**

Seminar—3 hours. Prerequisite: consent of instructor. Intensive study of topic chosen by instructor each year. Normally students will

focus on a specific country, although other possible foci include land reform and politics, the U. S. in Latin America, etc. Students conduct research projects related to their interests.

Mr. Tuohy

246. Selected Problems of Transitional Societies.

(4) I.

Seminar—3 hours.

Mr. Rothchild

***247A. Western European Governments. (4) II.**

Seminar—3 hours. Contemporary problems, with emphasis on France and Italy. Mr. Groth

247B. Western European Governments. (4) III.

Seminar—3 hours. Prerequisite: consent of instructor. Contemporary problems, with emphasis on Germany. The Staff

248. The Far East. (4) III.

Seminar—3 hours. Selected contemporary problems of government and international relations in the Far East. Mrs. Kallgren

260. Political Parties. (4) II.

Seminar—3 hours.

Mr. Hardin

***261. Political Behavior. (4) III.**

Seminar—3 hours.

Mr. Owens

***264. Seminar in Public Opinion. (4) III.**

Seminar—3 hours.

Mr. Costantini

***270. National and Regional Integration. (4) I.**

Lecture—3 hours. Prerequisite: one upper division course in comparative government or international relations, or consent of instructor. Examination of the means and motives of regional integration as well as the problems involved in operating and maintaining federations. Classical federal experience and experiments in developing countries will be considered.

Mr. Rothchild

POMOLOGY

Related Undergraduate Major.—See page 98.

Related Courses. See *Plant Science 112, 112L (Postharvest Physiology and Handling of Horticultural Commodities).*

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Course

3. Citrus and Other Subtropical Fruits. (3) III.

Lecture—3 hours. The production of the subtropical fruits including avocados, dates, olives, and citrus with special emphasis on citrus. A study of the fundamental information relating to orchard management as applied to these fruits.

Mr. Catlin

282. Concepts and Problems in Public Administration. (4) II.

Discussion—3 hours. The nature of administrative processes in modern society; analysis of complex organizations; contemporary management practices and processes; and means of controlling bureaucracy. Offered in even-numbered years.

Mr. Gable

286. Administrative Values. (4) I.

Seminar—3 hours. Examination of American administrative values. Offered in odd-numbered years.

Mr. Musolf

291. Seminar in American Constitutional Law.

(4) III.

Seminar—3 hours. Prerequisite: course 157B or consent of instructor.

Mr. Jacobs

***297. Internships in Political Science. (2) I, II, III.**

Seminar—2 hours. Prerequisite: open only to persons who have internships or other positions in governmental agencies, political parties, etc., including participants in the State and Local Government Internship Program. Deals with the application and evaluation of theoretical concepts through work experience or systematic observation in public and political agencies. May be repeated for credit. The Staff

298. Group Study. (1-4) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

299D. Directed Reading. (1-6) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

Upper Division Courses

100A. Principles of Pomology. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2. Origin, history, distribution, and adaptation of fruit and nut plants; their structure and function in relation to environment and cultural practices.

Mr. Kester

100B. Principles of Pomology. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2. Development of the vegetative structure of fruit and nut plants; the physiological responses to environment and cultural modification.

Mr. Crane

100C. Principles of Pomology. (3) III.

Lecture—2 hours; laboratory—3 hours. Pre-

NOTE: For key to footnote symbols, see page 191.

requisite: Botany 2. Flowering and fruiting; the nature and development of buds, flowers, and fruits in relation to the culture of fruit and nut plants and to their environment. Mr. Griggs

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Bringhurst in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.
The Staff (Mr. Bringhurst in charge)

Graduate Courses

201. Biochemistry and Physiology of Fruits. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry 101B; Botany 111B; or consent of instructor. Biochemical and physiological phenomena of growth, maturation, ripening, and senescence of fruit. (Open to qualified undergraduates.)
Mr. Maxie

210. Fruit Morphology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2. The development of flower, fruit, and seed structures of representative fruit types.
Miss Bradley

***216. Physiology of Fruit Plants. (4) II.**

Lecture—4 hours. Prerequisite: Botany 111B or consent of instructor. Physiological processes in the growth and development of fruit plants; metabolic relationships; influence of environment and culture. The Staff (Mr. Uriu in charge)

290. Seminar. (1) I, II, III.

Seminar—1 hour.
The Staff (Mr. Catlin in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Bringhurst in charge)

299. Research. (1-9) I, II, III, (Summer).

(S/U grading only.)
The Staff (Mr. Bringhurst in charge)

PORTUGUESE—See Spanish

PSYCHIATRY—See Medicine

PSYCHOLOGY

William A. Mason, Ph.D., *Chairman of the Department*
Department Office, 149 Young Hall

Professors:

William F. Dukes, Ph.D.
Joseph Lyons, Ph.D.
William A. Mason, Ph.D.
Thomas Natsoulas, Ph.D.
Robert Sommer, Ph.D.

Associate Professors:

Jarvis R. Bastian, Ph.D.
¹Stanley Coopersmith, Ph.D.
Alan C. Elms, Ph.D.
Dale F. Lott, Ph.D.
Gary D. Mitchell, Ph.D.
¹Robert M. Murphey, Ph.D.
Theodore E. Parks, Ph.D.
Charles T. Tart, Ph.D.
Edward D. Turner, Ph.D.

Assistant Professors:

Albert A. Harrison, Ph.D.
Kenneth R. Henry, Ph.D.
Carl C. Jorgensen, Ph.D. (*Psychology and Sociology*)
Neal A. Kroll, Ph.D.
Michael Moore, Ph.D.
Donald H. Owings, Ph.D.
Karen E. Paige, Ph.D.

Lecturers:

Michael H. Kellicutt, M.A.
Rosalie Lynn, Ph.D.
Herbert N. Weissman, Ph.D.



Departmental Major Advisers.—Mr. Bastian, Mr. Coopersmith, Mr. Dukes, Mr. Elms, Mr. Harrison, Mr. Henry, Mr. Jorgensen, Mr. Kellicutt, Mr. Kroll, Mr. Lott, Mr. Lyons, Mr. Mason, Mr. Mitchell, Mr. Moore, Mr. Murphey, Mr. Natsoulas, Mr. Owings, Ms. Paige, Mr. Parks, Mr. Sommer, Mr. Tart, Mr. Turner.

The Major Program

All Majors

Lower Division Courses.—Required: Psychology 1A, 1B, 1C, Mathematics 13 (must be taken prior to the junior year unless departmental permission is obtained).

Upper Division Courses.—Required: 36 units of advanced work in psychology (courses numbered above 99).

Before graduation, the student must complete one course in philosophy and one course in sociology or cultural anthropology. These may be taken at any time during the four years and may be either lower or upper division courses.

Bachelor of Arts Degree

Lower Division Courses.—Required: Mathematics 15; either Biological Sciences 1 or a combination of Biological Sciences 10 and one course from the following: Anthropology 1, Physiology 10, Genetics 10.

Upper Division Courses.—Required: Two courses from one of the following groups and three courses from the other:

(Group A) Psychology 108, 130, 131, 134, 150.

(Group B) Psychology 112, 145, 147, 168.

Bachelor of Science Degree

Upper Division Courses.—Required: Five courses from the following groups

(Group A) two courses from Psychology 130, 131, 134, 180A, 180G;

(Group B) two courses from Psychology 108, 129, 150, 180B, 180K;

(Group C) one course from Psychology 112, 132A–132B, 145, 147, 168.

In addition, bachelor of science majors must choose either a mathematics emphasis or a biology emphasis in which the following courses are required:

Mathematics Emphasis

Lower Division Courses.—Required: Mathematics 21A, 21B, 21C; Chemistry 10; Physics 10; Mathematics 29; and either Biological Science 1 or Biological Sciences 10 plus one course from Anthropology 1, Genetics 10, or Physiology 10.

Upper Division Courses.—Required: Psychology 103; either Psychology 107 or 206 or 207; and either Mathematics 105A–105B or 130A–130B or 131A–131B.

Biology Emphasis

Lower Division Courses.—Required: Either Mathematics 15, 16A, 16B or 21A, 21B; Chemistry 1A; Chemistry 1B; Biological Sciences 1; Physics 10; Physiology 2; Zoology 2.

Upper Division Courses.—Required: Genetics 100A and 100B or Genetics 115; Zoology 125 or Zoology 148; at least two courses from Psychology 108, 129, 150. Recommended: Zoology 105, 106, 155; Anthropology 154.

Honors and Honors Program (see page 157).—The honors program comprises course 194H, which includes an honors thesis, to be taken normally during the senior year.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Any thirty units in psychology.

Subject Representative: Mr. Turner.

Lower Division Courses**1A. Introduction to Psychology: General Processes. (5) I, II, III.**

Lecture—5 hours. The experimental psychology of general behavioral and mental processes treated in order of increasing complexity. Major topics include emotion, conditioning, perception, attention, human learning, memory, language and cognition. The Staff

1B. Introduction to Psychology: Biological Bases of Behavior. (5) I, II, III.

Lecture—5 hours. Prerequisite: course 1A. An analysis of behavior in terms of its evolutionary, genetic, and physiological determinants. The Staff

1C. Introduction to Psychology: Personality and Social Psychology. (3) I, II, III.

Lecture—3 hours. Prerequisite: course 1A. The normal and abnormal personality. The influence of social factors on the individual. The Staff

1D. General Psychology. (4) I, II, III.

Lecture—4 hours. Survey of the basic principles of psychology and their empirical foundations. Course intended for students who do not plan to major in psychology. The Staff

98. Directed Group Study. (1-5) I, II, III.

By prior arrangement with individual instructor. Primarily for lower division students. The Staff (Chairman in charge)

99. Special Study for Lower Division Students. (1-5) I, II, III.

By prior arrangement with individual instructor. The Staff (Chairman in charge)

Upper Division Courses**103. Advanced Quantitative Description of Behavior. (5) I.**

Lecture—5 hours. Prerequisite: Mathematics 13 and 15, or consent of instructor. Summary, inference, and prediction from psychological data, with emphasis on the theoretical aspects. Messrs. Kellicutt, Turner, Kroll

107. Psychometric Methods. (4) III.

Lecture—4 hours. Prerequisite: course 103 or consent of instructor. General principles of psychological measurement; psychophysical methods; scale, and correlational techniques in psychological measurement; reliability, validity. Mr. Moore, Mr. Turner

§108. Physiological Psychology. (5) I, II, III.

Lecture—5 hours. Prerequisite: course 1B; or course 1A and upper division standing in a biological science. Analysis of some of the con-

NOTE: For key to footnote symbols, see page 191.

tributions of neuroanatomy, neurophysiology, and neurochemistry to a mechanistic understanding of human and animal behavior. A reductionistic approach within a behavioristic framework. Mr. Henry

112. Developmental Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 1A. An ontogenetic account of human behavior through adolescence with emphasis on motor skills, mental abilities, motivation, and social interaction. Mr. Coopersmith, Mr. Mitchell

120. History of Psychology. (4) I, III.

Lecture—3 hours; term paper. Prerequisite: course 1A–1B–1C; upper division standing; and either Philosophy 20A–20B–20C or consent of instructor. The historical development of psychological thought and research. Mr. Bastian, Mr. Murphey

129. Sensory Processes. (5) II.

Lecture—5 hours. Prerequisite: course 1B; upper division standing in psychology; or consent of instructor. The sensory capabilities of man and animals. Behavioral evidence for sensory capacity and relationships to the structure and function of the sense organs. Mr. Henry

130. Human Learning and Memory. (5) I, II, III.

Lecture—5 hours. Prerequisite: course 1A and Mathematics 13; or consent of instructor. Consideration of major theories of human learning and memory with critical examination of relevant experimental data. Mr. Kroll, Mr. Parks

131. Perception. (4) I, II, III.

Lecture—3 hours; independent library work. Prerequisite: course 1A. The cognitive organizations related to measurable physical energy changes mediated through sensory channels. The perception of objects, space, motion, events. Mr. Natsoulas, Mr. Turner

132A. Language and Cognition. (3) I.

Lecture—3 hours. Prerequisite: course 1A and 6 units of upper division work in psychology or linguistics. Linguistic actions in zoological, social, and individual perspectives; the processes underlying speech production and perception and their development in children. Mr. Bastian

132B. Language and Cognition. (3) II.

Lecture—3 hours. Prerequisite: course 132A. A developmental examination of the reference and meaning of linguistic actions, their cognitive significance, and their consequences in human conduct, enculturation, and education. Mr. Bastian

134. Animal Learning and Motivation. (5) III.

Lecture—5 hours. Prerequisite: courses 1A, 1B, and Mathematics 13, or consent of instructor. Examination of several theories of animal conditioning and their consequences for current motivational microtheories. Mr. Kellcutt

135. Psychology of Consciousness. (3) I, III.

Lecture—3 hours. Prerequisite: course 1A. Consideration of major theories of consciousness, with critical examination of relevant experimental, clinical, and field data. Mr. Natsoulas

137. Altered States of Consciousness. (4) II, III.

Lecture—4 hours. Prerequisite: courses 1A or 10. Characteristics, uses, and abuses of altered states of consciousness from experiential behavioral, physiological, and methodological perspectives. Topics typically include sleep, borderline states, dreams, meditation, hypnosis, autohypnosis, marijuana intoxication, psychedelic drugs and mystical experiences. Mr. Tart

145. Social Psychology. (5) I, II, III.

Lecture—4 hours; term paper. Prerequisite: course 1A. Behavior of the individual in the group. Examination of basic psychological processes in social situations, surveying various problems of social interaction: group tensions, norm-development, attitudes, values, public opinion, status. Messrs. Harrison, Elms, Moore, Turner

147. Personality Theory. (5) I, II, III.

Lecture—4 hours; independent library work. Prerequisite: course 1A and 6 units upper division work in psychology. A systematic consideration of contemporary theories of personality. Mr. Moore, Mr. Elms, Ms. Paige

148. Interpersonal Relations. (4) II.

Lecture—4 hours. Prerequisite: 16 hours of social science or equivalent and consent of instructor. Study of interpersonal relationships from both a theoretical-experimental and experiential viewpoint. Social psychological theory, case studies and a small group laboratory within the class provide the basis for class discussion. Limited enrollment. Mr. Jorgensen

149. Psychology of Sex Differences. (4) II.

Lecture—4 hours. Prerequisite: upper division standing and enrollment in one of the following: course 108, 145 or 147. Extensive review of theory and research related to the origin of sex differences in human behavior. The role of physiology, child socialization, and cultural institutions in determining sex differences in personality, cognitive abilities, motivations, and social status. Ms. Paige

150. Comparative Psychology. (5) I, II, III.

Lecture—4 hours; term paper. Prerequisite: course 1B or appropriate biological training. Perspectives in animal behavior: zoological, physiological, psychological. Functional behavior categories: feeding, reproduction, communication, learning. Behavioral theory as derived from psychological and ethological contexts. Messrs. Mason, Lott, Owings

157. Personality Assessment. (4) II.

Lecture—4 hours. Prerequisite: course 147; Mathematics 13 or equivalent. An exploration and evaluation of the principal methods in personality assessment and research. Mr. Moore

159. Social Psychology of Black Americans. (5) III.

Lecture—4 hours; discussion—1 hour. Prerequisite: course 145 and one course from the following: Sociology 30A, 30B, 30C, 130, or consent of instructor. Interactions within the black community and between the black community and national institutions from the perspectives of black personality, black culture, and national institutional structure.

Mr. Jorgensen, Mr. Turner

†165. Introduction to Clinical Psychology.

(4) I, II, III.

Lecture—4 hours. Prerequisite: courses 1C, 168, and either 112 or 145. Major theoretical formulations in the history of clinical psychology, from classical psychoanalysis to contemporary existentialism and behavior and modification. Survey based on lectures, films, and tapes, of what clinical psychologists do, including methods of appraisal, professional roles, and approaches to treatment.

Ms. Lynn, Mr. Lyons, Mr. Weissman

168. Abnormal Psychology. (4) I, II, III.

Lecture—4 hours. Prerequisite: course 1A. Descriptive and functional account of behavioral disorders, with primary considerations given to neurotic and psychotic behavior.

Messrs. Weissman, Murphey, Sommer

***170. Environmental Awareness. (4) III.**

Lecture—3 hours; discussion—1 hour. Interactions of people with manmade environments. Research methods for evaluating designed environments and reviews of current research in environmental psychology. (Same course as Environmental Studies 170.) Mr. Sommer

171. Humanistic Psychology. (4) III.

Lecture—4 hours. Prerequisite: course 165 or equivalent and consent of instructor. Survey, including lectures and demonstrations of humanistic, existential, or "third-force" movements in contemporary psychology. Theory, data, and techniques in the work of Maslow, Rogers, and others who emphasize creativity and self-actualization. Mr. Tart

‡180A-K. Experimental Psychology. (4) I, II, III.

Lecture—2 hours; laboratory—4 hours. Prerequisite: four upper division psychology courses and consent of instructor. Laboratory investigation of selected problems. Content area will rotate among major fields of psychology from quarter to quarter. (180A. General

Methodology; 180B. Physiological; 180C. Developmental; 180D. Sensory Processes; 180E. Learning; 180F. Perception; 180G. Psycholinguistics; 180H. Motivation; 180I. Social; 180J. Personality; 180K. Comparative.) May be repeated for credit when different topic studied. The Staff

181. Field Work in Psychology. (5) I, II, III.

Laboratory—4 hours; term paper. Prerequisite: upper division standing in psychology and consent of instructor. Supervised internship in approved community agency. Credit not applicable towards 36 units of upper division psychology required of majors. (P/NP grading only.) Mr. Harrison

194H. Special Study for Honors Students.

(1-5) I, II, III.

Prerequisite: 20 units in psychology and honors status. Independent investigation of an empirical problem. The Staff

‡196. Advanced General Psychology. (4) II, III.

Lecture—4 hours. Prerequisite: 18 units upper division work in psychology. Exploration of the present status of systematic psychology. An integrative treatment of the major areas, problems, and methodologies.

Mr. Dukes, Mr. Murphey

198. Directed Group Study. (1-5) I, II, III.

By prior arrangement with individual instructor. Directed small group study on psychological topics of special interest and relevance to instructor and students.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

By prior arrangement with individual instructor. The Staff (Chairman in charge)

Graduate Courses**200. Current Research Topics in Psychology. (1) I.**

Seminar—1 hour. Prerequisite: consent of instructor. A seminar designed to introduce students entering graduate work in the department to its ongoing research activities. (S/U grading only.) The Staff

201. Research Preceptorship. (4) I, II, III.

Laboratory-discussion—6-9 hours. Prerequisite: consent of instructor. (S/U grading only.) The Staff

206. Statistical Analysis of Psychological Experiments. (4) II.

Lecture—4 hours. Prerequisite: course 103 or consent of instructor. Statistical analysis of data obtained with various experimental designs; analysis of variance and covariance, factorial and repeated measures, Latin square designs, and tests of trends. Mr. Turner, Mr. Kroll

NOTE: For key to footnote symbols, see page 191.

207. Statistical Inference from Psychological Experiments. (4) III.

Lecture—4 hours. Prerequisite: course 103 or consent of instructor. The relationships between statistical models and inferences about empirical processes, with an emphasis on distribution-free models. Mr. Turner, Mr. Kroll

208. Physiological Psychology. (4) II.

Seminar—4 hours. Prerequisite: graduate standing in psychology and consent of instructor. A conceptual analysis of the contributions of neuroanatomy, neurophysiology and neurochemistry to an understanding of animal and human behavior. Mr. Henry

***212. Developmental Psychology. (4) II.**

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The original behavioral repertoire of the child and its subsequent development. Mr. Coopersmith

230. Learning. (4) I.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theories of learning and memory as applied to the experimental study of simple and complex behavioral processes. Mr. Parks, Mr. Kroll

***231. Perception. (4) III.**

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Analysis of the role of perception in experience and its effects on behavior. Mr. Natsoulas

***234. Motivation. (4) II.**

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The origin and function of basic motivational systems as they influence behavior. _____

245. Social Psychology. (4) II.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in social psychology. Mr. Harrison

247. Personality. (4) III.

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in human personality. Mr. Elms

***250. Comparative Psychology. (4) III.**

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor.

The study of animal behavior in an evolutionary and comparative framework. Mr. Lott, Mr. Mason

***251. Genetic Correlates of Behavior. (4) I.**

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and experiment in the genetic determination of animal and human behavior. Mr. Murphey

***252. Seminar in Psychobiology. (4) I, II, III.**

Seminar—4 hours. The Staff

***255. Comparative and Physiological Psychology of Reproductive Behavior. (4) III.**

Seminar—4 hours. Biological bases of reproductive behavior; neural, hormonal, and environmental controls. _____

***264. Psycholinguistics. (4) III.**

Seminar—4 hours. Mr. Bastian

272. Experimental Study of Personality. (4) II.

Seminar—4 hours. Mr. Coopersmith

273. Environment and Behavior. (4) III.

Seminar—4 hours. The social psychology of the environment. Research into the use of space and its design implications. Mr. Sommer

§290. Seminar. (4) I, II, III.

Seminar—4 hours. Prerequisite: consent of instructor. Seminar devoted to a highly specific research topic in any area of basic psychology. Special topic selected for a quarter will vary depending on interests of instructor and students. The Staff

298. Group Study. (1-4) I, II, III.

(S/U grading only.) The Staff

299. Research. (2-9) I, II, III.

(S/U grading only.) The Staff

Professional Course**390. The Teaching of Psychology. (4) I.**

Seminar—4 hours; practical experience in teaching. The methods and problems of teaching psychology at the undergraduate and graduate levels; curriculum design and evaluation. Practical experience in the preparation and presentation of material. Mr. Lott

RADIOLOGICAL SCIENCES

Joe P. Morgan, D.V.M., Vet. med. dr., *Chairman of the Department*

Department Office, 1315 Haring Hall

Professors:

Leo K. Bustad, D.V.M., Ph.D.
(*Radiobiology Laboratory*)

Joe P. Morgan, D.V.M., Vet. med. dr.
Philip E. S. Palmer, M.D. (*School of
Medicine*)

Associate Professor:

Peter F. Suter, Dr. Med. vet.

Assistant Professor:

Timothy R. O'Brien, D.V.M., Ph.D.

Lecturer:

Charles R. Root, D.V.M.

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Upper Division Course**199. Special Study for Advanced Undergraduates.**

(1-5) I, II, III.

The Staff (Mr. Morgan in charge)

Graduate Courses**260. Radiology. (2) II.**

Lecture—1 hour; laboratory—3 hours. Prerequisite: courses 103, 220. The physics and practical operation of x-ray and fluoroscopic equipment; the development and interpretation of radiographs, radiation therapy, and radiobiology. Mr. Morgan

261. Special Radiographic Procedures. (3) I, II, III.

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 260 or consent of instructor. Theory of selected radiographic technics, contrast media, and special radiographic equipment. Messrs. Morgan, O'Brien, Suter

262. Advanced Radiographic Interpretation. (3) I, II, III, IV.

Laboratory—9 hours. Prerequisite: D.V.M. candidates. Radiographic interpretation in the diagnosis of disease of small and large animals utilizing both routine and special procedures. May be repeated for credit.

Mr. Morgan and staff

263. Principles of Radiotherapy. (3) I.

Lecture—1 hour; laboratory—6 hours; clinical cases utilized for teaching as they become available. Prerequisite: D.V.M. degree or consent of instructor. Biologic principles of radiotherapy and the treatment of malignant and benign diseases of large and small animals. May be repeated for credit. Mr. O'Brien

265. Radiographic Interpretation: Principles. (2) II.

Lecture—2 hours. Prerequisite: course 260 and consent of instructor. Principles of radiographic interpretation in the diagnosis of disease. Messrs. Morgan, Suter, O'Brien

266. Radiographic Interpretation: Thorax. (2) III.

Lecture—2 hours. Prerequisite: courses 260, 265, and consent of instructor. Principles of radiographic interpretation in the diagnosis of disease in the thorax. Mr. Suter

267. Radiographic Interpretation: Musculo-Skeletal and Abdomen. (2) III.

Lecture—2 hours. Prerequisite: courses 260

and 265 and consent of instructor. Principles of radiographic interpretation in the diagnosis of disease involving the musculo-skeletal system and abdomen. Mr. Morgan, Mr. O'Brien

268. Equine Radiology. (3) I.

Lecture—3 hours. Prerequisite: fourth-year veterinary student or D.V.M. and consent of instructor. Principles in the radiologic diagnosis of conditions that cause lameness in the equine. Methods used in large animal radiography illustrated and latest technique for treating equine lameness discussed. May be repeated for credit. Mr. O'Brien, Mr. Meagher

291. Radiology Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: course 260. Presentation by faculty, radiology graduate students, and visiting faculty of current research undertaken in clinical radiology both at this and other institutions. Mr. Morgan

298. Group Study. (1-2) I, II, III.

The Staff (Mr. Morgan in charge)

299. Research. (1-9) I, II, III.

The Staff

Professional Courses**440. Veterinary Radiology. (¾ to 1½ per week) I, II, III.**

Laboratory—25-50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns and residents carry out radiographic examinations and interpretations of cases referred from the hospitals and outpatient clinics and assist in diagnostic techniques under the direction of the senior radiology staff. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Morgan in charge)

490. Radiology Rounds. (1) I, II, III.

Discussion—2 hours. Prerequisite: professional standing; intern or resident in Veterinary Medical Teaching Hospital or consent of instructor. Films of interesting cases from the daily case load are presented and discussed. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Morgan in charge)

494. Radiology Conference. (1) I, II, III.

Discussion—2 hours. Prerequisite: professional standing; intern or resident in Veterinary Medical Teaching Hospital or consent of instructor. Radiographs presented of cases proven by pathologic examination of tissue obtained from biopsy or necropsy procedures. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Morgan in charge)

NOTE: For key to footnote symbols, see page 191.

RANGE MANAGEMENT

Major Advisers.—See *Class Schedule* listing under Range Science.

Major Program and Graduate Study.—See pages 99 and 182.

Related Courses. See *Agronomy 112 and 112L (Forage Crop Ecology)*; *Animal Science 118A (Range Livestock Production)*; *Resource Sciences 100 (Concepts in Renewable Natural Resources)*; *Soil Science 105 (Field Studies of Soil Resources)*, *120A (Soil Genesis and Morphology)*, *120B (Soil Classification, Mapping, and Evaluation)*; *Wildlife and Fisheries Biology 108 (Comparative Nutrition of Wildlife and Fish)*, *135 (Ecology and Management of Large Mammals)*, *151 (Wildlife Ecology)*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Course

1. Introduction to Range Management. (4) II.

Lecture—3 hours; discussion—1 hour. Basic principles of range management and their relationships to the management of wildlands for livestock production, wildlife, water, recreation, and timber. Mr. Laude

Upper Division Courses

100. Range Plants. (4) I.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2. Systematic relationships and identification of range grasses; legumes, forbs, and shrubs; their distribution, environmental requirements, and use. One Saturday field trip. Mr. Crampton

*103. Grassland Inventory, Analysis and Planning. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100 or consent of instructor. Sampling grasslands and other vegetational types to determine species composition, forage produc-

tion and utilization, carrying capacity, and changes in the plant community. Range inventory analysis and planning range use. Offered in odd-numbered years. Mr. Raguse

105. Field Course. (2) III.

Lecture—10 hours total; laboratory—30 hours total. Prerequisite: consent of instructor. Field studies of range conditions and methods of utilization in various parts of the state. To be given between winter and spring quarters. Considered a spring course for preenrollment. Mr. Love

133. Grassland Ecology. (3) II.

Lecture—3 hours. Prerequisite: course in plant ecology or consent of instructor. Structure, function and environment of North American grasslands, with emphasis on the California annual type. Concepts and problems in measuring primary and secondary productivity. Principles of grassland management, including vegetation improvement, utilization by animals and recreational and aesthetic values. Offered in even-numbered years. Mr. Raguse

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Knowles in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Prerequisite: senior standing and consent of instructor. The Staff (Mr. Knowles in charge)

Graduate Courses

290. Seminar. (1-2) I, II, III.

Seminar—1-2 hours.

The Staff (Mr. Knowles in charge)

299. Research. (1-9) I, II, III.

The Staff (Mr. Knowles in charge)

RELIGIOUS STUDIES

*Neal W. Gilbert, Ph.D., *Chairman of the Committee*
Committee Office, 124 Sprout Hall

Committee in Charge

Glen W. Erickson, Ph.D. (*Physics*)
Manfred P. Fleischer, Ph.D. (*History*)
*Neal W. Gilbert, Ph.D. (*Philosophy*)
Thomas A. Hanzo, Ph.D. (*English*)
David A. Robertson, Ph.D. (*English*)
Marian B. Ury, Ph.D. (*Oriental Languages*)

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Major Advisers.—Mr. Fleischer, Mr. Gilbert, Mrs. Ury.

This major which can lead to the Degree of

Bachelor of Arts is designed to give the student an understanding of religion in its manifold complexity. The study of religion must consider a vast number of elements in particular: (1) the message of the great historical religions; (2) the thought of the main theological and philosophical spokesmen for these traditions; (3) the contribution of great literary authors having religious significance; (4) the approach of the social sciences to the study of religious phenomena; (5) the history of religious thought and institutions and the political and social history of those

periods in which religious questions have played a prominent role; (6) the expression of religious beliefs through music and the arts.

The Major Program

Lower Division Courses.—Required: History 4A–4B, 9A; Philosophy 20A; Religious Studies 20. Recommended: American Studies 1B; Anthropology 2; Philosophy 6; Classics 10, 41. A reading knowledge of a foreign language is *highly recommended*.

Upper Division Courses.—Required: Religious Studies 190, 194. In addition, each student must select a consistent program of courses approved by the committee in charge. The program must include not fewer than 36 units of courses dealing with various aspects of religious study. At least one course must have a theological, philosophical or literary orientation; one course must be historical; one course must exemplify the approach of the social sciences to religious phenomena. A senior thesis is required.

Recommended upper division courses from other departments: Anthropology 124 (comparative religion); Greek 101 (Plato); English 171 (English Bible as literature); History 131B (early modern European history, 1500 to 1650); Italian 139A (Italian literature in English; early Italian literature and Dante Alighieri); Oriental Languages 170 (Chinese and Japanese Buddhism); Philosophy 105, 161, 162, 178 (philosophy of religion, Plato, Aristotle, Kierkegaard); Russian 140, 141 (Dostoevsky, Tolstoy).

Lower Division Courses

20. Introduction to Religious Studies. (2) I.

Lecture—2 hours. Reading and discussion of basic texts from at least two major religious traditions. Mr. Snow

98. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor; primarily for lower division students.

The Staff (Committee Chairman in charge)

REPRODUCTION

John W. Kendrick, D.V.M., Ph.D., *Chairman of the Department*

Department Office, 2301 Haring Hall

Professors:

John P. Hughes, D.V.M.
John W. Kendrick, D.V.M., Ph.D.

Associate Professors:

Andrew G. Hendrickx, Ph.D. (*in Residence*)
George H. Stabenfeldt, D.V.M., Ph.D.

Assistant Professor:

Maarten Drost, D.V.M.

Upper Division Courses

102. Christian Origins. (3) I.

Lecture—3 hours. Prerequisite: History 4A or 111C. The beginning of the Christian Faith seen in relation to milieu in which it originated. Examination of New Testament texts in light of Near Eastern culture in Hellenistic and Roman times. Mr. E. C. Hobbs

110. Religious Biographies. (3) II.

Lecture—3 hours. The lives of selected religious leaders, representative of different religious temperaments and historical traditions, such as Moses, Socrates, Jesus, Paul, Mohammed, Francis, Luther, Gandhi. Mr. Gilbert

168. The Religions of India. (3) II.

Lecture—3 hours. Prerequisite: History 9A or consent of instructor; History 9B recommended. Introduction to the study of the religions of the Indian Subcontinent including both those religions which originated there and those which were introduced from the outside. Course covers both historical and contemporary aspects. Mr. R. B. Epstein

190. Senior Colloquium. (2) I.

Seminar—2 hours. Prerequisite: open only to seniors in Religious Studies. Discussion of central issues of religion. Mr. Murphy

194. Proseminar. (4–6) I, II, III.

Supervised research—12–18 hours. Prerequisite: open only to seniors majoring in Religious Studies. Preparation of senior thesis on topic selected by the student with approval of Religious Studies curriculum committee.

The Staff (Committee Chairman in charge)

198. Directed Group Study. (1–5) I, II, III.

Prerequisite: upper division standing and consent of instructor. The Staff

(Committee Chairman in charge)

Lecturers:

Donald L. Bath, Ph.D.
Charles S. Crane, D.V.M.
Robert E. Dickerson, D.V.M.
Robert S. Dickson, D.V.M.
Robert J. Harris, D.V.M.
James R. Howard, D.V.M., Ph.D.
Donald R. Lamond, D.V.M., Ph.D.
Ronald L. Laub, D.V.M.

NOTE: For key to footnote symbols, see page 191.

Gerald R. Mitchell, D.V.M.

Jack W. Morse, D.V.M.



Upper Division Course

199. Special Study for Advanced Undergraduates.
(1-5) I, II, III.

The Staff (Mr. Kendrick in charge)

Graduate Courses

209. Reproduction in the Equine. (1) II.

Lecture—1 hour. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. A discussion of special problems of equine reproduction with emphasis on methods of diagnosis and the interpretation of clinical and laboratory findings. Mr. Hughes

230. Reproduction, Genital Diseases and Obstetrics.
(6) I.

Lecture—5 hours; laboratory—3 hours. Prerequisite: Pathology 122C, Physiological Sciences 140B. Course in the diagnosis, treatment, and control of diseases affecting the reproductive organs; the normal and disturbed physiology of reproduction; and obstetrics.

Messrs. Drost, Hughes, Kendrick, Stabenfeldt

231. Pathophysiology of Mammalian Reproductive Processes. (3) III.

Lecture—3 hours. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. Physiological and pathological aspects of reproductive failure in mammals concerning gonadal function, fertilization, implantation, prenatal mortality, neonatal mortality, environmental factors, anatomical and hereditary defects, intersexuality and behavior.

Mr. Stabenfeldt

232. Teratologic Aspects of Development. (2) II.

Lecture—2 hours. Prerequisite: courses in embryology, histology, and anatomy, or consent of instructor. Embryological and phar-

macological principles of teratogenesis; design and interpretation of teratogenic tests; consideration of congenital malformations and abnormalities induced by environmental and genetic factors. Offered in odd-numbered years.

Mr. Hendrickx

233. Large Animal Obstetrics. (1) III.

Laboratory—3 hours. Prerequisite: course 230 or consent of instructor. Diagnostic and manipulative techniques used for examination of pregnant and parturient animals.

Mr. Drost, Mr. Kendrick

***290. Seminar in Veterinary Medicine.** (1) I, II, III.

The Staff (Mr. Kendrick in charge)

292. Current Topics in Reproduction. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. Discussion of current scientific literature in reproduction, as well as presentation of research findings by graduate students and faculty.

The Staff (Mr. Stabenfeldt in charge)

298. Group Study. (1-2) I, II, III.

The Staff (Mr. Kendrick in charge)

299. Research. (1-9) I, II, III.

The Staff

Professional Courses

424. Genital Diseases and Obstetrics of Farm Animals. (1½ per week) I, II, III.

Laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Emphasis placed on preventive medicine aspects of reproduction in the horse and cow. Opportunity given for in-depth study of individual animal disease problems. Seminar participation is required. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Kendrick and Mr. Hughes in charge)

RESOURCE SCIENCES

Related Undergraduate Major.—See page 100.

Related Courses. See *Agricultural Economics* 147 (*Natural Resource Economics*), 148 (*Economic Planning for Regional and Resource Development*), 176 (*Economic Analysis in Resource Use*), 283 (*Analysis of Research in Natural Resource Economics*); *Atmospheric Science* 20 (*Introduction to Meteorology*); *Environmental Planning and Management* 1 (*Environmental Quality*); *Environmental Studies* 10 (*Introduction to Environmental Studies*), 12 (*Environmental Planning*), 100 (*General Ecology*); *Geography* 3 (*Climate and Weather*), 5 (*Man and Resource Development*), 161 (*Conservation of Resources and Environment*); *Range Management* 1 (*Introduction to Range Management*), 105 (*Field Course*); *Soil Science* 88 (*Land and Life*), 105 (*Field Studies*); *Soil and Water Science* 1 and 2

(*Soil, Water and Air Resources*); *Water Science* 10 (*Water and Man*); *Wildlife and Fisheries Biology* 2 (*Wildlife Biology*), 151 (*Wildlife Ecology*).

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

2. Concepts in Forestry. (2) II.

Lecture—2 hours. An introduction to the concepts of forestry as illustrated by current issues in the western United States. Mr. Delwiche

10. California and the West. (2) III.

Lecture—2 hours. Recommended as an in-

troductory course for lower division students. How population, agricultural, and industrial centers and their conflicts in environmental pollution and overcrowding develop in relation to the West's physical features. Weekly guest lectures in geology, physical geography, water, and the atmospheric, plant, and animal sciences.

Mr. Snyder, Mr. Johnston

10L. Aerial Study of California and the West. (1) III.

Laboratory—1 hour. Prerequisite: course 10 (must be taken concurrently). Aerial study of the natural resources of California and adjacent states. Flight route includes the Sierra, Cascade, and Coast ranges; observation of major forest, valley, and river systems and their relationship to man's living, working, and leisure. (Flight fee approximately \$50.)

Mr. Snyder, Mr. Johnston

99. Special Study for Undergraduates. (1-5) I, II, III.

The Staff (Mr. Whittig in charge)

Upper Division Courses

100. Concepts in Renewable Natural Resources.

(3) I.

Lecture—3 hours. Prerequisite: junior standing or consent of instructor. Survey of renewable natural resources, interrelationships of climate, air, soil, water, plants, animals and their impact on society. Role of man in their management, preservation, and improvement for man's environment, his recreation, and the production of food and fiber.

Mr. Whittig, Mr. Snyder

100L. Discussion of Resource Concepts. (1) I.

Discussion—1 hour. Prerequisite: course 100 (may be taken concurrently). Discussion of current problems and concepts in renewable natural resources, development, and conservation. An in-depth consideration of the topics surveyed in course 100. (P/NP grading only.)

Mr. Snyder, Mr. Whittig

101. Agriculture and Wildlife. (3) II.

Lecture—3 hours; one Saturday field trip. Prerequisite: upper division standing or consent of instructor. Study of the Central California Valley and the Delta region as an example of utilization for production, agriculture, and outdoor recreation—the conflicts and harmonies; lectures by distinguished biologists of the University, and the State Department of Fish and Game.

Mr. Love

108. Mineral Elements in Food Chains. (2) III.

Lecture—2 hours. Prerequisite: one course each in biological science and earth science or consent of instructor. The sources of mineral nutrients, their progression through food chains, and their importance in plants, animals and human life support systems; the effects of man's activities on mineral nutrient cycling and utilization. Guest lecturers for some topics.

Messrs. Burau, Epstein, Rendig

110. Wildflowers of the Central Valley of California. (2) III.

Lecture—2 hours. Study of the resident plants in and about the Central Valley of California; growth forms, plant communities; identification and systematic relationships, field collections; land use and overall influence on wildflower habitats.

Mr. Crampton

190. Proseminar in Renewable Natural Resources.

(1) I, II, III.

Seminar—1 hour. Prerequisite: senior standing in Resource Sciences. Selected topics in renewable natural resources.

The Staff (Mr. Whittig in charge)

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Whittig in charge)

RHETORIC

Gerald P. Mohrmann, Ph.D., *Chairman of the Department*

Department Office, 207 North Hall

Professor:

James J. Murphy, Ph.D.

Associate Professors:

Gerald P. Mohrmann, Ph.D.

Ralph S. Pomeroy, Ph.D.

Assistant Professors:

Stuart J. Kaplan, Ph.D.

F. Eugene Scott, Ph.D.

Harry W. Sharp, Jr., Ph.D.

Lecturer:

John L. Vohs, M.A.

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Departmental Advisers.—Mr. Kaplan, Mr. Mohrmann, Mr. Murphy, Mr. Pomeroy, Mr. Scott, Mr. Sharp, and Mr. Vohs.

The Major Program

Lower Division Courses.—Required are courses 1 and 3.

NOTE: For key to footnote symbols, see page 191.

Upper Division Courses.—Thirty-six units in rhetoric, including: (1) courses 110, 120 as early as possible in the major; (2) at least one additional course from each of the following series: 110, 120 or 160, and 150; (3) course 190 in the senior year.

Required courses outside the Department of Rhetoric.—A coherent program of twelve quarter units selected in consultation with the departmental adviser from appropriate courses outside the Department of Rhetoric. This program will ordinarily be chosen from a designated set of courses related to one of the four course series in the Department of Rhetoric (Series 110, 120, 150, or 160).

The Department will certify completion of a major program only on the basis of at least a C average in the upper division courses taken in the Department.

Teaching Major.—Same as major.

Teaching Minor.—Thirty quarter units, including Rhetoric 1, 3, 41, and eighteen upper division units including either course 110 or 120.

Optional Minor.—Twenty or more quarter units, at least one course from four of the following sets:

- a) Lower division (Rhetoric 1, 3, 41).
- b) History of rhetorical theory (Rhetoric 110, 111, 112, 113).
- c) Rhetorical criticism (Rhetoric 120, 121A, 121B, 121C).
- d) Rhetorical theory (Rhetoric 150, 151, 153, 155, 156).
- e) Rhetorical analysis (Rhetoric 160, 161, 162).

Graduate Study.—The Department of Rhetoric offers programs of study and research leading to the M.A. degree in Rhetoric. Detailed information may be obtained from the Graduate Adviser, Department of Rhetoric.

Lower Division Courses

1. Introduction to Public Speaking. (4) I, II, III.

Lecture—4 hours. Practice in the preparation and delivery of speeches with an introduction to rhetorical theory and criticism as applied to public address. The Staff

2. Oral Interpretation. (4) I, II, III.

Lecture—4 hours. Theory and practice in the oral reading of literature. The Staff

3. Group Communication. (4) I, II, III.

Lecture—4 hours. Prerequisite: consent of instructor or course 1. Study of the rhetorical process in informal situations. Topics include interaction, leadership techniques, and decision making in groups. Regular participation in discussions. (P/NP grading only.) The Staff

41. Introduction to Advocacy. (4) I, II.

Lecture—4 hours. Introduction to the rhetoric

of controversy, with emphasis upon the nature of public debate, the analysis of issues, and the logical presentation of evidence in support of arguments. Provision for practice in intercollegiate debate. Mr. Sharp

42. Rhetoric in the News Media. (4) II.

Lecture—2 hours; discussion—2 hours. Study of rhetorical concepts and processes influencing the news function of television, radio, newspapers, and mass circulation periodicals. Discussions, lectures, and group projects on problems of media bias, objective reporting, feature writing, and editorial responsibility. Critical analysis of journalistic styles. Mr. Pomeroy

99. Special Study for Undergraduates.

(1–5) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

Upper Division Courses

110. Classical Rhetorical Theory. (4) I.

Lecture—4 hours. Origins of Greek and Roman rhetorical theory, with emphasis upon the contributions of Isocrates, Plato, Aristotle, Cicero, and Quintilian. The Staff

111. Medieval and Renaissance Rhetorical Theory.

(4) II.

Lecture—4 hours. Development of the European rhetorical tradition to 1700 through the contributions of such writers as Augustine, Alcuin, Wilson, and other Ciceronians, with attention to the anti-Ciceronian reaction represented by Ramus, Francis Bacon, and Fenelon. The Staff

112. Early Modern Rhetorical Theory. (4) II.

Lecture—4 hours. English and continental theories of rhetoric to 1900, with reference to developments in psychology, philosophy, and belles-lettres. Emphasis upon the works of Ward, Priestley, Campbell, Blair, and Whately. Mr. Pomeroy

113. Contemporary Rhetorical Theory. (4) III.

Lecture—4 hours. Current approaches to rhetorical theory, from the James-Winans theory of attention to the Hovland, Janis, Kelley studies of persuasion. Mr. Kaplan, Mr. Sharp

120. Rhetorical Criticism. (4) I.

Lecture—4 hours. Survey of critical methods and their use in the interpretation of rhetorical discourse. Mr. Mohrmann

121A. History of Public Address to 1500. (4) II.

Lecture—4 hours. Study of major rhetorical practitioners and movements from ancient Greece to the Renaissance. Special emphasis on the development of oratorical prose in the Attic Orators, Cicero, and the Christian preachers. The Staff

121B. History of Public Address from 1500 to 1800. (4) III.

Lecture—4 hours. Study of major rhetorical practitioners and movements in the Early Modern period. Special attention to England, France, and America, including: preaching during the Reformation, parliamentary debate during the English Civil War, and rhetoric of the American and French Revolutions.

121C. History of Public Address from 1800 to the Present. (4) III.

Lecture—4 hours. Study of major rhetorical practitioners and movements in the nineteenth and twentieth centuries. Special attention to rhetoric in the shaping and transmitting of cultural values and institutions, including the rise of popular agitation and of the mass media.

Mr. Scott

150. Modes of Discourse. (4) I.

Lecture—4 hours. Examination of elements of the communication process, including sources, messages, media, and receivers. Study of the role of these elements as they are influenced by various communicative situations.

Mr. Vohs

151. Methods of Advocacy. (4) I.

Lecture—4 hours. Study of problems inherent in securing acceptance of ideas; consideration of logical and nonlogical means of persuasion.

Mr. Pomeroy

153. Empirical Studies in Rhetoric. (4) II.

Lecture—4 hours. Prerequisite: consent of instructor. Consideration of contributions derived from sociometric and psychometric approaches to analysis of rhetorical process.

Mr. Vohs

154. Forensics Laboratory. (1) I, II, III.

Laboratory—2 hours. Prerequisite: consent of instructor. Practice in the principles of forensics, including argumentation and debate. Intercollegiate and tournament forensics. May be repeated for credit up to a total of six units.

Mr. Sharp

155A. Mass Communication and the Public. (4) II.

Lecture—4 hours. Current issues in mass communications policy, with emphasis on the broadcast media. Examination of the economic and legal influences on media performance; the role of public broadcasting; the social impact of technological advances, including cable television and communication satellites.

Mr. Kaplan

155B. Mass Communication Theory and Research.

(4) III.

Lecture—4 hours. Recent developments in the study of mass communications content and effects, with emphasis on the broadcast media. Special attention to the function of television

for selected audiences: children, minorities, the aged.

Mr. Kaplan

156. Group Communication Processes. (4) III.

Lecture—4 hours. Examination of current theories of group formation, goals, structure, and leadership, as they relate to communication processes.

Mr. Vohs

***160. The Persuasive Campaign.** (4) I.

Lecture—4 hours; class project. Study of selected political and nonpolitical campaigns, illustrating prolonged organized efforts to change, maintain, or deter designated behaviors in a given audience through the use of a variety of media and influences.

Mr. Sharp

161. The Rhetoric of Formal Argument. (4) I.

Lecture—4 hours. Study of selected examples, illustrating the characteristics and functions of rhetoric in situations placing formal or technical constraints upon argument. Special attention to legal pleading, scientific argument, and philosophical disputation.

The Staff

***162. Deliberative Rhetoric.** (4) III.

Lecture—4 hours. Study of selected examples, illustrating major trends, characteristics, and functions of rhetoric in policy-making situations, with emphasis upon speaking in legislative assemblies. Examples drawn from various historical periods and deliberative groups.

190. Senior Proseminar. (4) II, III.

Lecture—2 hours; seminar—2 hours. Prerequisite: required of majors with senior standing. Individual research on a rhetorical topic approved by a committee of the faculty.

The Staff (Chairman in charge)

192. Internship in Rhetoric. (3–5) I, II, III.

Laboratory—3–5 hours. Prerequisite: 12 upper division units in rhetoric and consent of instructor. Work-research projects at off-campus sites under departmental supervision. (P/NP grading only.)

Mr. Sharp

197T. Tutoring in Rhetoric. (2–4) I, II, III.

Seminar—1–2 hours; laboratory—1–2 hours. Prerequisite: upper division standing with major in rhetoric and consent of Department Chairman. Tutoring in undergraduate rhetoric courses, including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit up to six units.

The Staff (Chairman in charge)

198. Directed Group Study. (1–4) I, II, III.

Prerequisite: consent of instructor.

The Staff (Chairman in charge)

NOTE: For key to footnote symbols, see page 191.

199. Special Study for Advanced Undergraduates.
(1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

Seniors may take graduate courses with consent of instructor.

200. Research in Oral Discourse. (4) I.

Lecture—4 hours. Survey of traditional and current approaches to the study of human communication; special attention to bibliography and methodology, with sample research projects.

Mr. Sharp

210. The Evolution of Rhetorical Concepts. (3) II.

Lecture—3 hours. Prerequisite: course 110 or consent of instructor. Analysis of a selected concept such as ethos, proof, structure, audience, or delivery. Topic selected will be traced through tradition to contemporary approaches.

Mr. Murphy

211. Study of a Major Rhetorician. (3) III.

Lecture—3 hours. Intensive study of a major theorist such as Aristotle, Cicero, Whately, or

Toulmin, with emphasis upon cultural and intellectual environment. The Staff

220. Case Studies in Public Controversy. (3) II.

Lecture—3 hours. Prerequisite: one course from course 120 series or consent of instructor. Analysis of origins, development, and promulgation of conflicting views in public controversies such as slavery and temperance movement.

Mr. Scott

250. Rhetoric of Non-Oratorical Works. (3) III.

Lecture—3 hours. Prerequisite: course 150 or consent of instructor. Study of rhetorical aspects of communications other than the public speech. Examination of rhetorical concepts in relation to news media, advertising, literature, with attention to nonverbal communication.

Mr. Pomeroy

298. Group Study. (1-5) I, II, III.

Lecture—3 hours.

The Staff (Chairman in charge)

299. Individual Study. (1-12) I, II, III.

The Staff (Chairman in charge)

RUSSIAN

Department Office, 416 Sproul Hall

Professor:

Valerie A. Tumins, Ph.D.

Assistant Professors:

George Genereux, Ph.D.

Galina Tuniks, Ph.D.

Lecturer:

Lawrence T. Grant, M.A.



Departmental Major Adviser.—Mr. Genereux.

Graduate Adviser.—Miss Tumins.

The Major Program

The requirements are Russian 1 through 6 (or the equivalent); Russian 40, 41, 42; and a minimum of 36 units of upper division course work including Russian 101A, 101B, 101C, 102 or 103.

Honors and Honors Program (see page 157).

—The honors program comprises at least one quarter of study under course 194H, which will include a research paper.

The Master of Arts Degree

The Department offers two programs of study (one with emphasis on language and culture, the other with emphasis on literature) leading to the M.A. degree. Detailed information may be obtained by writing to the Graduate Adviser.

Teaching Major.—Requirements for the teaching major are the same as those for the departmental major with the addition of course 300.

Teaching Minor.—Six quarter courses in the lower division or their equivalents. Usually these will consist of Russian 1, 2, 3, 4, 5, 6. A total of 20 upper division units is required, including courses 101A, 101B, 101C.

Subject Representative: Mr. Genereux.

Lower Division Courses

Course Placement.—Students with two years of Russian in high school normally continue in Russian 2; those with three years, Russian 3; those with four years, Russian 4.

1. Elementary Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Mr. Grant and staff

2. Elementary Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite course 1. Mr. Grant and staff

***2X. Intensive Elementary Russian. (16) II.**

Recitation—15 hours; laboratory—1 hour; supplementary laboratory and group practice. Prerequisite: course 1. Intensive course using contemporary materials, stressing modern spoken Russian, and covering grammar fundamentals. Mr. Grant and staff

3. Elementary Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 2. Mr. Grant

4. Intermediate Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 3. Grammar review based on a selected literary text and conversational practice with everyday topics and situations. Mr. Grant and staff

***4X. Intensive Intermediate Russian. (16) I.**

Recitation—15 hours; laboratory—1 hour. Prerequisite: course 3 or placement in course 4. Intensive course emphasizing spoken Russian. Contemporary linguistic and literary materials will be used to increase the student's conversational skills and to broaden his knowledge of Russian grammar. Mr. Grant and staff

5. Intermediate Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 4. Composition, grammar review, and conversation on literary texts and everyday topics and situations. Mr. Grant

6. Intermediate Russian. (6) I, II, III.

Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 5. Composition, grammar review, and conversation on literary texts and everyday topics and situations. Mr. Grant and staff

30. Great Russian Writers. (3) I.

Lecture—3 hours. Knowledge of Russian not required. Introduction to the important prose and dramatic works of such writers as Gogol, Turgenev, Dostoevsky, Tolstoy, Chekhov, Sholokhov, and Pasternak. Offered in even-numbered years. Mr. Genereux

40. Survey of Russian Literature to 1800. (4) II.

Lecture—3 hours. Knowledge of Russian not required. Introduction to the philosophic, historic, and stylistic elements of Russian literature from the earliest period up to Russian Sentimentalism with a discussion of the major writings and major literary figures. Offered in odd-numbered years. Miss Tumins

41. Survey of Russian Literature: Nineteenth Century. (4) I.

Lecture—3 hours. Knowledge of Russian not required. Introduction to the dominant literary trends, the major literary figures and landmarks of Russian prose and poetry from the period of Sentimentalism through Romanticism and Realism to the beginnings of Modernism. Offered in odd-numbered years. Mr. Genereux

42. Survey of Russian Literature: Twentieth Century. (4) III.

Lecture—3 hours. Knowledge of Russian not

required. Introduction to major literary trends such as Symbolism, Acmeism, Futurism, Neorealism, and Socialist Realism. Readings from representative writers such as Gorky, Bely, Pasternak, Solzhenitsyn, and Tertz. Offered in even-numbered years. Mr. Genereux

99. Special Study for Undergraduates. (1-5) I, II, III.
The Staff (Chairman in charge)

Upper Division Courses

101A. Advanced Grammar and Reading. (4) I.

Recitation—3 hours. Prerequisite: course 6. Study of advanced grammar with reading and discussion of literary and cultural texts. Mr. Grant

101B. Advanced Grammar and Reading. (4) II.

Recitation—3 hours. Prerequisite: course 6. Study of advanced grammar with reading and discussion of literary and cultural texts. Mr. Grant

101C. Advanced Grammar and Reading. (4) III.

Recitation—3 hours. Prerequisite: course 6. Study of advanced grammar with reading and discussion of literary and cultural texts. Mr. Grant

102. Russian Composition. (4) I.

Recitation—3 hours. Prerequisite: course 6. Offered in even-numbered years. Miss Tumins

103. Literary Translation. (4) III.

Discussion—3 hours. Prerequisite: course 6. Translation of Russian literary texts into stylistically equivalent idiomatic English. Offered in odd-numbered years. Mr. Genereux

105. Advanced Russian Conversation. (4) II.

Conversation—3 hours. Prerequisite: course 6. Intensive conversational practice and discussion based on current events and contemporary texts. Miss Tumins

121. The Nineteenth-Century Russian Novel. (4) II.

Lecture—3 hours. Knowledge of Russian not required. The origin and development of the novelistic tradition beginning with Pushkin, Lermontov, Gogol, and continuing with such writers as Goncharov, Turgenev, and Saltykov (excluding Tolstoy and Dostoevsky). Offered in even-numbered years. Mr. Genereux

123. The Twentieth-Century Russian Novel. (4) II.

Lecture—3 hours. Knowledge of Russian not required. Examination of various trends including Critical Realism, Symbolism, Neorealism, and Socialist Realism in the development of the novel. Readings from such writers as Gorky, Zamiatin, Sholokhov, and Pasternak. Offered in even-numbered years. The Staff

NOTE: For key to footnote symbols, see page 191.

124. History of Russian Literary and Social Criticism. (4) II.

Lecture—3 hours; term paper. Knowledge of Russian not required. Natural-School and Slavophile criticism contrasted to "esthetic" criticism. Revolutionary-democratic social writings; conservatives; symbolists; formalists; Marxists; and anti-Marxist criticism. Critical writings of major novelists. Mr. Genereux

125. Russian Drama to 1917. (4) III.

Lecture—3 hours. Prerequisite: course 6. The rise and development of Russian drama. Reading and analysis of Fonvizin and nineteenth-century dramatic works by authors such as Griboedov, Pushkin, Ostrovsky, A. K. Tolstoy, Leo Tolstoy, Chekhov, and Gorky. Offered in odd-numbered years. Miss Tumins

127. The Golden Age of Russian Poetry. (4) III.

Lecture—3 hours. Prerequisite: course 101A. Study of Russian versification, the historical background to the Golden Age, and readings from Derzhavin, Batiushkov, Gnedich, Pushkin, Delvig, Baratynsky, Lermontov, and other poets of the first half of the nineteenth century. Offered in even-numbered years. The Staff

128. Modern Russian Poets. (4) III.

Lecture—3 hours. Knowledge of Russian not required; Russian majors fulfill readings in Russian. Readings in translation of modern poetry belonging to various "schools" (e.g., Symbolism, Acmeism, Futurism) including such poets as Blok, Esenin, Akhmatova, Maiakovskiy, Pasternak, and Evtushenko. Offered in odd-numbered years. The Staff

140. Dostoevsky. (4) I.

Lecture—3 hours. Knowledge of Russian not required. Reading and analysis of Dostoevsky's principal works such as *Crime and Punishment*, *The Idiot*, *The Brothers Karamazov*, and *The Diary*. Study of social and political views as reflected in Dostoevsky's works. Offered in even-numbered years. Miss Tumins

141. Tolstoy. (4) I.

Lecture—3 hours. Knowledge of Russian not required. Study of Leo Tolstoy's literary evolution and moral quest. Readings include his *Confession*, a major novel such as *War and Peace* or *Anna Karenina*, and representative shorter fiction. Offered in odd-numbered years. The Staff

150. Russian Culture. (4) III.

Discussion—3 hours; term paper. Knowledge of Russian not required. Brief introduction of the beginnings up to the nineteenth century. Study of Russian culture in the nineteenth and twentieth centuries: Russian art, music, philosophy, church, traditions, and daily life. Miss Tumins

154. Russian Folklore. (4) III.

Lecture—3 hours; term paper. Knowledge of Russian not required. Russian folklore, rituals, and history will be analyzed and compared with folklore of other peoples. Sociological implications of attitudes toward family unit, children, etc. Influences of folklore on Russian literature and historiography. Miss Tuniks

161A-C. Varieties of Authorial Vision. (4) I, II, III.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Study of representative examples of imaginative literature from antiquity to the present. Content will alternate among the following segments: A. The Tragic Vision; B. The Comic Vision; C. The Tragicomic Vision. May be repeated for credit in different subject area. (Same course as Classics, Comparative Literature, English, French and German 161A-C.) The Staff

***162A-F. The Theory and Practice of Literary Translation. (4) II.**

Lecture—2 hours; discussion—1 hour; term translation project. Prerequisite: competence in "source" language and consent of instructor. Theories and problems of rendering texts in foreign languages into English; imaginative equivalence and re-creative adaptation demonstrated in terms of various models; comparison of student translation projects. Content will alternate among the following segments: A. French to English; B. German to English; C. Greek/Latin to English; D. Italian to English; E. Russian to English; F. Spanish to English. May be repeated for credit in different subject area. (Same course as Classics, Comparative Literature, English, French and German 162A-F.) The Staff

163A-C. Intercultural Literary Colloquium Literature and the Other Arts. (4) II.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. The encounter of literature with other art forms; structural and thematic elements of music and the fine arts reflected as subject matter or compositional principles in literature; contrast and similarity in the creative process of the several media. Content will alternate among the following segments: A. Music and the Artist-Hero; B. Pictorial Arts and Visual Media; C. Theater, Opera and Dramatic Forms. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, French and German 163A-C.) The Staff

***164A-C. Intercultural Literary Colloquium: The Great Periods of International Culture. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in the literary crosscurrents, accommodation and dominance that have characterized the literatures of a common Western culture. Content

will alternate among the following segments: A. The Middle Ages; B. The Renaissance; C. Rationalism and the Enlightenment. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, French, and German 164A-C.) The Staff

***165. Intercultural Literary Colloquium: Studies in Fantastic Reality. (4) III.**

Lecture—2 hours; discussion—1 hour; term paper. The literary experience of mystery, the fantastic, and the demonic in Western tradition, including works by such writers as Borges, Dostoevski, and Kafka. (Same course as Comparative Literature, English, French and German 165.) The Staff

***166A. Modalities of Modern Literature: The Novel. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Intercultural literary colloquium on the transformation of self, nature, and community in novels by such writers as Dostoevski, Svevo, Kafka, Faulkner, and Robbe-Grillet. (Same course as Comparative Literature, English, French and German 166A.) The Staff

***167. Intercultural Literary Colloquium: Comparative Study of Major Authors. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Pivotal works of artists in the Western mainstream, such as Dante, Shakespeare, Cervantes, Goethe, Tolstoi, Proust, and Joyce. (Same course as Comparative Literature, English, French, and German 167.) The Staff

168A-E. Intercultural Literary Colloquium: Modern Literary Movements and Styles. (4) I.

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in popular taste, messianic vision, and elitist polarities. Content will alternate among the following segments: A. Romanticism; B. Symbolist Poetry and Poetics; C. Naturalism and Expressionism; D. Utopianism and Authoritarian Structures; E. Quests of Mystery and Science Fiction. May be repeated for credit in different subject area. (Same course as Comparative Literature, English, French and German 168A-E.) The Staff

***169A-D. Intercultural Literary Colloquium: The Avant Garde. (4) II.**

Lecture—2 hours; discussion—1 hour; term paper. Literary innovation and rebellion in Western Culture since World War I. Content will alternate among the following segments: A. Dada and Surrealism; B. The Absurdist Tradition; C. The "New Novel;" D. Proletarian and Epic Theater. May be repeated for credit in

different subject area. (Same course as Comparative Literature, Dramatic Art, English, French, and German 169A-D.) The Staff

185. Intercultural Literary Colloquium. (4) II.

Lecture—2 hours; discussion—1 hour; readings in English or Russian; term paper. Interdepartmental inquiry into such European and American themes as the anti-hero, guilt and judgment, escape, and utopia. Specific topics to be chosen by instructors. Limited enrollment. (To be given jointly with German 185.) The Staff

***190. Senior Proseminar. (4) III.**

Group conference and assigned reading in preparation for graduate study. Miss Tumins

192. Research Essay. (2) I, II, III.

Prerequisite: concurrent enrollment or previous completion of a course in Russian literature. A research essay, based on primary and secondary sources, dealing in depth with a topic arising from or related to the prerequisite literature course. May be repeated for credit. The Staff

194H. Special Study for Honors Students.

(5) I, II, III.

Prerequisite: open only to honors students. Guided research leading to an honors paper.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

200. Old Church Slavic. (4) I.

Lecture—3 hours; reading projects. A synchronic and diachronic analysis of Old Church Slavic. Miss Tuniks

201. Comparative Slavic Linguistics. (4) II.

Lecture—3 hours; reading projects. Prerequisite: course 200. An introduction to comparative Slavic linguistics based on the contrastive analysis of Old Church Slavic with Old Russian. Miss Tuniks

202. Descriptive Russian Grammar. (4) II.

Lecture—3 hours. Introduction to modern Russian phonology and morphology. Miss Tuniks

204. Historical Russian Grammar. (4) III.

Lecture—3 hours; reading projects. Evolution of the Russian phonological and grammatical systems from the eleventh to the eighteenth centuries. Miss Tuniks

210. Style and Syntax. (4) I.

Discussion—3 hours; reading projects. Examination of stylistic differences between spoken and written Russian. Miss Tuniks

NOTE: For key to footnote symbols, see page 191.

***220. Old Russian Literature. (4) III.**

Seminar—3 hours. Prerequisite: course 201. Advanced study of intellectual movements and literary styles of works such as "The Song of Igor's Campaign," "Zadonshchina," Epifany's "Lives," Ivan IV's cycle of epistles. May be repeated for credit.

Miss Tumins

221. Eighteenth-Century Russian Literature. (4) III.

Seminar—3 hours. Advanced study of literary movements and styles in prose or poetry. The works of writers such as Kantemir, Lomonosov, Sumarokov, Radishchev and Karamzin will be analyzed. May be repeated for credit.

Miss Tumins

222. Nineteenth-Century Russian Literature. (4) I.

Seminar—3 hours. Advanced study in literary movements such as Romanticism, Naturalism, and Realism, or of a major writer such as Pushkin, Gogol, Dostoevsky, or Tolstoy. May be repeated for credit.

Miss Tumins and Staff

223. Early Twentieth-Century Russian Literature.

(4) I.

Seminar—3 hours. Reading and analysis of the achievements selected from the literary renaissance beginning with the Russian Sym-

bolists and continued by such diverse groups as the Acmeists, the Futurists and the Serapion Brotherhood. May be repeated for credit.

The Staff

***224. Soviet Russian Literature. (4) III.**

Seminar—3 hours. Analysis of selected works of Russian prose and poetry with particular emphasis on works of extraordinary literary merit or of unusual importance in the development of genres, schools, styles, techniques, and various formal elements. May be repeated for credit.

Mr. Genereux

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-9) I, II, III.

The Staff (Chairman in charge)

Professional Course**300. The Teaching of Russian. (3) (Summer)**

Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in a modern foreign language. Study of various methods of teaching a foreign language at elementary, high school, and college levels. Organization and methods of other language learning media, i.e., private language schools, television, and radio.

The Staff

RUSSIAN LITERATURE AND HISTORYC. Bickford O'Brien, Ph.D., *Chairman of the Committee*

Department Office, 156 Voorhies Hall

Committee in Charge:Alexander J. Groth, Ph.D. (*Political Science*)C. Bickford O'Brien, Ph.D. (*History*)Valerie A. Tumins, Ph.D. (*Russian*)

This major is designed to give the student a better understanding of Russia through the study of its history and literature, two fields closely linked in its intellectual development.

This combined major is planned in such a way that the student will be prepared for graduate studies in either field—Russian History, Russian Literature or in a similar combined program. In either case the knowledge of Russian is a prerequisite.

Required courses for the joint Bachelor of Arts degree in Russian Language, Literature and History:

History

a) History 4A-4B-4C (History of Western Civilization).

b) A minimum of 12 units from the following courses: History 102F (Proseminar in Russian History), 137A (Russian History: Kievan and Muscovite Russia), 137B (Russian History: The Empire to 1856), 137C (Russian History: The Empire, 1856-1917), 137D (Russian History: Soviet Russia).

c) A minimum of 8 units in another field of history (preferably Europe or East Asia).

Russian

a) Russian 1-2-3 (Elementary Russian), 4-5-6 (Intermediate Russian), 40 (Survey of Russian Literature to 1800), 41 (Survey of Russian Literature: Nineteenth Century), 42 (Survey of Russian Literature: Twentieth Century).

b) A minimum of 12 units from the following courses: Russian 101A-101B-101C (Advanced Grammar and Reading), 102 (Russian Composition), 103 (Russian Literary Translation).

c) A minimum of 8 units from the following courses: Russian 121 (The Russian

Novel: Pushkin to Turgenev), 123 (The Russian Novel: Saltykov to Pasternak), 125 (Russian Drama to 1917), 127 (The Golden Age

of Russian Poetry), 128 (Modern Russian Poets), 140 (Dostoevsky), 141 (Tolstoy).

SOCIOLOGY

Travis Hirschi, Ph.D., *Chairman of the Department*
Department Office, 135 Young Hall

Professors:

Travis Hirschi, Ph.D.
Edwin M. Lemert, Ph. D.
Leon H. Mayhew, Ph.D.
Julius Roth, Ph.D.

Associate Professors:

Bruce Hackett, Ph.D.
John Lofland, Ph.D.
James McEvoy, Ph.D.
John F. Scott, Ph.D.

Assistant Professors:

Ruth Dixon, Ph.D.
Carl C. Jorgensen, Ph.D. (*Sociology and Psychology*)
Arthur Lipow, Ph.D.
Lyn Lofland, Ph.D.
Lenore Weitzman, Ph.D.

Lecturer:

Isao Fujimoto, M.A. (*Sociology and Applied Behavioral Sciences*)

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Departmental Major Advisers.—(a) Undergraduate: The Staff (b) Graduate: The Staff.
The Major Program

Lower Division Courses.—Required: Sociology 1, 46A, 46B or their equivalent; 8 units selected from Anthropology 2, Economics 1A, 1B, and Psychology 1A, 1B and 1C. Recommended: Anthropology 1 and Philosophy 12A, 12B, 20A–20B–20C.

Upper Division Courses.—Required: 36 units of Sociology including 165A and 165B. Recommended: Anthropology 102, 118, 119A, 119B, 124, 128; History 101, 102; Philosophy 107C, 151, 156A; Political Science 150, 161; Psychology 145; Mathematics 105A, 105B.

Pre-Social Welfare Students

Lower Division Courses.—Required: Sociology 1, 3, 46A, 46B or their equivalent, and Psychology 1A, 1B and 1C. Recommended: Anthropology 2, Economics 1A, 1B, Philosophy 12A–12B, Political Science 1A, 1B.

Upper Division Courses.—Required: Sociol-

ogy 120, 165A or 165B, 185, and Psychology 112, 147, 165, 168; 8 additional units selected from Sociology 130, 131, 140, 150, 152, 170; Psychology 145. Recommended: Anthropology 118, 119A, 119B, 128; Economics 116, 130A, 130B, 150, 151, 152; Human Development 136, 140, 141; Political Science 100, 104, 180.

Graduate Study.—The Department offers a program of study leading to the M.A. and Ph.D. degrees in sociology. Further information and applications regarding graduate study may be obtained at the department office.

Teaching Major.—Requirements for the teaching major are the same as for the departmental degree plus Sociology 122 or 124, 130 and 140.

Teaching Minor.—Thirty units of sociology taken in consultation with the subject representative.

Subject Representative: Mr. J. Roth.

Lower Division Courses

1. Introduction to Sociology. (5) I, II, III.

Lecture—4 hours; discussion—1 hour. Principles and basic concepts of sociology. The study of groups, culture, collective behavior, classes and caste, community and ecology, role, status, and personality.

3. Social Problems. (4) I, III.

Lecture—3 hours; discussion—1 hour. General sociological consideration of contemporary social problems in relation to sociocultural change and programs for improvement.

7. Seminar in Sociological Analysis. (4) I, II, III.

Seminar—3 hours; to be arranged—1 hour. Research and analysis using basic concepts of sociology, social organization, culture, socialization, stratification in application to specific problems. May be repeated for credit with consent of instructor. Limited enrollment. The Staff

8. General Sociology. (5) I, II, III.

Lecture—4 hours; to be arranged—1 hour. Analysis of sociological research and concepts emphasizing application of the basic concepts of social organization, culture, socialization, stratification in relation to specific selected problems of analysis. May be repeated for credit with consent of instructor. Limited enrollment. The Staff

NOTE: For key to footnote symbols, see page 191.

9A-9B-9C. Seminar in Sociological Analysis.

(2-2-2) I-II-III.

Seminar—2 hours. Research and analysis using basic concepts of sociology, social organization, culture, socialization, stratification in application to specific problems. Course must be completed within one academic year. May be repeated for credit with consent of instructor. Limited enrollment. (Deferred grading only, pending completion of sequence.) The Staff

12. Introduction to Sociological Theory. (4) III.

Lecture—4 hours. Introduction to classic texts and problems in the tradition of sociological inquiry. Representative works of important figures, such as Marx, Comte, Weber, and Durkheim; the relevance of these materials for contemporary sociology.

15A-15B-15C. Universities. (4-4-4) I-II-III.

Lecture—2 hours; discussion—1 hour; laboratory—1 hour. Prerequisite: enrollment in Experimental Freshman Program. Study of the history, social structure, and functions of contemporary American universities, with special reference to the University of California at Davis. Mr. Hackett

25. Sociology of Popular Culture. (4) II.

Lecture—4 hours. The historical emergence of popular culture, "High" culture, "folk" culture and "mass" culture; the democratization of cultural values; the organization of popular tastes; characteristic art forms of popular culture: literature, music, the graphic arts. The social structure of audiences.

30A-30B-30C. The Negro Experience in American Society. (4-4-4) I-II-III.

Lecture—4 hours. A historical consideration of ideological and institutional forces affecting the social status of black people in America. Among the topics considered will be the African backgrounds, slavery, racism, the Civil War, "Jim Crow," black reconstruction, and recent protest movements.

46A. Introduction to Social Research. (4) I.

Lecture—4 hours. Prerequisite: 8 units of Sociology. Examination of the methodological problems of social research. Selection and definition of problems of investigation, data-gathering techniques, and sampling.

46B. Introduction to Social Research. (4) II.

Lecture—4 hours. Prerequisite: course 46A. Data-analysis techniques, measurement, scaling, multivariate analysis, and quantitative measures of association.

99. Special Study for Undergraduates. (1-5)

I, II, III.

Prerequisite: consent of instructor.

The Staff (Mr. Hirschi in charge)

Upper Division Courses**101. Social Processes. (4) II.**

Lecture—3 hours; discussion—1 hour. Examination of the problems of determining what are the crucial variables in the social processes that relate man to the environment. Economic theory, human ecology and general systems theory are examined to evaluate their utility in isolating strategic social variables. (Same course as Environmental Studies 101.) Mr. McEvoy

102. Sociology of the Environment. (4) II.

Lecture—3 hours; laboratory—2 hours. Prerequisite: one college level course in mathematics or statistics and upper division status. Course will examine two questions: (1) What is the effect of environmental change on social systems? (2) How can such change be measured? Systems to be studied include economics, population, recreation, transportation, institutions, and values. Laboratory and field work in measurement of effects. Mr. McEvoy

104. Empirical Social Research and Social Theory. (4) III.

Lecture—4 hours. Prerequisite: upper division standing and 8 units of sociology, or consent of instructor. Examination of important works in sociology, in the light of the ways in which theory informs and shapes actual research operations, and the ways in which the results of empirical research mold social theory.

105A-105B. Laboratory in Survey Research. (5-5) I-II.

Lecture—4 hours; laboratory—3 hours. Prerequisite: one course in sociological research methods or Mathematics 13 or 15 or 29. Study design, drawing a sample from the city of Sacramento, and analysis of the data collected. Provides an introduction to survey methods, nonexperimental research, and data collection and analysis. (Deferred grading only, pending completion of sequence.) Mr. McEvoy

106. Intermediate Social Statistics. (4) III.

Lecture—4 hours. Prerequisite: course 46B. An intermediate level course in statistical analysis of social data, emphasizing the logic and use of statistical measures, procedures and mathematical models especially relevant to sociological analysis.

107. Seminar in Sociological Analysis. (4) I, II, III.

Seminar—3 hours; to be arranged—1 hour. Prerequisite: upper division standing and 9 units of sociology. Research and analysis using basic concepts of sociology, social organization, culture, socialization, stratification in application to specific problems. May be repeated for credit with consent of instructor. Limited enrollment.

The Staff

108. Advanced General Sociology. (5) I, II, III.

Lecture—4 hours; to be arranged—1 hour. Prerequisite: upper division standing and consent of instructor. Analysis of sociological research and concepts emphasizing application of the basic concepts of social organization, culture, socialization, stratification in relation to specific selected problems of analysis. May be repeated for credit with consent of instructor. Limited enrollment. The Staff

109A-109B-109C. Seminar in Sociological Analysis. (2-2-2) I-II-III.

Seminar—2 hours. Prerequisite: upper division standing and 9 units of sociology. Research and analysis using basic concepts of sociology, social organization, culture, socialization, stratification in application to specific problems. Course must be completed within one academic year. May be repeated for credit with consent of instructor. Limited enrollment. (Deferred grading only, pending completion of sequence.) The Staff

118. Political Sociology. (4) II.

Lecture—4 hours. Prerequisite: course I or consent of instructor. Relation of social cleavages and social cohesion to the functioning of political institutions; the social bases of local and national power structures; social sources of political movements; analysis of concepts of alienation, revolution, ideology, ruling class, and elite.

119. Sociology of Military Institutions. (4) II.

Lecture—4 hours. Prerequisite: course I. Relationship of military institutions to the political, economic, and class structure of historic and contemporary societies. The impact of professionalism and bureaucratic organization. The application of social theory to the analysis of such phenomena as militarism, the *coup d'etat*, revolutionary war, etc.

120. Deviation and Society. (5) I.

Lecture—4 hours; term paper. Prerequisite: 8 units of sociology or consent of instructor. Theory and studies of deviation in relation to societal reaction, group processes and social roles. Stigma and incapacity; cosmetic defect. Deviation theory applied to selected crimes, prostitution, drugs, alcohol use, and mental disorders. Creativity and society. Mr. Lemert

122. Sociology of Adolescence. (4) III.

Lecture—4 hours. Prerequisite: 8 units of sociology. Chronological age and social status; analysis of social processes bearing upon the socialization of children and adolescents. The emergence of "youth cultures." Generational succession as a cultural problem.

123. American Society. (4) III.

Lecture—4 hours. Prerequisite: 8 units of social science or consent of instructor. The institutional structure and social organization of the United States.

124. Sociology of Education. (5) II.

Lecture—4 hours; term paper. Prerequisite: four units of sociology or consent of instructor. Education and the social structure. Class size, curriculum, and economies of scale. Relations between families and schools in socialization; familial ascription and educational achievement. Education and industrialization. Organizational and occupational structure of schools. Discussion of selected controversies. Mr. Scott

125. Sociology of Intellectual Life. (4) I.

Lecture—4 hours. Prerequisite: upper division standing and consent of instructor. Sociological analysis of the intelligentsia; types of intellectuals, theories concerning their social role; research on the social sources of intellectual work in politics, literature, art, and science; historical considerations of intellectual milieu; international comparisons of intellectuals.

126. Social Interaction. (4) I.

Lecture—4 hours. Everyday interaction in natural settings; ethnographic approaches to the understanding of social meanings, situations, personal identity and human relationships. Particular attention to the work of Erving Goffman and to principles of field observation and qualitative analysis. Ms. Lofland

130. Race Relations and Minority Groups. (4) I, III.

Lecture—4 hours. Prerequisite: 8 units of social science or consent of instructor. Study of contacts and interaction between racial and ethnic groups; sources and effects of prejudice and discrimination; programs for reducing intergroup tensions. Mr. Lipow

131. The Family. (5) I.

Lecture—4 hours. Prerequisite: course 2. Social implications of primate reproductive physiology; the nuclear family; major familial roles; normative controls on sex and reproduction; inheritance groups; status ascription; the family and stratification; marital selection; relations between the family and industrial social change. Mr. Scott

132. The Sociology of Sex Roles. (4) II.

Lecture—3 hours; discussion—1 hour. Analysis of biological, psychological, cultural and structural conditions underlying the status and roles of men and women in contemporary society, drawing on a historical and comparative perspective.

NOTE: For key to footnote symbols, see page 191.

140. Social Stratification. (4) III.

Lecture—4 hours. Prerequisite: course 1. Systems of social ranking; theories of stratification; power, prestige, culture, and styles of life of various social classes; social mobility and its consequences for social structure. Mr. Hackett

141. Industrialization and Social Change. (4) II.

Lecture—4 hours. Prerequisite: 4 units of sociology. Selected technological and social factors. Preconditions of economic development and industrialization. Social, political and cultural issues at various levels of economic development. Major historical differences and major current trends. Emphasis either on highly industrialized countries or on less developed countries.

142. Comparative Institutions and Social Structures. (4) I.

Lecture—4 hours. Prerequisite: 8 units of sociology. Selected comparisons of major political and social institutions in complex societies. Patterns of institutional persistence and change in past and present societies. Particular attention will be given to nonquantitative methodological problems of comparative studies.

143. Urban Society. (4) I.

Lecture—4 hours. Prerequisite: 8 units of sociology. Urbanization as a social process; comparison of urban, suburban, metropolitan and rural phenomena; types of cities; the subcultures of cities; the urban future. Mr. Hackett

144. Rural Society. (4) II.

Lecture—4 hours. The characteristics of rural social systems in contrast to urban; the nature of peasant and folk societies; the impact of social change upon rural community life considered from the standpoint of regional differences in the United States and selected world areas. Mr. Fujimoto

145. Social Structure of the U.S.S.R. (4) II.

Lecture—4 hours. Survey of major institutions of Soviet society, including the family, education, work, health and welfare, the arts, ethnic and national groups.

146. Sociology of Religion. (4) II.

Lecture—4 hours. Prerequisite: 8 units of sociology or consent of instructor. The relationship between social structures and religions. The social setting of the major world religions. Religious innovators and institutionalization (churches, sects, cults). Secularization in the modern world and the rise of secular ideologies.

148. Collective Behavior. (4) III.

Lecture—4 hours. Prerequisite: course I or consent of instructor. Analysis of the characteristics, causes and consequences of noninstitutionalized collective actions; fads, panics, expressive crowds, riots, social and revolutionary movements.

150. Criminology. (4) III.

Lecture—4 hours. Prerequisite: 8 units of social science or consent of instructor. Sociological analysis of criminal behavior in relation to social structure and the criminalization process.

152. Juvenile Delinquency. (4) II.

Lecture—4 hours. Prerequisite: 8 units of sociology or psychology. Study of juvenile delinquency in relation to the family, peer groups, community, and institutional structures. Consideration of processing of the delinquent by formal agencies of control, with special attention given to the juvenile court. Mr. Lemert

154. Sociology of Medicine. (4) I.

Lecture—4 hours. Prerequisite: 4 units of sociology. An overview of sociological research in medicine and health care, with emphasis on the organizational and institutional aspects.

The Staff

155. Sociology of Law. (4) III.

Lecture—4 hours. Prerequisite: 8 units of social science. Law considered as social control; relation of legal institutions to society as affecting judicial decision making and administration of justice. Lawyers as an occupational group. Legal reform. Mr. Lemert

159. Sociology of Occupations. (4) II.

Lecture—4 hours. Prerequisite: 8 units of sociology or consent of instructor. The natural history of occupations; the institutional matrix of occupations; colleague and client relationships; occupational social controls; career lines, and occupational-related self-definitions; occupational politics. The Staff

160. Work and Leisure. (4) II.

Lecture—4 hours. Prerequisite: course 1. Historical and comparative analysis of problems associated with quality of work and quantity of leisure; impact of cultural and social change on occupational pattern and leisure activity.

165A. Sociological Theory. (4) I.

Lecture—4 hours. Prerequisite: 8 units of sociology. A historical introduction to sociological theory with special reference to its European origins. The development of modern sociological theory in Europe by Durkheim, Weber, Simmel, Pareto, Mosca and others. Mr. Mayhew

165B. Sociological Theory. (4) II.

Lecture—4 hours. Prerequisite: 8 units of sociology. Contemporary sociological theory with special reference to the history of American sociology and the emergence of contemporary schools of thought in the United States. Schools discussed will include functionalism, symbolic interactionism, exchange theory, and ecology.

170. Population. (4) I.

Lecture—4 hours. Prerequisite: 8 units of social science or consent of instructor. Introduction to the study of human population, including theories and statistical measures; social causes and consequences of population trends; changes in population structure; geographical distribution; migration; socio-psychological factors affecting fertility. Mr. Scott

173. Sociology through Literature. (4) II.

Lecture—4 hours. Prerequisite: 4 units of sociology. Introduction to analysis of literature as sociological data. Reading of numerous works on American and other societies by authors such as Steinbeck, Lewis, Dreiser, Schulberg, Orwell, etc. Mr. McEvoy

175. Sociology of Communication. (4) II.

Lecture—4 hours. Prerequisite: course 46B. Studies of mass communications, media, and public opinion; theories of information flow, ideology, group and personal influence on opinion formation. The Staff

176. Sociology of Knowledge. (4) III.

Lecture—4 hours. Critical analysis of the social foundations of knowledge in society. The history, problems, and dilemmas in classical sociology of knowledge. Contemporary applications. Natural and social sciences as social systems. Sociology of personal knowledge in everyday life.

180. Complex Social Organization. (4) II.

Lecture—4 hours. Prerequisite: course 1 or consent of instructor. Institutional analysis of administrative structures and voluntary associations; consideration of informal organization, ideologies, bureaucracy, decision making, and morale in selected areas of government, industry, religion, and education. Mr. Hackett

185. Sociology of Social Welfare. (4) I.

Lecture—4 hours. Prerequisite: course 3 and upper division standing. A sociological analysis of the evolution and current organization of welfare functions in modern societies.

197T. Tutoring in Sociology. (1-4) I, II, III.

Prerequisite: upper division standing in sociology and consent of Department Chairman. The Staff (Mr. Mayhew in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. The Staff (Mr. Hirschi in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

Prerequisite: open to seniors only. The Staff (Mr. Hirschi in charge)

Graduate Courses**205. Methodological Critique of Research. (4) III.**

Lecture and discussion—3 hours. Prerequisite: course 46B or consent of instructor. Methodological analysis and criticism of empirical research exemplifying different types of research design. Examination of surveys, experiments, historical and comparative studies, and studies using biographical and demographic data.

207A-207B. Methods of Quantitative Research. (4-4) II-III.

Lecture—3 hours; paper. Prerequisite: course 106 or equivalent. Principles of study design, examination of measurement, survey research methods and multivariate analysis. Course will stress actual practice of techniques. Students will carry out quantitative data analysis using packaged computer programs. (Deferred grading, pending completion of sequence.)

219A-219B. Behavioral Political Sociology. (4-4) I-II.

Seminar—4 hours. Prerequisite: graduate status in sociology, political science or psychology. Development of behavioral and empirical political sociology; study of conflict, discontent, community politics, the international system, game theory, and coalition formation. Empirically grounded theories. Mr. McEvoy

220. Deviance, Law, and Social Control. (4) I.

Seminar—3 hours. Prerequisite: course 120 or consent of instructor. Report and discussions of literature on selected forms of deviance in relation to law and formal social control. Agency contacts and exploratory research projects. Mr. Lemert

222. Sociology of Youth. (4) I.

Seminar—3 hours. Adolescence as a social category which "juvenilizes" the young; its prolongation in industrial societies; adolescence and "identity"; age-graded subcultures and their relation to other minority subcultures; youth and popular culture.

224. Sociology of Education. (4) II.

Seminar—3 hours. Structural differentiation of and relationship among socializing agencies. Comparison of educational institutions among societies. Industrialization and secularization. Political control, education and occupational placement, professionalization of educators. Current trends and recent research. Mr. Scott

226. Sociological Social Psychology. (4) II.

Lecture—2 hours; discussion—2 hours. Prerequisite: course 126 or consent of instructor. Advanced study of approaches to sociological social psychology with particular attention to symbolic interactionism and ethnomethodology. The Staff

NOTE: For key to footnote symbols, see page 191.

230. Ethnic Race Relations. (4) III.

Lecture—3 hours; paper. Advanced study of the determinants of ethnic groupings and their interrelationships. Major theme will be the patterns of ethnic stratification and causes of ethnic conflict. Specific focus upon dominance and resistance to dominance. Influence of social science research. Mr. Jorgensen

242. Comparative Method in Historical Sociology. (4) III.

Lecture and discussion—3 hours. Prerequisite: course 142 or consent of instructor. Comparative approaches to major historical phenomena such as nationalism, bureaucratization, feudalism, and capitalism; the relevance of psychological and sociological theories to historical interpretation; the verifiability of historically grounded hypotheses; the meaning of analogy, correspondence, and causality.

243. Urban Society. (4) III.

Seminar—3 hours; paper. Broad overview of the issues and concerns of the field of urban sociology. Special emphasis on the human experience of urban living in contemporary, cross-cultural or historical settings. Ms. Lofland

248. Social Movements. (4) II.

Lecture-discussion—4 hours. Prerequisite: graduate standing, undergraduates with consent of instructor. Advanced study of selected aspects of social and revolutionary movements. Particular focus upon the relations between internal organization of movements; kinds and amounts of change sought; strategies and tactics adopted; and the structure of and impact on the larger society. Ms. Lofland

255. Sociology of Law. (4) III.

Seminar—4 hours. Prerequisite: consent of instructor. Analysis of the nature of the legal process and its impact on social behavior. Will consider 1) nature and function of law, 2) the organization and administration of law, and 3) the capacity of law to affect social behavior. Ms. Weitzman

265. Sociological Theory. (4) II.

Lecture and discussion—3 hours. Prerequisite: courses 165A, 165B; or consent of instructor. The emergence of sociological thinking as part of the history of ideas; the application of sociological analysis to sociological ideas. The French sociological tradition from Saint-Simon to Durkheim; the influence of Marxist thinking on subsequent sociological ideas.

280. Organizations and Institutions. (4) II.

Seminar—3 hours. Prerequisite: course 180 or consent of instructor. Theory of formal organizations and bureaucracy. Methods of research in organizational and institutional studies. Historical and comparative analysis of political, religious, educational, military and economic structure. Mr. Hackett

288. Research Preceptorship. (1-9) I, II, III.

Prerequisite: consent of instructor.

The Staff

290. Seminar. (4) I, II, III.

Seminar—3 hours. (S/U grading only.)

The Staff (Chairman in charge)

292A-292B-292C. Field Research. (4-4-4) I-II-III.

Seminar—3 hours. Prerequisite: graduate standing. Perspective, logic, and techniques of qualitative social research and analysis; the nature and uses of intensive interviewing, participant observation, and analytic ethnography. Application of field research principles is stressed: each participant develops, conducts, and completes a three-quarter field work project. (Deferred grading only, pending completion of sequence.) Ms. Lofland

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Individual Study. (1-9) I, II, III.

(S/U grading only.)

The Staff (Chairman in charge)

SOIL SCIENCE

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 101 and 182.

Related Courses. See *Plant Science 216 (Principles of Plant Nutrition)*; *Resource Sciences 108 (Mineral Elements in Food Chains)*; *Water Science 116 (Processes of Soil and Water Pollution)*, *200 (Water-Soil-Plant Relationships in Irrigation Programming)*, *250 (Physics of Soil and Water Movement)*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Course***88. Land and Life. (2) I.**

Lecture—2 hours. Earth as a life support system. Relationships between land and life crucial to man's increasing demands on land resources. Mr. Munns

Upper Division Courses**105. Field Studies of Soil Resources. (8)**

(Extra Session—Summer)

On campus—1 week daily; study tour—daily 5 weeks. Recommended: course 88 or Soil and

Water Science 2. *In situ* soil studies with emphasis on the interactions between soil characteristics and kinds of land use. Field identification and evaluation of soils for agricultural, range, forest, urban, and other uses.

Mr. Begg, Mr. Huntington

109. Soil Fertility and Fertilizers. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Soil and Water Science 2 or consent of instructor. Forms and availability of plant nutrient elements in soils; effects of fertilizers and soil amendments on crop and soil characteristics; conduct and interpretation of soil fertility assays.

Mr. Reisenauer

111. Geomicrobiology. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: general chemistry and an introductory course in biology. Major groups of microorganisms in the geosphere and their responses to environmental variables. Activities of microorganisms in relation to water pollution, solid waste disposal, pesticide degradation, and soil fertility.

Mr. Broadbent

120A. Soil Genesis and Morphology. (2) II.

Lecture—2 hours. Prerequisite: Soil and Water Science 2; Geology 1 or 2. Basic principles of geomorphology; soil forming factors and processes as they influence the genesis and characteristics of soil properties.

Mr. Begg

120B. Soil Classification, Mapping, and Evaluation. (3) III.

Lecture—2 hours; laboratory or field—3 hours. Prerequisite: course 120A. Basic principles underlying various systems of soil classification and mapping; methods of evaluating and rating soils for land use.

Mr. Huntington

122. Salt-Affected Soils. (3) II.

Lecture—3 hours. Prerequisite: consent of instructor; a course in soil chemistry and either plant physiology or plant nutrition recommended. Soil problems in salt-prone arid zone climates; origin and encroachment of salts; chemical interactions with soil minerals under alkaline situations; salinity control in relation to environmental quality; physiological characteristics of native and crop plant species governing salt tolerance and sensitivity. Offered in even-numbered years.

Mr. Whittig, Mr. Rains

150. Soil and Plant Testing. (3) III.

Lecture—3 hours. Prerequisite: introductory course in soil science; knowledge of quantitative analytical techniques and soil-plant interrelationships recommended. Methods and interpretation of soil and plant analyses for the diagnosis of problems associated with the mineral nutrition of plants.

Mr. Brown

198. Directed Group Study. (1-5) I, II, III.

Directed group study in soil science for advanced undergraduates.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses

207. Soil Physics. (3) II.

Lecture—3 hours. Prerequisite: Mathematics 22C or consent of instructor; Soil and Water Science 101 recommended. Physical processes occurring in soils with emphasis on heat flow, diffusion of gases and solutes, the movement of soluble materials during leaching and irrigation, mechanics, and applications of physics and mathematics to soil systems. Offered in even-numbered years.

Mr. Rolston

208. Soil-Plant Interrelationships. (3) III.

Lecture—3 hours. Prerequisite: Botany 111B; Soil and Water Science 104; or consent of instructor. Advanced course on the effects of soil factors on plant development; the influence of soil conditions, processes, and reactions on metabolic reactions in plants; effects of plant root activity on the nature of the rhizosphere.

Mr. Rendig

211. Soil Microbiology. (2) II.

Lecture—2 hours. Prerequisite: Chemistry 8B, Soil and Water Science 102, or consent of instructor. Activities of some important groups of soil microorganisms, metabolism of organic substances in soil including pesticides; influence of microbial activities on soil properties, microbial activities in soil in relation to some environmental problems.

Mr. Broadbent

***214. Soil Mineralogy. (5) I.**

Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: a course in soil chemistry or consent of instructor. Nature, properties, and occurrence of the more common minerals in soils and rocks. Application of mineral analysis methods, including X-ray, thermal and chemical for characterization of mineral systems, and in the study of properties of soils and weathering of minerals. Offered in even-numbered years.

Mr. Whittig

215. Physical Chemistry of Soils. (3) III.

Lecture—3 hours. Prerequisite: Chemistry 107B or 110B, or consent of instructor. Physicochemical, colloidal, and surface aspects of the soil system. Offered in even-numbered years.

Mr. Burau

NOTE: For key to footnote symbols, see page 191.

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: graduate standing in soil science, plant physiology, or related subjects. Topics of current interest in soil science, including research recently carried out by students, will be discussed. Each student will prepare and present reports to the seminar. (S/U grading only.) Mr. Delwiche

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Rendig in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)
The Staff (Mr. Rendig in charge)

SOIL AND WATER SCIENCE

Major Advisers.—See *Class Schedule* listing.

Major Program and Graduate Study.—See pages 101 and 182.

Related Courses. See *Resource Sciences 108 (Mineral Elements in Food Chains)*; *Soil Science*; *Water Science*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses**1. Soil, Water, and Air Resources. (3) I.**

Lecture—3 hours. Prerequisite: Biological Sciences 1 or consent of instructor; open to non-majors. Interrelationships of man and environmental factors; utilization and development of renewable natural resources; characteristics of soil, water, and air and their relation to management and planning concepts.

Mr. D. Henderson

2. Soil, Water and Air Resources. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 1 or consent of instructor. Development and properties of soils; sources and properties of water; properties of the atmosphere; technical aspects of management, development, and conservation of soil and water.

Mr. Whittig

Upper Division Courses***101. Physics of Soil and Water Systems. (5) II.**

Lecture—3 hours; discussion-laboratory—4 hours. Prerequisite: course 2; Physics 2B; Mathematics 16B; or consent of instructor. Factors affecting soil physical condition and irrigation; soil texture, structure, aeration, and strength. Principles of soil management; basic concepts of hydraulics, soil water storage and movement, infiltration, water potential, irrigation and drainage. Principles of irrigation practices.

102. Soil and Water Chemistry. (5) II.

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 2 or consent of instructor. Chemical nature of the mineral and organic constituents of soil and of the soil solution; ion exchange and other colloidal

phenomena including the effect of soil amendments and fertilizers; microbiological processes in soils. Mr. Burau

103. Water Quality, Salt Control, and Reclamation. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 102 or consent of instructor. Water quality, water analysis, salinity, salt and plant relations, reclamation of water and soil, infiltration problems, and soil amendments.

Mr. Biggar

104. Soil-Water-Plant Relationships. (4) III.

Lecture—4 hours. Prerequisite: courses 101, 102; Botany 2. Influence of soil properties—physical, chemical, and biological—and of soil water supply on plant growth; availability, uptake, and use of nutrients and water by plants; principles of soil structure, irrigation, and fertilizer management for crop production.

Mr. Hsiao

130. The Soil System. (4) III.

Lecture—3 hours; laboratory or field—3 hours. Prerequisite: course 2 or equivalent, Botany 2, Physics 2B, Chemistry 1B; or consent of instructor. Properties of the solid, aqueous, gaseous, and biotic soil components. Processes involving the soil as a medium for plant growth and as a part of the environment. The soil profile in relation to the terrain.

Mr. Reisenauer, Mr. Brown

140. Principles of Water Science. (4) III.

Lecture—3 hours; laboratory or field—3 hours. Prerequisite: course 2 or equivalent, Botany 2, Physics 2B, Chemistry 1B; or consent of instructor. Sources, distribution, and properties of water; water in the soil-plant-atmosphere system; reclamation of soil and water; the interrelationships between water quality, use, and management, including social, political, and economic considerations.

The Staff (Mr. Scott in charge)

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Rendig in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Mr. Rendig in charge)

SPANISH

Homero Castillo, Ph.D., *Chairman of the Department*
Department Office, 616 Sproul Hall

Professors:

Donald G. Castanien, Ph.D.
Homero Castillo, Ph.D.
¹Antonio Sánchez-Romeralo, Ph.D.

Associate Professors:

Didier T. Jaén, Ph.D.
Daniel S. Keller, Ph.D.
Robert M. Scari, Ph.D.

Assistant Professors:

Reed Anderson, Ph.D.
Carlota B. Cannon, Ph.D.
Guillermo Rojas, Ph.D.
Máximo Torreblanca, Ph.D.

Lecturers:

Fabiola Cuevas, M.A.
Mariano González, Ph.D.
Santiago Rojas, M.A.
Fabián A. Samaniego, M.A.

*The Major Program*

Lower Division Courses.—Required: Spanish 1, 2, 3, and 6, or their equivalents; 27A–27B–27C.

Upper Division Courses.—Required: 36 units of upper division courses including 101A–101B–101C or 102A–102B–102C, 180 or 181, one course in each of the following areas: literature of the Golden Age, nineteenth or twentieth-century Spanish literature, twentieth-century Spanish American literature.

The above requirements must be fulfilled through courses offered by this Department. With the consent of the Chairman, and upon the recommendation of the departmental adviser, exceptions may be allowed in special circumstances.

Students are urged to consult with a departmental adviser, especially in regard to work to be done or work previously done at other institutions.

Majors and prospective majors who participate in the Education Abroad Program must consult with a departmental adviser prior to enrollment in the program.

The Master of Arts Degree

The Department offers courses leading to the M.A. degree in Spanish to students who have completed with distinction the A.B. degree in Spanish, or its equivalent. Candidates will be recommended for admission to graduate studies

in Spanish provided they meet the requirements of the Graduate Division and the Department of Spanish. Detailed information may be obtained by writing to the Chairman, Department of Spanish.

The Degree of Doctor of Philosophy

The Department offers programs of study and research leading to the Ph.D. degree. Detailed information may be obtained by writing to the Chairman of the Spanish Department.

Teaching Major.—Requirements for the teaching major are the same as for the departmental major.

Teaching Minor.—Spanish 1, 2, 3 and 6; 27A–27B–27C, or their equivalents. At least 16 units of upper division work, including Spanish 101A–101B or 102A–102B, 134 or 135; one course in twentieth-century Spanish-American or Spanish literature, or one of the following: Spanish 101C or 102C.

Subject Representative: Mr. Keller.

Portuguese**Lower Division Courses****1. Elementary Portuguese. (4) I.**

Laboratory—2 hours; recitation—3 hours. Portuguese grammar, conversation, and reading.

2. Elementary Portuguese. (4) II.

Laboratory—2 hours; recitation—3 hours. Prerequisite: course 1. Continuation of course 1.

3. Elementary Portuguese. (4) III.

Laboratory—2 hours; recitation—3 hours. Prerequisite: course 2. Continuation of course 2.

Upper Division Courses**104. Survey of Brazilian Literature: Prose Fiction. (4) I.**

Lecture—3 hours; individual and group conferences. Prerequisite: course 3.

105. Survey of Brazilian Literature: Poetry. (4) II.

Lecture—3 hours; individual and group conferences. Prerequisite course 3.

106. Survey of Brazilian Literature: Drama and Essay. (4) III.

Lecture—3 hours; individual and group conferences. Prerequisite: course 3.

NOTE: For key to footnote symbols, see page 191.

Spanish

Departmental Major Advisers.—Mr. Anderson, Mr. Jaén, Mr. Keller, Mr. G. Rojas, Mr. Scari.

Graduate Adviser.—Mr. Castanien.

Lower Division Courses

1. Elementary Spanish. (6) I, II, III.

Laboratory—two ½-hour sessions; recitation—5 hours. The Staff

2. Elementary Spanish. (6) I, II, III.

Laboratory—two ½-hour sessions; recitation—5 hours. Prerequisite: course 1. Continuation of course 1. The Staff

3. Intermediate Spanish. (6) I, II, III.

Laboratory—two ½-hour sessions; recitation—5 hours. Prerequisite: course 2. Continuation of course 2. The Staff

6. Intermediate Spanish: Conversation and Reading.

(3) I, II, III.

Recitation—3 hours. Prerequisite: course 3. Spoken Spanish stressed through class discussion of a variety of selected readings. The Staff

27A–27B–27C. Introduction to the Forms of Hispanic Literature. (3–3–3) I–II–III; II–III–I; III–I–II.

Lecture—3 hours. Prerequisite: course 6. Introductory study of the forms of Spanish and Spanish-American prose and poetry; analysis of particular works. The Staff

34. Mexico in Its Literature. (3) II.

Lecture—3 hours. Introduction to significant literary trends in Mexican literature. Lectures and discussions in English, readings in either English or Spanish of representative works by major contemporary authors. May not be counted as part of the major or minor in Spanish. Mr. G. Rojas

35. Survey of Mexican Culture. (3) III.

Lecture—3 hours. Indian cultural patterns before the discovery of Mexico; development of Mexican civilization during the Spanish conquest, the national period, and the Revolution of 1910. Conducted in English. May not be counted as part of the major or minor in Spanish. Mr. G. Rojas

50A. Hispanic Literary Heritage. (3) I.

Lecture—3 hours. Major works in Spanish literature, from the Medieval Epic to the Golden Age, presented in English translations. Lectures and discussions in English. May not be counted as part of the major or minor in Spanish. Mr. Anderson

50B. Hispanic Literary Heritage. (3) II.

Lecture—3 hours. Major works in Spanish and Latin American literatures, from the nineteenth century to the present, presented in English translations. Lectures and discussions in English. May not be counted as part of the major or minor in Spanish. Mr. Scari

98. Directed Group Study. (1–5) I, II, III.

Prerequisite: consent of instructor and Department Chairman. Primarily for lower-division students. The Staff (Chairman in charge)

Upper Division Courses

100A. Advanced Spanish Conversation. (3) I.

Lecture—3 hours. Prerequisite: course 6. Intensive conversational practice, accurate pronunciation, and language fluency. The Staff

100B. Advanced Spanish Conversation. (3) II.

Lecture—3 hours. Prerequisite: course 6. Intensive conversational practice, accurate pronunciation, and language fluency. The Staff

100C. Advanced Spanish Conversation. (3) III.

Lecture—3 hours. Prerequisite: course 6. Intensive conversational practice, accurate pronunciation, and language fluency. The Staff

101A–101B–101C. Grammar and Composition.

(4–4–4) I–I–III; II–III–I; III–I–II.

Lecture—3 hours; instructor student conferences. Prerequisite: course 6. The Staff

102A–102B–102C. Grammar and Composition for Native Speakers. (4–4–4) I–II–III.

Lecture—3 hours; conferences and reports. Prerequisite: open to students whose native language is Spanish or to those who are bilingual; consent of instructor. Mr. G. Rojas

106. Literature of Colonial Spanish America. (4) I.

Lecture—3 hours; conferences and reports. Prerequisite: course 27C. Study of the most important authors and movements in the various regions of Spanish America to 1810. Mr. Castanien

107. Spanish-American Literature of the Nineteenth Century. (4) II.

Lecture—3 hours; conferences and reports. Prerequisite: course 27C. The literary development of Spanish America between Independence and *Modernismo*. Mr. Jaén

108A. Spanish-American Prose of the Twentieth Century. (4) III.

Lecture—3 hours; conferences and reports. Prerequisite: course 27C. Emphasis on the development of the novel. Offered in odd-numbered years. The Staff

108B. Spanish-American Prose of the Twentieth Century. (4) III.

Lecture—3 hours; conferences and reports.
Prerequisite: course 27C. Emphasis on the essay.
Offered in even-numbered years. Mr. Jaén

109. Spanish Drama of the Golden Age. (4) III.

Lecture—3 hours; conferences and reports.
Prerequisite: course 27C. Offered in even-numbered years. Mr. Sánchez-Romeralo

111. Don Quijote. (4) II.

Lecture—3 hours. Prerequisite: course 27C.
Mr. Castanien

114. Spanish Romantic Literature. (4) I.

Lecture—3 hours; conferences and reports.
Prerequisite: course 27C. Readings and lectures on romantic writers of the first half of the nineteenth century with emphasis on drama and poetry. Offered in even-numbered years.
Mr. Scari

115. Lyric Poetry of the Golden Age. (4) III.

Lecture—3 hours. Prerequisite: course 27C.
Offered in odd-numbered years.
Mr. Sánchez-Romeralo

119. Spanish Novel of the Nineteenth Century. (4) III.

Lecture—3 hours. Prerequisite: course 27C.
Offered in odd-numbered years. Mr. Scari

120A. Twentieth-Century Spanish Prose. (4) I.

Lecture—3 hours. Prerequisite: course 27C.
Mr. Anderson

120B. Twentieth-Century Spanish Drama. (4) III.

Lecture—3 hours. Prerequisite: course 27C.
Offered in odd-numbered years. Mr. Anderson

120C. Twentieth-Century Spanish Poetry. (4) III.

Lecture—3 hours. Prerequisite: course 27C.
Offered in even-numbered years.
Mr. Sánchez-Romeralo

125A. Modernism: The Precursors. (4) I.

Lecture—3 hours. Prerequisite: course 27C.
Offered in even-numbered years. Mr. Castillo

125B. Modernism: The Major Poets. (4) II.

Lecture—3 hours. Prerequisite: course 27C.
Offered in even-numbered years. Mr. Castillo

127. Poetry of Post-Modernism and Vanguardism. (4) III.

Lecture—3 hours; conferences. Prerequisite: course 27C. Offered in even-numbered years.
Mr. Castillo

128. Contemporary Spanish-American Short Story Writers. (4) II.

Lecture—3 hours; conferences and reports.

Prerequisite: course 27C. Literary trends in the development of the short story in Spanish America as seen in the representative works of major contemporary authors. Offered in even-numbered years.
Mr. Castillo

129. The Mexican Novel. (4) III.

Lecture—3 hours; conferences and reports.
Prerequisite: course 27C; consent of instructor.
Major figures in the development of the Mexican novel. Offered in odd-numbered years.
Mr. G. Rojas

131A. Modern Spanish Syntax. (4) I.

Lecture—3 hours. Prerequisite: course 101C or consent of instructor. Mr. Keller

131B. Modern Spanish Syntax. (4) II.

Lecture—3 hours. Prerequisite: course 101C or consent of instructor. Mr. Keller

132. Introduction to Spanish Linguistics. (3) III.

Lecture—3 hours. Prerequisite: course 101C. Principles of classical phonemics and morphemics together with more recent developments; descriptive analysis of modern Spanish sounds and forms. Theoretical and practical comparison with English and other Romance Languages.
The Staff

134. Survey of Spanish Culture. (4) I.

Lecture—3 hours. Prerequisite: course 27C.
Mr. González

135. Survey of Mexican Culture. (4) III.

Lecture—3 hours; conferences and reports.
Prerequisite: course 27C; consent of instructor.
Offered in even-numbered years. Mr. G. Rojas

138. Contemporary Spanish-American Drama. (4) II.

Lecture—3 hours; conference and reports.
Prerequisite: course 27C. Study of major authors, significant trends, as well as origins and development of the genre.
Mr. Keller

149. Order and Chaos: Latin American Literature in Translation. (4) I

Lecture—3 hours; conferences and reports. Reading, lectures, and discussion in English of works by Neruda, Vallejo, Borges, García Márquez, Paz, and others. May not be counted toward major in Spanish.
Mr. Jaén

150. Masterpieces of Spanish Literature. (4) I.

Lecture—3 hours. Reading, lectures, and discussion in English. May not be counted as part of the major in Spanish.
Mr. Scari

151. Study of a Major Writer. (4) I, II, III.

Lecture—3 hours. Prerequisite: course 27C. May be repeated for credit with consent of instructor.
The Staff

NOTE: For key to footnote symbols, see page 191.

175. Introduction to Literary Theory and Criticism. (4) II.

Lecture—3 hours; conferences. Prerequisite: course 27C. Basic concepts for the analysis of literature with emphasis on Spanish literary and critical theory applied to Spanish literature.

Mr. Jaén

180. History of Spanish Literature. (4) III.

Lecture—3 hours. Prerequisite: open only to majors in their senior year; consent of instructor.

Mr. Scari

181. History of Spanish-American Literature. (4) II.

Lecture—3 hours; conferences and reports. Prerequisite: open only to majors with senior standing; consent of instructor.

Mr. Keller

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor and Department Chairman.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Chairman in charge)

Graduate Courses**200. Techniques of Literary Scholarship. (4) III.**

Seminar—3 hours. Elements of bibliography and fundamental methods of literary research. (S/U grading only.)

Mr. Castanien

210. Literary Criticism: Poetry. (4) I.

Seminar—3 hours. Offered in odd-numbered years.

Mr. Castillo

230A. History of the Spanish Language. (4) I.

Seminar—3 hours. Prerequisite: Latin 1.

The Staff

230B. History of the Spanish Language. (4) II.

Seminar—3 hours. Prerequisite: Latin 1.

The Staff

231A. Spanish Literature of the Golden Age: Lyric Poetry. (4) I.

Seminar—3 hours. Sixteenth-century currents in Spanish poetry. Offered in odd-numbered years.

Mr. Sánchez-Romeralo

231B. Spanish Literature of the Golden Age: Lyric Poetry. (4) II.

Seminar—3 hours. Seventeenth-century currents in Spanish poetry. Offered in even-numbered years.

Mr. Sánchez-Romeralo

231C. Spanish Literature of the Golden Age: Prose Non-Fiction. (4) II.

Seminar—3 hours. Offered in odd-numbered years.

Mr. Castanien

231D. Spanish Literature of the Golden Age: Prose Fiction. (4) II.

Seminar—3 hours. Offered in even-numbered years.

Mr. Castanien

231E Spanish Literature of the Golden Age: The Drama. (4) II.

Seminar—3 hours. Offered in odd-numbered years.

Mr. Sánchez-Romeralo

232. Cervantes. (4) I.

Seminar—3 hours. The major works of Cervantes and of the principal Cervantine critics. Offered in odd-numbered years.

Mr. Castanien

233. Medieval Spanish Literature. (4) II.

Seminar—two 1½ hour sessions. Study of the main genres of the Spanish Medieval period. Emphasis on the essential characteristics of medieval literature with attention given to at least one representative work of each genre. Offered in odd-numbered years.

The Staff

234A. Twentieth-Century Spanish Poetry (4) I.

Seminar—3 hours. From 1898 up to the Generation of 1927.

Mr. Sánchez-Romeralo

234B. Twentieth-Century Spanish Poetry. (4) II.

Seminar—3 hours. New trends in Spanish poetry from 1927 to the present.

Mr. Sánchez-Romeralo

235A. Twentieth-Century Spanish Prose. (4) I.

Seminar—3 hours. Offered in odd-numbered years.

Mr. Anderson

235B. Twentieth-Century Spanish Prose. (4) II.

Seminar—3 hours. Offered in even-numbered years.

Mr. Anderson

236. Twentieth-Century Spanish Thinkers. (4) III.

Seminar—3 hours. Major thinkers from Gaiquer to Unamuno and Ortega y Gasset. Emphasis will be placed on the relationships between Spanish thought and European philosophical currents. Offered in even-numbered years.

Mr. Scari

237. Spanish Romanticism. (4) I.

Seminar—3 hours. Sources and development of Romanticism in Spain, particularly in poetry and drama. Offered in odd-numbered years.

Mr. Scari

238A. Spanish-American Drama: 1880-1930. (4) III.

Seminar—3 hours. Offered in odd-numbered years.

Mr. Keller

238B. Spanish-American Drama: 1930 to Present. (4) III.

Seminar—3 hours. Offered in even-numbered years.

Mr. Keller

239. Post-Romantic Spanish Literature of the Nineteenth Century. (4) II.

Seminar—3 hours. Offered in even-numbered years. Mrs. Cannon

241A. Spanish-American Novel, 1900–1920. (4) I.

Seminar—3 hours. Offered in even-numbered years. Mr. Castillo

241B. Spanish-American Novel, 1920–1940. (4) II.

Seminar—3 hours. Offered in odd-numbered years. Mr. Castillo

242. New Trends in Spanish-American Fiction from 1940 to the Present. (4) III.

Seminar—3 hours. Offered in odd-numbered years. Mr. Castillo

245. Darío and His Contemporaries. (4) II.

Seminar—3 hours. Offered in even-numbered years. Mr. Castillo

247. New Directions in Spanish-American Poetry. (4) III.

Seminar—3 hours. Offered in even-numbered years. Mr. Castillo

248. The Spanish-American Essay. (4) II.

Seminar—3 hours. Major Spanish-American essayists from Sarmiento to Octavio Paz. Offered in odd-numbered years. Mr. Jaén

251. Study of A Major Writer. (4) I, II, III.

Seminar—3 hours. The development of one major writer and his intellectual and literary milieu. May be repeated for credit with consent of instructor. The Staff

299. Research. (2–5) I, II, III.

The Staff (Chairman in charge)

Professional Courses

300. The Teaching of Spanish. (3) III.

Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in Spanish. Mr. Samaniego

390. Problems in Teaching Spanish at College Level. (1) I.

Discussion—1 hour. Prerequisite: graduate standing. Theoretical instruction in modern teaching methods and demonstration of their practical application. Intended primarily for graduate teaching assistants. Mr. Samaniego

SUBJECT A

Program Office, 906 Sproul Hall

Lecturer and Supervisor of Instruction:
Karl F. Zender, Ph.D.



Subject A. English Composition (no credit). I, II, III.

Lecture—2 hours; discussion—2 hours. Principles of composition, with special emphasis on precision and exactness of sentences. The Staff

SURGERY

John D. Wheat, D.V.M., *Chairman of the Department*
Department Office, 1319 Haring Hall

Professors:

Robert M. Cello, D.V.M.
Robert L. Leighton, V.M.D.
Gordon H. Theilen, D.V.M.
John D. Wheat, D.V.M.

Thomas G. Kawakami, Ph.D. (*Pathology*)
Lionel W. Richards, D.D.S.
Charles T. Robinson, D.V.M.
Alida P. Wind, M.V.D.



Associate Professors:

I. M. Gourley, D.V.M., Ph.D.
Terrell A. Holliday, D.V.M., Ph.D.
Dennis M. Meagher, D.V.M., Ph.D.

Upper Division Course

199. Special Study for Advanced Undergraduates. (1–5) I, II, III.

The Staff (Mr. Wheat in charge)

Assistant Professors:

Robert Hart, M.R.C.V.S., D.V.A.
Robert D. Norrie, D.V.M.

Graduate Courses

205. Advanced Veterinary Clinical Neurology. (1) III.

Laboratory—2 hours. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. Extension of neurology portions of 204 and Veterinary Medicine

Lecturers:

S. Gary Brown, D.V.M.
David A. Fagan, D.D.S.

NOTE: For key to footnote symbols, see page 191.

250. Some special techniques of neurological examination, electroencephalography, electromyography, and neuroradiography. Discussions emphasizing the anatomical, physiological, and pathological basis of the techniques and interpretation of the results. Mr. Holliday

206. Clinical Oncology. (3) II.

Lecture—2 hours; laboratory—2 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. A study of neoplastic diseases of animals.

Mr. Theilen, Mr. Ling

208. Advanced Small Animal Surgery. (2) III.

Lecture—1 hour; laboratory—3 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Comprehensive review of the surgical diseases encountered with particular attention to those of the cat. Illustrated by slides, demonstrations, and current cases from the Veterinary Medical Teaching Hospital. Limited enrollment. Mr. Leighton

213. Veterinary Ophthalmology. (2) III.

Lecture—2 hours. Prerequisite: course 204E or consent of instructor. Selected topics relating to the eye and its diseases. Mr. Cello

214. Ophthalmic Surgery. (1) III.

Laboratory—2 hours. Prerequisite: consent of instructor. Technics of eye surgery in domestic animals. Limited enrollment. Mr. Cello

220. Introductory Surgery. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Pathology 122C, Physiological Sciences 140B. Principles of surgery and surgical technique. Surgery Staff

221. Veterinary Surgery. (5) II.

Lecture—4 hours; laboratory—3 hours. Prerequisite: course 220 or consent of instructor.

Surgery Staff (Mr. Wheat in charge)

222. Techniques of Small Animal Surgery. (5) III.

Lecture—4 hours; laboratory—3 hours. Prerequisite: junior standing in the School of Veterinary Medicine or consent of instructor.

Surgery Staff

223. Experimental Surgery. (3) II.

Lecture—1 hour; laboratory—2 hours and two 3-hour laboratories. Prerequisite: graduate standing or consent of instructor. Basic course in experimental surgery with emphasis on the principles of surgical technique, experimental animal care, and anesthesia. Mr. Gourley

298. Group Study. (1-2) I, II, III.

The Staff (Mr. Wheat in charge)

299. Research. (1-9) I, II, III.

The Staff

Professional Courses

410. Small Animal Surgery. (1½ per week) I, II, III.

Laboratory—50 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for preoperative preparation of hospital patients, assistance at operating and postoperative care under the supervision of the senior surgical staff. Provides experience in orthopedic and general surgery in small animals. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Leighton in charge)

411. Small Animal Surgery. (1½ per week) I, II, III.

Laboratory—50 hours. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for care of pet animal patients in the hospital including physical examinations, presurgical work-ups, surgery, postoperative care and followup under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Leighton in charge)

412. Large Animal Surgery. (1½ per week) I, II, III.

Laboratory—50 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for care of surgical patients in the hospital and outpatient clinic including physical examinations, presurgical work up, assistance at operations, surgery, post-surgical care and follow-up under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Wheat in charge)

414. Veterinary Anesthesiology. (1½ per week) I, II, III.

Laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for anesthetic care of patients in the operating rooms under the supervision of the senior staff. May be repeated for credit. (S/U grading only.)

The Staff (Mr. Hart in charge)

420. Veterinary Neurology. (1½ per week) I, II, III.

Laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns and residents responsible for care of hospital and outpatients including history taking, neurologic examinations and special diagnostic and therapeutic procedures under the direction of the staff neurologist. (S/U grading only.) Mr. Holliday

422. Veterinary Ophthalmology. (¾ to 1½ per week) I, II, III.

Laboratory—25-50 hours. Prerequisite: professional standing, intern or resident in Veteri-

nary Medical Teaching Hospital, or consent of instructor. Interns and residents responsible for the care of animals in the hospital and outpatient clinic including history taking, ophthalmologic examinations, special diagnostic techniques, assistance at ophthalmologic surgery and medical and post surgical care under the direction of the staff ophthalmologist. May be repeated for credit. (S/U grading only.) Mr. Cello

492. Large Animal Grand Rounds. (1/2) I, II, III.

Discussion—1 hour. Prerequisite: professional standing; intern or resident in Veterinary Medical Teaching Hospital or consent of instructor. Interns and residents take an active part in the presentation and discussion of selected cases from the large animal and ambulatory clinics. May be repeated for credit. (S/U grading only.) The Staff (Mr. Wheat in charge)

SWEDISH

Department Office, 416 Sproul Hall

Lower Division Courses

1. Elementary Swedish. (6) I.

Discussion—5 hours; language laboratory—two 1/2-hour sessions. Mr. Sammern-Frankenegg

2. Elementary Swedish. (6) II.

Discussion—5 hours; language laboratory—two 1/2-hour sessions. Prerequisite: course 1. Mr. Sammern-Frankenegg

3. Elementary Swedish. (6) III.

Discussion—5 hours; laboratory—two 1/2-hour sessions. Prerequisite: course 2. Mr. Sammern-Frankenegg

TEXTILES AND CLOTHING

Major Advisers.—See *Class Schedule* listing.

Major Program.—See page 102.

Related Courses. See *Consumer Science and Design.*

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Note.—Each course (includes lower division, upper division, and graduate courses) is listed under one of the following groups:

- a) Clothing
- b) Textiles
- c) Field, Group, and Special Study

a) CLOTHING

7. Clothing and the Individual. (2) I, III.

Lecture—2 hours. Prerequisite: Psychology 1A or 10. The relation of the self-concept and of the human form to elements of design as expressed through clothing. Miss Engel

17A. Clothing Structure. (3) I, II, III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 6, 7 (may be taken concurrently.) Principles of clothing design through the medium of drafting and flat pattern. Construction principles are applied. Mrs. Pontrelli

17B. Clothing Structure. (3) I, II, III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 17A. Principles of clothing design through the medium of draping in various textile fabrics. Mrs. Pontrelli

170. Experimental Problems in Clothing Structure. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 6 and 17B; Design 170B. Design and construction of body coverings utilizing technological innovations in fabrics and new techniques such as fusing and molding. The Staff (Mr. Zeronian in charge)

172. Clothing and Society. (3) II.

Lecture—3 hours. Prerequisite: Economics 1A; Psychology 1A or 10; and a course in sociology or cultural anthropology. The relation of clothing and textiles to social, psychological and economic patterns of families and cultures. Miss Engel

b) TEXTILES

6. Introduction to Textiles. (3) I.

Lecture—2 hours; laboratory—3 hours. Introduction to the structure and properties of textiles. Consumer use and fabric characteristics are emphasized. Miss Morris

160. Textile Fibers and Finishes. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 6 and Chemistry 8B. Properties of textile fibers in relation to performance and end-use; dyeing and finishing of fabrics; textile maintenance. Mr. Needles

161. Textile Chemistry. (3) I.

Lecture—3 hours. Prerequisite: course 160. The theory of fiber structure; the relation be-

NOTE: For key to footnote symbols, see page 191.

tween chemical structure and physical properties of fibers. The principles of the application of dyes and finishes to textiles. Mr. Zeronian

161L. Textile Chemistry Laboratory. (2) I.

Laboratory—6 hours. Prerequisite: course 161 (may be taken concurrently). Laboratory methods and procedures employed in studying chemical and physical properties of textile fibers. Mr. Zeronian

162. Textile Fabrics. (3) II.

Lecture—3 hours. Prerequisite: course 6. Properties of fabrics as related to serviceability, comfort, and appearance. Miss Morris

162L. Textile Fabrics Laboratory. (1) II.

Laboratory—3 hours. Prerequisite: course 162 (may be taken concurrently). Laboratory methods and procedures employed in studying properties of textile fabrics as related to serviceability, comfort, and appearance. Miss Morris

292. Seminar in Textiles. (2) I, II, III.

Seminar—2 hours. Selected topics related to the chemical and physical properties of fibers and fabrics. The Staff (Mr. Zeronian in charge)

c) FIELD, GROUP, AND SPECIAL STUDIES

47. Field Study. (1) III.

Seminar—three 2-hour sessions; field trip—2 days. To observe commercial aspects of the

VEGETABLE CROPS

Related Undergraduate Majors and Graduate Study.—See pages 84, 98, and 182.

Related Courses. See *Plant Science 112 and 112L (Postharvest Physiology and Handling of Horticultural Commodities)*.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Upper Division Courses

100. Principles of Vegetable Crops. (3) I.

Lecture—3 hours. Prerequisite: Plant Science 1 and 2 or consent of instructor. The vegetable industry. Fundamentals of vegetable crop production, handling, processing and utilization. Demonstrations will supplement the lecture. Mr. Lorenz

101. Major Vegetable Crops. (4) II.

Lecture—4 hours. Prerequisite: Plant Science 1 and 2 or consent of instructor. Adaptation, growth habits and methods of culture and handling of the principal vegetable crops. The application of experimental evidence to production problems is stressed. Mr. Harrington

*105. Systematic Olericulture. (2) I.

Laboratory—6 hours. Prerequisite: Botany 2.

design, production, development, distribution and maintenance of textiles and clothing. To be given between the winter and spring quarters. Considered a spring course for preenrollment. (Advance registration required.) Miss Engel

99. Special Study for Lower Division Students.

(1-5) I, II, III.

The Staff (Mr. Zeronian in charge)

197. Introduction to Research in Textiles and Clothing. (4) II.

Lecture—1 hour; laboratory—9 hours. Prerequisite: majors in Textiles with senior standing. Senior thesis on independent problems.

The Staff (Mr. Needles in charge)

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Zeronian in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Zeronian in charge)

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Zeronian in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Zeronian in charge)

Origin, history, types, classification, nomenclature, and adaptation of the more important American vegetable varieties; minor vegetable crops; trends in development of new varieties. Offered in even-numbered years. Mr. Smith

118. Seed Physiology and Production. (3) II.

Lecture—3 hours. Prerequisite: Botany 111B. Physiological factors affecting induction of seedling, seed development, viability and longevity of seed. Principles of seed production. One or more field trips. Mr. Harrington

150. Vegetables as World Food Crops. (3) II.

Lecture—3 hours. Prerequisite: upper division standing or consent of instructor. A technical course concerned with historical and current aspects of production and use of vegetables as human food; ecology, economics, geography, human cultural patterns, dietary preferences, nutritional values, and use of microclimates related to commercial and subsistence production. Mr. Yamaguchi

197. Field Study of Vegetable Industry. (1) III.

Lecture—1 hour; field study—56 hours. Prerequisite: consent of instructor. Field study illustrating different aspects of California agriculture, including research institutions, farm op-

erations, field stations, extension service, marketing, processors, equipment, etc. To be given between winter and spring quarters. Considered a spring course for preenrollment. (P/NP grading only.)
Mr. Flocker

198. Directed Group Study. (1-5) I, II, III.

The Staff (Mr. Lyons in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III. The Staff (Mr. Lyons in charge)

Graduate Courses

212. Postharvest Physiology of Vegetables. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: consent of instructor. Comparative physiology of harvested vegetables representing diverse plant structures; emphasis on experimental studies of maturation, compositional and morphological changes, senescence, and physiological disorders; lecture stresses species responses and requirements; laboratory stresses concepts and research procedures. Offered in even-numbered years. Mr. Morris, Mr. Pratt

220. Vegetable Genetics and Improvement. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Genetics 100B; course 105 and Plant Science 113 recommended. Breeding systems of vegetable species as affected by self-incompatibility, flower structure, pollen vectors, and other reproductive factors. Problems of chromosome

number and structure, heterosis, pest resistance, and species hybrids peculiar to vegetable improvement.
Mr. Rick

221. Vegetable Physiology. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 111B and consent of instructor. Physiological and environmental principles involved in the production of vegetable crop species.
Mr. Pratt, Mr. Rappaport

290. Seminar. (1) I, II, III.

Discussion—1 hour. (S/U grading only.)
The Staff (Mr. Spurr in charge)

291. Seminar in Postharvest Physiology. (1) I, II, III.

Discussion—1 hour. Prerequisite: consent of instructor. Intensive study of selected topics in the field of postharvest physiology of fruits and vegetables. This seminar will be conducted jointly with Pomology 291. (S/U grading only.)
The Staff (Mr. Pratt in charge)

298. Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor. Current concepts, techniques, and procedures applicable to research and to the production of vegetables.
The Staff (Mr. Yamaguchi in charge)

299. Research. (1-9) I, II, III.

(S/U grading only.)
The Staff (Mr. Lorenz in charge)

VETERINARY MEDICINE, School of

William R. Pritchard, D.V.M., Ph.D., J.D., *Dean of the School*

Edward A. Rhode, D.V.M., *Associate Dean—Instruction*

Richard H. McCapes, D.V.M., *Associate Dean—Public Programs*

Jerry R. Gillespie, D.V.M., Ph.D., *Associate Dean—Student Services*

School Office, 1018 Haring Hall

Veterinary Medicine

Upper Division Courses

100. Veterinary Medicine: Orientation. (2-1-1)

I, II, III.

Seminar—1 hour; Laboratory—5 hours; field trips. Prerequisite: first-year standing in School of Veterinary Medicine; consent of instructor. An overview of the Veterinary Medical profession emphasizing its many integrant parts and publics; environmental needs of a wide spectrum of animal species pointing up unique biological characteristics and necessities; breeds recognition; interrelationships of the animal kingdom and mankind. Course runs for 36 weeks. (P/NP grading only.)

Mr. McGowan and staff

101. The Normal Animal, Examination, and Topographic Anatomy. (3) I.

Lecture—2 hours; laboratory—4 hours. Prerequisite: freshman standing in the School of Veterinary Medicine. Anatomic structures, features and landmarks fundamental to an integrated study of organ systems, the performance of physical examination, and routine diagnostic and therapeutic procedures. Course runs for 10 weeks.
Mr. Knight and staff

102. Cell Biology. (12) I.

Lecture—8 hours; discussion—2 hours; laboratory—6 hours. Prerequisite: freshman in Veterinary Medical School standing. Physical-chemical principles underlying biological proc-

esses; intermediary metabolism and its control. Emphasis on structural-functional relationships from the molecular to the tissue level to give a background for understanding animal physiology, metabolic disturbances, and disease. Course runs for 12 weeks. Mr. Black and staff

103. General Principles of Pharmacology. (3) II.

Lecture—2 hours; laboratory-demonstration-discussion—one 2-hour session. Prerequisite: biochemical and cellular bases of veterinary medicine and supra-cellular organizations, or consent of instructor. Designed to provide veterinary medical students with basic foundation for understanding how drugs are used to restore diseased animals to normal health. Lectures-demonstrations-discussions on pharmacokinetics, drug metabolism, pharmacodynamics, toxicity, and pharmacotherapeutics. Course runs for 10 weeks. Messrs. Conzelman, Giri, Joy, Peoples

104. Fundamentals of Radiography. (1½) II.

Lecture—12 hours; laboratory—2 hours. Prerequisite: freshman standing in the School of Veterinary Medicine. The production of x-rays, description of x-ray-producing equipment, utilization of accessory equipment, principles of film processing, preparation of technique chart, and principles of positioning. Course runs for 10 weeks. Mr. Morgan and staff

120. Musculoskeletal Basis of Locomotion. (5) II.

Lecture—1 hour; laboratory—6 hours. Prerequisite: normal animal, examination, and topographic anatomy; biochemical and cellular bases of veterinary medicine; first-year standing in School of Veterinary Medicine. Gross, subgross, light microscopic, electron microscopic, functional anatomy of the musculoskeletal system of selected domestic animals. Course runs for 16 weeks. Messrs. Kitchell, Julian, Lohse

121. Neurosciences. (6½) II.

Lecture—4 hours; laboratory—3 hours. Prerequisite: normal animal, examination and topographic anatomy; biochemical and cellular basis of veterinary medicine; first-year standing in School of Veterinary Medicine. An integrated study of the nervous system relating anatomy, physiology, pharmacology, and animal behavior to veterinary medicine. Course to run for 13 weeks. Messrs. Kitchell, Scobey, Joy, Sprague

125. Cardiopulmonary and Renal Systems: Normal Form and Function. (8) III.

Lecture—56 hours total; laboratory—24 3-hour sessions (discussion-laboratory sessions flexible). Prerequisite: first-year standing in School of Veterinary Medicine. Correlated presentation emphasizing anatomical, physiological and pharmacological aspects of the cardiovascular, respiratory, and renal systems of common domesticated animals. (Homeostatic mechan-

isms governing body fluids and electrolytes will be included.) Course runs for 13 weeks commencing the last part of winter quarter and through spring quarter.

Mr. Dungworth and staff

130. Structure and Function of the Gastrointestinal System. (4) III.

Lecture—26 hours total; laboratory—14 3-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine. The structure and function of the normal gastrointestinal system, including ruminants, as a basis for understanding the disease process. Emphasis will be on integrating morphology and physiology with respect to gastrointestinal secretions, motility, absorption, and allied processes. Course runs for 9 weeks only. Mr. Kaneko and staff

131. Metabolism and Bioenergetics. (2) II.

Lecture—2 hours; Prerequisite: first-year standing in School of Veterinary Medicine. Energetics of metabolic processes and interaction of carbohydrate, lipid, and protein metabolism with emphasis on physiological control mechanisms in animals; factors affecting metabolic control including hormones, nutrition, and development; adaptations involved in homeostasis. Significance of these processes in health and in disease. Mr. Kaneko and staff

180A-180B-180C. Clinic Rounds for Freshmen. (1) I, II, III.

Discussion—1 hour. Prerequisite: freshman standing in Veterinary Medicine School. Basic aspects of clinical diagnosis. (P/NP grading only.) Mr. Knight and Mr. Ling in charge

Graduate Courses

249. Clinics. (2-8) (Summer—Extra Session).

Prerequisite: completion of third-year of study in veterinary medicine. Diagnosis and treatment of animal diseases. Students have responsibility for case records, care of patients, physical examinations, and participation in surgery. Laboratory exercises in restraint, diagnostic and therapeutic procedures, and surgical techniques. (S/U grading only.)

Teaching Hospital Staff (Mr. Cello in charge)

250A. Clinics. (8) I.

Laboratory—24 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Diagnosis and treatment of animal diseases. Students have responsibility for case records, care of patients, physical examinations, and participation in surgery. Laboratory exercises in restraint, diagnostic and therapeutic procedures and surgical techniques. Course runs for 12 full weeks. (S/U grading only.)

Teaching Hospital Staff (Mr. Cello in charge)

250B. Clinics. (8) II.

Laboratory—24 hours. Prerequisite: course 250A. Diagnosis and treatment of animal diseases. Students are responsible for case records, care of patients, physical examinations, and participation in surgery. Laboratory exercises in restraint, diagnostic and therapeutic procedures and surgical techniques. Course runs for 12 full weeks. (S/U grading only.)

Teaching Hospital Staff (Mr. Cello in charge)

250C. Clinics. (7) III.

Laboratory—21 hours. Prerequisite: course 250B. Diagnosis and treatment of animal diseases. Students have responsibility for case records, care of patients, physical examinations, and participation in surgery. Laboratory exercises in restraint, diagnostic and therapeutic procedures, and surgical techniques. Course runs for 12 full weeks. (S/U grading only.)

Teaching Hospital Staff (Mr. Cello in charge)

VETERINARY MICROBIOLOGY

Ernst L. Biberstein, D.V.M., Ph.D., *Chairman of the Department*

Department Office, 2004 Haring Hall

Professors:

Norman F. Baker, D.V.M., Ph.D.

Ernst L. Biberstein, D.V.M., Ph.D.

Hugh S. Cameron, D.V.M., Ph.D., LL.D.
(*Emeritus*)

James R. Douglas, Ph.D. (*Emeritus*)

Michel M. J. Lavoipierre, M.B., Ch.B.

Delbert G. McKercher, D.V.M., Ph.D.

*John W. Osebold, D.V.M., Ph.D.

Moshe Shifrine, Ph.D. (*Adjunct*)

Clyde Stormont, Jr., Ph.D.

Associate Professor:

*Yuan C. Zee, D.V.M., Ph.D.

Assistant Professors:

Audria Matheson, Ph.D.

Jerold H. Theis, D.V.M., Ph.D. (*School of Veterinary Medicine*)

Lecturer:

Edmond C. Loomis, Ph.D.



Upper Division Courses

111. Immunogenetic and Electrophoretic Techniques. (2) I.

Lecture—1 hour; laboratory—3 hours. Prerequisite: Genetics 107 (may be taken concurrently) or consent of instructor. Immunologic and electrophoretic techniques used in the exploration of heritable differences in red cell antigens, serum proteins and enzymes of domestic animals. Mr. Stormont

126. Fundamentals of Immunology. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: an introductory course in microbiology; Biochemistry 101A–101B or the equivalent. The immune response and defenses of the host against infection: antibodies, antibody-antigen

reactions, hypersensitivity, the immune response and its relationship to disease processes.

Miss Matheson

127. Medical Microbiology. (5) I.

Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: Bacteriology 2; a working knowledge in fundamental immunology. Principles of infection and resistance; microbial pathogenicity; the bacterial and mycotic pathogens of man, with emphasis on pathogenic mechanisms and ecological aspects of infectious disease. Mr. Biberstein, Miss Meyer

***128. Biology of Animal Viruses. (3) I.**

Lecture—3 hours. Prerequisite: Biochemistry 101A or the equivalent. Fundamental physical and chemical properties of animal viruses; methods of propagation, purification and assay. Mechanisms of viral replication and pathogenesis of viral infections in man and animals. Immunity to virus diseases and oncogenic properties of animal viruses. Mr. Zee, Mr. Manning

***129. Perspectives in Microbiological Research.**

(2) I.

Lecture—1 hour; discussion—1 hour. Prerequisite: senior or graduate standing, or consent of instructor. Students contemplating careers in research will become familiar with experimental methods of investigation and with trends of current research within various fields of endeavor open to microbiologists. Students will prepare analyses of research papers in current journals. Miss Meyer

***130. Animal Virology Laboratory. (4) II.**

Discussion—2 hours; laboratory—6 hours. Prerequisite: course 128 or consent of instructor. Introduction to laboratory procedures employed in the study of animal viruses. Emphasis placed on propagation, assay, isolation, and identification of animal viruses including viral pathogenesis and serology.

Mr. Zee, Mr. Manning

NOTE: For key to footnote symbols, see page 191.

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

The Staff (Mr. Biberstein in charge)

Graduate Courses**270. Advanced Immunology. (6) III.**

Lecture—3 hours; laboratory—9 hours. Prerequisite: courses 120-123 or 127 or consent of instructor. Dynamics of infection and resistance: antibody production and manifestations of antigen-antibody reactions, immuno-chemistry, hypersensitivity. Immunological considerations of the groups of disease agents. Offered in even-numbered years.

Mr. Osebold,
Miss Matheson, Mr. Shifrine***290. Seminar. (1) I, II, III.**

Seminar—1 hour.

The Staff (Mr. Biberstein in charge)

291. Seminar in Immunology. (1) I, II, III.

Seminar—2 hours, alternate weeks. A discussion of the current topics in immunology.

Mr. Shifrine

292. Seminar in Animal Virology. (1) I, II, III.

Seminar—1 hour. A discussion of the current topics in animal virology. Mr. Zee, Mr. Manning

293. Seminar in Infectious Diseases. (1) I, II, III.

Seminar—2 hours, alternate weeks. A discus-

sion of the current topics in infectious diseases in man and animals. (S/U grading only.)

Mr. Biberstein

294. Seminar in Parasitology. (1) I, II, III.

Seminar—1 hour. A discussion of the current topics in parasitology and entomology.

Mr. Baker

295A-295B-295C. Clinical Microbiology. (1-1-1)

I-II-III.

Discussion—5 hours total; laboratory—6 hours total. Prerequisite: fourth-year standing in School of Veterinary Medicine. Application of laboratory methods to the diagnosis and treatment of infectious animal diseases. (S/U grading only.) Messrs. Baker, Mc Kercher, Biberstein

296. Microbiological Diagnosis. (2-5) I, II, III.

Laboratory—6-15. Prerequisite: consent of instructor; concurrent enrollment in course 293 recommended. Identification of microbial pathogens in clinical and pathological specimens. Casework in Veterinary Medical Teaching Hospital diagnostic laboratory.

Mr. Biberstein

298. Group Study. (1-5) I, II, III.

The Staff (Mr. Biberstein in charge)

299. Research. (1-12) I, II, III.

The Staff (Mr. Biberstein in charge)

VITICULTURE AND ENOLOGY

Related Undergraduate Majors.—See pages 90 and 98.

Related Courses. See *Food Science and Technology; Plant Science 112 and 112L (Postharvest Physiology and Handling of Horticultural Commodities).*

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses**3. Introduction to Wine Making. (3) I, II, III.**

Lecture—3 hours. An introduction to wine technology, including history, fermentation, production practices, wine types, and the wine industry of California and other wine producing areas.

Mr. Singleton, Mr. Amerine

99. Special Study for Undergraduates. (1-5) I, II, III.

The Staff (Mr. Berg in charge)

Upper Division Courses**105. Systematic Viticulture Including Fruit Maturation and Handling. (3) I.**

Lecture—1 hour; laboratory—6 hours. Prerequisite: Plant Science 2 or consent of instructor. Principal fruiting varieties, rootstocks, and species of grapes; environmental factors affect-

ing composition of the fruit during growth and maturation; fruit handling practices for wine, raisin, and table grape production.

Mr. Nelson, Mr. Olmo

116A. General Viticulture. (3) II.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2 or consent of instructor. Principles underlying pruning, training, grafting, and propagation of vines; environmental and economic factors affecting choice of vineyard type and location; establishment of vineyards.

Mr. Cook

116B. General Viticulture. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 116A. Economics and scientific principles of recommended vineyard management practices including irrigation, mineral and carbohydrate nutrition, flower development and fruit set, virus and fungal diseases, and insect control.

Mr. Cook

123. Analysis of Musts and Wines. (3) I.

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: Chemistry 5; Food Science and Technology 103 recommended. The principles and practice of wine analysis.

Mr. Amerine, Mr. Ough

124. Wine Production. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Bacteriology 2; Chemistry 5, 8B. Recommended: Chemistry 10, 107B; Food Science and Technology 107A, 107B, Plant Science 2; and courses 3 and 123. The principles and practice of making the various standard types of wines, with special reference to the grape varieties used and the method of vinification required for each. Mr. Webb

125. Wine Types and Sensory Evaluation. (3) II.

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: Chemistry 8B. Recommended: Food Science and Technology 107A, 107B; and courses 3, 123, and 124. Major types of wines and the factors influencing their quality; principles of sensory evaluation. Mr. Amerine

126. Wine Processing. (3) III.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Bacteriology 2; Chemistry 5, 8B. Recommended: Chemistry 10, 107B; Plant Science 2 and courses 3, 123, 124, and 125. Principles and theory of nonbacterial disorders: metal, tartrate, protein, color, oxidation and their control by clarification, refrigeration, filtration and ion exchange. Mr. Berg

140. Distillation Principles and Brandy Technology. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 5, 8B. Recommended: Chemistry 107B; Food Science and Technology 110A. Principles of distillation including engineering aspects and problems with emphasis upon the alcohol-water system and distillation of wines; brandy types, sensory and chemical analysis and production factors. Offered in odd-numbered years. Mr. Guymon

190. Proseminar in Viticulture. (1) I.

Lecture—1 hour. Prerequisite: consent of instructor. Reports and discussions of recent advances in viticulture. Mr. Olmo

198. Directed Group Study. (1-5) I, II, III.

Prerequisite: consent of instructor.
The Staff (Mr. Berg in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III.

The Staff (Mr. Berg in charge)

Graduate Courses

208. Plant Hormones and Regulators. (3) I.

Lecture—3 hours. Prerequisite: Botany 111B; Chemistry 8B; or consent of instructor. Open to qualified upper division students. History, occurrence, extraction, measurement, chemical nature, developmental and physiological effects, role, and theories of action of plant hormones and growth regulators; methods of application of growth regulators and factors altering effectiveness; application in the control of plant and fruit responses. Mr. Weaver

208L. Plant Hormones and Regulators Laboratory.

(2) I.

Laboratory—6 hours. Prerequisite: course 208 (may be taken concurrently) or consent of instructor. Experiments in plant hormones and regulators using various bioassay methods for auxins, gibberellins, and kinins; preparation and testing of gibberellic acid; extraction and identification of naturally occurring plant hormones. Mr. Weaver

217. Microbiology of Wine Production. (3) III.

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 123, 124; Bacteriology 3; Biochemistry 101A; Chemistry 8B. Recommended: courses 125, 126. Nature development, physiology, biochemistry, and control of yeasts and bacteria involved in the making, aging, and spoilage of wines. Mr. Kunkee

219. Plant Phenolics. (3) III.

Lecture—3 hours. Prerequisite: Biochemistry 101B or equivalent and consent of instructor. Flavonoids and other natural phenolic substances of plants; their chemistry, natural occurrence, biochemistry, relation to animal diets, and relation to properties of foods and other products. Mr. Singleton

290. Seminar. (1) I, II, III.

Seminar—1 hour. Prerequisite: consent of instructor. Mr. Webb

298. Group Study. (1-5) I, II, III.

(S/U grading only.)
The Staff (Mr. Berg in charge)

299. Research. (1-12) I, II, III.

(S/U grading only.)
The Staff (Mr. Berg in charge)

WATER SCIENCE—See also Soil and Water Science, Soil Science

WATER SCIENCE

Related Undergraduate Major.—See page 101.

Related Courses. See Soil Science 207 (Soil Physics);

Soil and Water Science; Engineering: Civil 142 (Water Supply), 143 (Water Resources Engineering), 144 (Ground Water and Seepage), 146 (Hydraulic Engineering Laboratory).

NOTE: For key to footnote symbols, see page 191.

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Courses

10. Water and Man. (3) III.

Lecture—3 hours. Water as a factor in civilization and man's environment. Water supply and utilization problems of agricultural, domestic, industrial, and other water users in developed and developing nations. A cultural and technical course providing an introduction to water science and engineering. Mr. Hagan

40. Ecological Studies of Streams and Ponds. (2)

I, III.

Lecture—2 hours. Prerequisite: introductory course in biology. Analysis of water quality problems resulting from multiple use and effects of man's activities on streams and ponds. Multidisciplinary student teams may design and conduct projects leading to alternative approaches. Mr. Knight, Mr. Biggar

Upper Division Courses

*106. Principles of Soil Water Movement. (3) I.

Lecture—2 hours; laboratory—3 hours. Prerequisite: Soil and Water Science 101 (may be taken concurrently or with consent of instructor). Introduction to basic mechanisms of soil water movement with emphasis on infiltration, evaporation, and redistribution within the soil profile. Laboratory measurements of the forces involved in soil water movement. ———

110A. Irrigation Principles and Practices. (3) II.

Lecture—3 hours. Prerequisite: Physics 2B. General course for engineering and agricultural students. Principles for relating water, soil, plant and atmospheric conditions to irrigation planning and practices. Selecting lands for irrigation, water-soil-plant relations, irrigation requirements for principal crops, irrigation scheduling for maximum efficiency. Mr. Henderson

110B. Irrigation Principles and Practices. (3) III.

Lecture—3 hours. Prerequisite: Physics 2B. General course for engineering and agricultural students. Farm irrigation distribution systems, water measurement, farm water supply including wells and pumping plants, land preparation for irrigation, water application, and drainage requirements. Mr. Henderson

116. Processes of Water and Soil Pollution. (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor. Physical, chemical and biological processes, natural and man-made, that cause pollution of water and soil; nature of pollutants, persistence, and control. Mr. Biggar

120. Ecology of Polluted Waters. (3) II.

Lecture—3 hours. Prerequisite: Biological Sciences I and junior standing. The causes and nature of various types of pollution and their effects upon the aquatic biota. Particular emphasis on biological effects of toxic compounds, inorganic compounds, suspended matter, organic matter, salts and heated water on aquatic life. Mr. Knight

124. Man, Waste and Water Quality. (2) III.

Discussion sessions; nine field trips. Tour designed to acquaint students with selected water and waste treatment facilities as well as research and pilot projects involved in new approaches in water treatment and renovation. Mr. Knight

141. Hydrology. (3) II.

Lecture—3 hours. Prerequisite: consent of instructor. Principles of hydrologic analysis including consideration of precipitation, stream flow and ground water phenomena. Mr. Burgy

150. Water Law and Water Institutions. (3) I.

Lecture—3 hours. Introductory course in water law and institutions. Current problems. Basic principles, with utilization of case-study method. Water rights: kind, acquisition, adjudication, administration and loss. Water organizations and enterprises: kinds, organization, financing, public regulation. Acreage limitation. Water pollution. Mr. Malakoff

160. Water Application Systems. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: senior standing in Soil and Water Science or Civil Engineering, or consent of instructor. Design construction and operation of water-application systems (with emphasis on farm irrigation methods) and appurtenant structures. Preparation of land for irrigation. Problem solving and field and laboratory exercises. Mr. Pruitt

170. Irrigation and Drainage Management in the Field. (6) (Extra Session—Summer).

Lecture—86 hours total; laboratory and field trips—66 hours total. Prerequisite: senior standing in Soil and Water Science or Engineering, or consent of instructor. Discussions, laboratory and field exercises, including assessment of soil and water resources; irrigation methods; soil-plant-water relations; water quality and salinity; drainage; irrigation scheduling; and production economics in irrigated agriculture. The Staff (Mr. Miller in charge)

198. Directed Group Study. (1-5) I, II, III, (Summer)

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III, (Summer)

Prerequisite: senior standing.

The Staff (Chairman in charge)

Graduate Courses

200. Water-Soil-Plant Relationships in Irrigation Programming. (3) III.

Lecture—3 hours. Prerequisite: Soil and Water Science 104 or consent of instructor. Selected topics including prediction of crop responses to irrigation, evapotranspiration and water requirements, production functions, strategy for using limited water supplies, and irrigation planning and operations for optimizing water use and crop production under conditions of developed and developing nations. Mr. Hagan

201. Water in Physiology and Biochemistry of Plants. (3) II.

Lecture—3 hours. Prerequisite: Botany 111B, Chemistry 5. Recommended: Biochemistry 101B; Botany 205A and a course in physical chemistry. Solute-water interactions; water and the structure of biological macromolecules; cell-water relations; physiology and biophysics of water uptake, transport and dissipation by plants; physiology and biochemistry of stomata; water stress and plant metabolism. Mr. Hsiao

202. Evapotranspiration. (2) II.

Lecture—2 hours. Prerequisite: Atmospheric Sciences 20 and 20L, or Agricultural Engineering Technology 111, or consent of instructor. Radiation and energy balances of water, soil and vegetative surfaces and the effects of wind, temperature, humidity thereon. Lysimeter and other measurement techniques. Prediction of evapotranspiration from aerodynamic, energy balance, and empirical approaches. Mr. Pruitt

WILDLIFE AND FISHERIES BIOLOGY

Major Advisers.—See Class Schedule listing.

Major Program.—See page 103.

Related Courses. See Avian Sciences 150 (*Comparative Nutrition of Avian Species*); Entomology 104 (*Insect Ecology*), 116 (*Biology of Aquatic Insects*); Environmental Studies 116 (*The Oceans*), 140 (*Limnology*); Genetics 131 (*Genetics of Animal Adaptations*); Resource Sciences 101 (*Agriculture and Wildlife*); Zoology 105 (*Phylogenetic Analysis of Vertebrate Structure*), 106 (*Functional Analysis of Vertebrate Structure*), 116 (*Principles of Animal Resource Management*), 125 (*Animal Ecology*), 133A and 133B (*Taxonomy and Field Biology of Amphibians, Reptiles, and Fishes*), 136 (*Mammalogy*), 137 (*Ornithology*).

Questions pertaining to the following courses should be directed to the instructor or to the Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Course

2. Wildlife Biology. (4) III.

Lecture—4 hours. Prerequisite: Biological

***215. Advanced Topics in Water and Soil Chemistry. (3) II.**

Lecture—3 hours. Prerequisite: course in physical chemistry and soil chemistry or consent of instructor. Advanced course in water chemistry emphasizing principles governing interactions of ionic constituents in water with sediment and soils. Topics include electro-kinetic properties of clays, membrane phenomena, rate processes and thermodynamic applications to the water soil system. Offered in odd-numbered years. Mr. Biggar

***250. Physics of Soil Water Movement. (3) II.**

Lecture—3 hours. Prerequisite: Mathematics 22C or consent of instructor; course in physics of soil or water systems recommended. The physics of fluid flow through porous media; miscible and immiscible displacement theories; theory of capillary pressure and pore size distribution with emphasis on unsaturated flow problems; physical aspects of permeability, porosity, specific surface and pore structure. Offered in odd-numbered years. Mr. Nielsen

290. Seminar. (1) II.

Seminar—1 hour. Prerequisite: graduate standing. Critical review of relevant water quality problems and recent water quality research and literature. Mr. Knight

298. Group Study. (1-5) I, II, III, (Summer).

The Staff (Chairman in charge)

299. Research. (1-12) I, II, III, (Summer).

(S/U grading only.)

The Staff (Chairman in charge)

Sciences 1. Principles underlying the biology and effective management and conservation of fish, waterfowl, small mammals, upland game species. Included are effects of man-related activities on wild game species and the biological, social, economical, and political considerations involved. Mr. Moyle, Mr. Schwab

Upper Division Courses

101. Field Studies in Wildlife and Fisheries Management. (5) (Extra Session—Summer)

Lecture—2 hours; laboratory—24 hours. Prerequisite: course 2. An intensive five-week field study of the biology and management of wildlife resources. Emphasis is placed on individual field investigation which affords the student the opportunity to implement the knowledge gained in other courses relating to the biology and management of wildlife and fisheries.

Messrs. Raveling, Schwab, Moyle, Li

NOTE: For key to footnote symbols, see page 191.

108. Comparative Nutrition of Wildlife and Fish.

(4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B. The principles of nutrition and their application to feeding problems related to wild animals (ruminants and non-ruminants), birds and fish in their natural habitats and in captivity. Mr. Weir

110. Biology and Management of Wild Mammals.

(3) I.

Lecture—3 hours. Prerequisite: upper division courses in mammalogy, ecology, and physiology; or consent of instructor. Integrated introduction to the biology, ecology, and management of nondomestic mammals. Emphasis is on the natural history, anatomical and physiological adaptations of the species to its environment, species interactions, and economic considerations of selected mammalian groups. Mr. Schwab

110L. Mammalian Biology Laboratory. (2) I.

Discussion—1 hour; laboratory and field—3 hours. Prerequisite: concurrent enrollment or previous completion of course 110 or Zoology 136 or consent of instructor. Laboratory and field exercises in the identification, gross anatomy, behavior, activity patterns, population dynamics, capture-handling-marking methods, research and management techniques, and the natural history of economically important wild mammals. Mr. Schwab

111. Biology and Management of Waterfowl and Upland Game Birds. (3) III.

Lecture—3 hours; one or more field trips (weekend) optional. Prerequisite: course 2 or consent of instructor. Phylogeny, geographical distribution, migration, reproduction, population dynamics, behavior, and physiological-ecology of waterfowl and upland game birds. Primary emphasis upon exploited species with reference to their interactions with man and man-induced environmental changes. Mr. Raveling

111L. Waterfowl and Upland Game Birds Laboratory. (1) III.

Laboratory—3 hours. Prerequisite: concurrent enrollment in course 111 or consent of instructor. Laboratory exercises in species identification, anatomy, molts, age and sex differences, specialized adaptations, behavior, and research and management techniques as related primarily to waterfowl and upland game birds. Mr. Raveling

120. Functional Morphology of Fishes. (4) I.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 2, Zoology 2, or consent of instructor. Study of comparative anatomy of fishes in different taxonomic groups. Emphasis

given to observation of living specimens illustrating integration of morphological structures.

Mr. Moyle

121. Physiology of Fishes. (4) II.

Lecture—3 hours; laboratory—3 hours. Prerequisite: upper division courses in nutrition and physiology or consent of instructor. Comparative physiology, growth, reproduction, behavior, and energy relations of fishes.

Mr. Brocksen

122. Biological Management of Fishes. (3) III.

Lecture—3 hours. Prerequisite: course 2, Zoology 2, or consent of instructor. Principles of fisheries management, associated with the major aquatic habitats. Properties of fish populations as they relate to their environment, fish husbandry methods including aquaculture, economics, and aesthetics of marine, estuarine, and freshwater fish. Mr. Li

135. Ecology and Management of Large Mammals.

(3) III.

Lecture—3 hours. Prerequisite: course 110 or consent of instructor. Emphasis on ecology and management principles of North American ungulates with other selected examples. Includes population dynamics, reproduction, parasites, diseases, and management problems.

Mr. Longhurst

135L. Laboratory in Ecology and Management of Large Mammals. (1) III.

Laboratory—3 hours. Prerequisite: course 135 (to be taken concurrently). Laboratory and field trips to complement course 135.

Mr. Longhurst

151. Wildlife Ecology. (3) II.

Lecture—3 hours. Recommended: course 2. Consideration of the ecology of wildlife species in man-disturbed environments, including ecological aspects of wild vertebrates in relation to reforestation, range management, and pollution; the relationship of wildlife to recreation and wildlands; and resource conservation in the human ecosystem. Mr. Howard

152. Principles of Vertebrate Control. (4) III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 2; course 151 recommended. The philosophical, historical, ecological, behavioral, and economical basis for regulating population levels of species of terrestrial vertebrates found throughout the world. Mr. Howard

190. Proseminar in Wildlife and Fisheries Biology.

(1) I, II, III.

Seminar—1 hour. Prerequisite: senior standing in Wildlife and Fisheries Biology or consent of instructor. Reports and discussions of recent advances related to wildlife and fisheries biology. (P/NP grading only.)

The Staff (Mr. Raveling in charge)

- 198. Directed Group Study. (1-5) I, II, III.**
The Staff (Mr. Boda in charge)
- 199. Special Study for Advanced Undergraduates. (1-5) I, II, III.**
The Staff (Mr. Raveling in charge)

Graduate Courses

- 298. Group Study. (1-5) I, II, III.**
Lectures and/or discussions—1-5 hours.
The Staff (Mr. Raveling in charge)
- 299. Research. (1-12) I, II, III.**
The Staff (Mr. Raveling in charge)

WORK-LEARN

Questions pertaining to the following course should be directed to the Bixby Work-Learn Office, Room 105, TB-10.

Upper Division Course

- 192. Internship. (1-15) I, II, III.**
Laboratory—3-40 hours. Prerequisite: consent of instructor. Work-learn experience off and

on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. Student transcripts show the field in which an internship is taken. (P/NP grading only.)

College of Agricultural and Environmental Sciences Faculty

ZOOLOGY

Ronald J. Baskin, Ph.D., *Chairman of the Department*
Everett W. Jameson, Jr., Ph.D., *Vice-Chairman of the Department*
Department Office, 2320 Storer Hall

Professors:

Norman F. Baker, D.V.M., Ph.D.
(*Veterinary Microbiology*)
Ronald J. Baskin, Ph.D. (*Zoology and Physiology*)
Milton Hildebrand, Ph.D. (*Zoology and Applied Behavioral Sciences*)
Everett W. Jameson, Jr., Ph.D.
Milton A. Miller, Ph.D.
Lauren E. Rosenberg, Ph.D.
Robert L. Rudd, Ph.D.
George W. Salt, Ph.D.
Herman T. Spieth, Ph.D. (*Emeritus*)
Tracy I. Storer, Ph.D., LL.D. (*Emeritus*)
Kenneth E. F. Watt, Ph.D., LL.D.

Associate Professors:

David W. Deamer, Ph.D.
Robert D. Grey, Ph.D.
William M. Hammer, III, Ph.D.
Stephen L. Wolfe, Ph.D.

Assistant Professors:

Peter B. Armstrong, Ph.D.
John H. Crowe, Ph.D.
Arthur M. Shapiro, Ph.D.
Judy Stamps, Ph.D.

**Bachelor of Arts Major Program**

Lower Division Courses.—Required: Biolog-

ical Sciences 1; Zoology 2; Chemistry 1A-1B and 8A-8B (or Chemistry 128A-128B-128C), Chemistry 1A-1B (or 4A-4B-4C) and 8A-8B (or 128A-128B-128C); Physics 2A-2B-2C; Mathematics 13 or 16A-16B. Recommended: Botany 2; Bacteriology 2; Chemistry 1C.

Upper Division Courses.—Required: Genetics 100A-100B; Zoology 148 or Genetics 103; an additional 27 units of advanced biological science which must include at least one course (or course sequence, if specified) from two of the following core areas: (a) Morphology—Zoology 100, 105, 106, 107, 110, 112; (b) Cell Biology-Physiology, with laboratory—Zoology 121A, 121B, 166 (121L with any one of these three), 142-142L, Physiology 110A-110B-111A-111B (all four courses); (c) Ecology—Zoology 114, 115, 116, 125, 133A, 133B, 136, 137. Of this 27-unit requirement, at least 15 units must be taken in the Zoology Department, and not more than 5 units in the 190 series may be counted. Recommended: Biochemistry 101A, 101B.

Bachelor of Science Major Program

Lower Division Courses.—Required: Biological Sciences 1; Zoology 2; and Botany 2 or Bacteriology 2; Chemistry 1A-1B-1C (or 4A-4B-4C) and 8A-8B (or Chemistry 128A-128B-128C); Physics 2A-2B-2C; Mathematics 13 and 16A-16B. Recommended: Chemistry 5; Mathematics 16C.

Upper Division Courses.—Required: Biochemistry 101A-101B; Genetics 100A-100B; Zoology 148 or Genetics 103; an additional 30

NOTE: For key to footnote symbols, see page 191.

units of advanced biological science which must include at least one course (or course sequence, if specified) from each of the following core areas: (a) Morphology—Zoology 100, 105, 106, 107, 110, 112; (b) Cell Biology—Physiology with laboratory—Zoology 121A, 121B, 166 (121L with any one of these three), 142–142L, Physiology 110A–110B–111A–111B (all four courses); (c) Ecology: Zoology 114, 115, 116, 125, 133A, 133B, 136, 137. Of this 30-unit requirement, at least 15 units must be taken in the Zoology Department, and not more than 5 units in the 190 series may be counted.

The Bachelor of Science program may be adopted by students in either the College of Letters and Science or the College of Agricultural and Environmental Sciences.

Graduate Study.—The Department of Zoology offers programs of study and research leading to the M.A. and Ph.D. degrees. For detailed information regarding graduate study write to the Graduate Adviser, Department of Zoology.

Teaching Major.—Requirements for students planning to be primary or secondary teachers, with a major in zoology, are the same as for the Bachelor of Arts degree in zoology.

Teaching Minor.—Required: 30 units in biological sciences, including Biological Sciences 1, Zoology 2, and 18 units of upper division courses in zoology or closely related fields chosen in consultation with the subject representative. Recommended: an upper division course in invertebrate zoology and an upper division course in each of as many other areas of zoology as possible (e.g., cell biology, physiology, ecology, genetics, morphology, evolution).

Students who plan to be teachers should consult the Department of Education in regard to further preparation for certification.

Physiology

Lower Division Courses

2. Introductory Physiology. (3)

Lecture—3 hours. Prerequisite: course 1. Physiology of muscular contraction, nervous integration, sensation, circulation, respiration, excretion, and digestion.

2L. Introductory Physiology Laboratory. (2)

Laboratory—6 hours. Prerequisite: course 2 (completed or in progress).

10. Elementary Physiology. (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: not open for credit to students who have had Biological Sciences 1. Introductory course in physiology for nonscience majors.

Mr. Deamer

Zoology

Lower Division Courses

2. General Zoology. (6) I, II, III.

Lecture—3 hours; discussion—1 hour; laboratory—6 hours. Survey of the diversity of animal life and the basic principles of adaptation, evolution, and integration in animals.

I. Mr. Miller; II. Mr. Shapiro; III. Mr. Hamner

*33. Seminar in Vertebrate Zoology. (2) III.

Seminar—1½ hours; 2–4 field trips. Prerequisite: a strong interest in vertebrate biology. Open to freshmen and sophomores only. Introduction to some of the basic aspects of the biology of wild vertebrates. Limited enrollment. (P/NP grading only.)

Mr. Jameson

99. Special Study for Lower Division Students.

(1–5) I, II, III.

Directed study of a specific topic selected by the student and the instructor.

The Staff (Chairman in charge)

Upper Division Courses

100. Embryology. (5) I, II, III.

Lecture—3 hours; laboratory—two 3-hour sessions. Prerequisite: Biological Sciences 1; Zoology 2. Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation and organogenesis, with emphasis on vertebrates.

I. Mr. Grey; II. ———; III. Mr. Armstrong

*101. Developmental Biology: Cellular Basis of Morphogenesis. (4) I.

Lecture—3 hours; term paper. Prerequisite: course 100. Development of form and structure; morphogenetic movement, differential growth, pattern formation, interaction of cells and tissues during development.

Mr. Armstrong

102. Developmental Biology: Cell Differentiation.

(4) III.

Lecture—3 hours; term paper. Prerequisite: course 100 and Biochemistry 101B. Current concepts of cell differentiation, principally in animal systems. Topics include properties of major differentiated cell types, and principal mechanisms of control.

Mr. Grey

105. Phylogenetic Analysis of Vertebrate Structure.

(5) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2. The structure of the classes and subclasses of vertebrates is described and interpreted in terms of phylogeny.

Mr. Hildebrand

106. Functional Analysis of Vertebrate Structure.

(3–4) III.

Lecture—2 hours; laboratory-demonstration

—4 hours; optional project report. Prerequisite: course 2. Mechanical principles are used to interpret the structures associated with supporting the body, running, digging, climbing, swimming, and feeding. Mr. Hildebrand

107. Microanatomy. (5) II.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. The finer structure and activities of organs, tissues, and cells of vertebrates, with emphasis on those of mammals. Mr. Rosenberg

110. Protozoology. (3) III.

Lecture—3 hours. Prerequisite: Biological Sciences 1. Structure, life history, and ecology of the groups of protozoa with emphasis on relationships to biological problems. Mr. Rosenberg

110L. Protozoology Laboratory. (2) III.

Laboratory—6 hours. Prerequisite: course 110 (may be taken concurrently). Examination of prepared and living materials, emphasizing high degree of diversity of structure and adaptation. Isolation, culture, and preparation of specimens. Study of micrographs, identification of forms, and stages of economic importance. Mr. Rosenberg

112. Invertebrate Zoology. (6) II.

Lecture—3 hours; laboratory—6 hours; field trips and special project reports. Prerequisite: course 2. Comparative anatomy, classification, and phylogeny of the invertebrate metazoa. Mr. Miller

114. Invertebrate Physiological Ecology. (5) II.

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 112. Physiology, behavior, and ecology of the invertebrate metazoa. Field trips. Mr. Hamner

115. Problems in Marine Biology. (15) III.

Prerequisite: course 112 or equivalent and consent of instructor. Full-time study at Bodega Marine Laboratory. Lectures, laboratory, field work and directed study in selected topics, stressing experience in original research. Limited enrollment. Mr. Miller

116. Principles of Animal Resource Management. (5) I.

Lecture—3 hours; laboratory—3 hours; special projects. Prerequisite: Biological Sciences 1; Mathematics 13 and 16A. Population dynamics and management of marine, freshwater, and terrestrial animal resources; analysis and solution of problems in maximization of animal resource production. Mr. Watt

121A. Cell Biology. (3) II.

Lecture—3 hours. Prerequisite: Biochemistry 101A, 101B. Structure and function of

living systems at the molecular and subcellular level, including molecular organization of membranes, models of membrane structure, photosynthesis and respiration. Mr. Deamer

121B. Cell Biology. (3) III.

Lecture—4 hours. Prerequisite: Biochemistry 101A, 101B. Continuation of course 121A. Structure and function of living systems at the molecular and subcellular level, concentrating on synthetic mechanisms in the nucleus and cytoplasm, including cell division. Mr. Wolfe

121L. Cell Biology Laboratory. (2) III.

Laboratory—6 hours. Recommended: course 121A and/or 121B. Exercises illustrating the principles of cell biology; emphasis on individual research employing one or more advanced techniques. Mr. Deamer, Mr. Wolfe

125. Animal Ecology. (3) I.

Lecture—3 hours. Prerequisite: course 2 and one course in biological science having at least part of the studies conducted in the field (e.g., courses 112, 133A, 133B, 136, 137, Botany 108 or Botany 117). Theory of relationships between animals and their environments. Mr. Salt

133A. Biology of Cold-Blooded Vertebrates. (4) II.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2. Phylogeny, morphologic and biological adaptations in fishes, amphibians and reptiles. Mr. Jameson

133B. Biology of Cold-Blooded Vertebrates. (4) III.

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2. Seasonal cycles and population phenomena of fishes, amphibians and reptiles. Mr. Jameson

136. Mammalogy. (5) III.

Lecture—2 hours; laboratory—6 hours; weekend field trips. Prerequisite: course 125 or consent of instructor. Systematics, ecology and life history of mammals with emphasis on Western North America. Offered in even-numbered years. Limited enrollment. Mr. Rudd

***137. Ornithology. (5) III.**

Lecture—2 hours; laboratory—6 hours; weekend field trips. Prerequisite: course 125 or consent of instructor. Systematics, ecology and life history of birds with emphasis on Western North America. Offered in odd-numbered years. Limited enrollment. Mr. Rudd

142. Invertebrate Physiology. (3) I.

Lecture—3 hours; extensive reading and research report. Prerequisite: course 112, Chemistry 1A, 1B, Physics 2B; Biochemistry 101A,

NOTE: For key to footnote symbols, see page 191.

101B recommended. Comparative physiology of invertebrate organ systems. Mr. Crowe

142L. Invertebrate Physiology Laboratory. (2) I.

Laboratory—6 hours; independent study and research report. Prerequisite: course 142 (may be taken concurrently). Experiments on the physiological mechanisms of invertebrate organ systems. Mr. Crowe

147. Zoogeography. (4) I.

Lecture—3 hours. Prerequisite: course 2 or Entomology 1. Movements of terrestrial animals. The role of geologic, climatic, and biologic changes in the geographic distribution of animals. Mr. Jameson

148. Animal Phylogeny and Evolution. (5) I.

Lecture—5 hours. Prerequisite: course 2 or Entomology 1. Recommended: course 147 and Genetics 100B. The origins and relationships of the major groups of animals, with emphasis on the analysis of variation and the mechanics of evolutionary change. Mr. Rudd

149. Evolution of Ecological Systems. (4) III.

Lecture—3 hours; term paper. Prerequisite: course 2 or Botany 2 or Entomology 1; Genetics 100B recommended. Evolution as an organizing force in natural communities. Coadaptation in trophic and competitive relationships. Ecology of polymorphisms, clines, and speciation. Mr. Shapiro

155. Behavior of Animals. (4) II.

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Basic principles, mechanisms and evolution of behavior, with special reference to the significance of behavior under natural conditions.

***160. Invertebrate Neurophysiology. (5) III.**

Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: an upper division course in physiology or physicochemical biology or invertebrate zoology. Comparisons of the nervous systems of invertebrates with emphasis on nervous processes related to behavior.

166. Advanced Cell Biology. (4) I.

Lecture—3 hours; extensive reading and research report. Prerequisite: Biochemistry 101B and Mathematics 16B. The physical-chemical basis of cell structure and function, including a discussion of aspects of biological thermodynamics, the ionic basis of excitation, and the molecular basis of contractility. Mr. Baskin

167. Cellular Inheritance. (3) II.

Lecture—3 hours. Prerequisite: Genetics 100B and course in cytology or cell biology. The morphology and replication of cellular structures with partial or complete genetic autonomy, including chromosomes, mitochondria, chloro-

plasts, and centrioles. Possible evolutionary origins of the major cytoplasmic organelles.

Mr. Wolfe

197. Senior Colloquium in Zoology. (2) III.

Lecture-discussion—2 hours. Prerequisite: senior standing. The consideration of innovation and synthesis in broad areas of zoology. (P/NP grading only.) The Staff

197T. Tutoring in Zoology. (1-5) I, II, III.

Discussion—1-2 hours. Prerequisite: major in zoology; consent of instructor. Experience in teaching zoology under guidance of staff.

The Staff (Chairman in charge)

198. Directed Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

199. Special Study for Advanced Undergraduates.

(1-5) I, II, III.

Directed study of a specific topic selected by the student and the instructor.

The Staff (Chairman in charge)

Graduate Courses

201A. Ecological Theory. (3) II.

Lecture—2 hours; discussion—1 hour. Prerequisite: a course in ecology, e.g., Environmental Studies 100, and graduate standing. Course will focus on the ecologic community as a unit. The major generalizations concerning structure and functioning of the community will be examined together with the generalizations relating both structure and function to the abiotic environment and its fluctuations. (Same course as Botany, Ecology and Geology 201A.) Messrs. Salt, Major, Valentine

201B. Analysis of A Selected Ecosystem. (3) I.

Lecture—2 hours; discussion—1 hour; Prerequisite: graduate standing; course 201A or consent of instructor. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a particular ecosystem. Recent advances in theory, technique, and basic information are emphasized. Lectures will be given by specialists from several fields. May be repeated for credit. (Same course as Botany, Ecology and Geology 201B.) The Staff (Mr. Goddard in charge)

201C. The Changing Biosphere. (3) III.

Lecture—2 hours; 1 assigned problem. Prerequisite: graduate standing; courses 201A, 201B; or consent of instructor. Course deals with changing gas balance and weather in the biosphere and effects on plants and animals, the effects of structural, chemical and physical changes on living systems, changes in species diversity, effects of human population increase, and related topics. (Same course as Botany, Ecology and Geology 201C.)

The Staff (Mr. Richerson in charge)

202. Biomathematics. (6) III.

Lecture—4 hours; laboratory—6 hours. Prerequisite: two courses in calculus; three courses in statistics. Mathematical aspects of physiology, ecology, and epidemiology; development and testing of models, mathematical description of biological systems; measurement, analysis, simulation and optimization in biology. Offered in odd-numbered years. Mr. Watt

224. Developmental Biology. (5) I.

Lecture—1 hour; discussion—1 hour; laboratory—6 hours; 1 weekend laboratory trip. Prerequisite: course 100 and consent of instructor; Biochemistry 101 recommended. Introduction to research in development. Observations and experiments involving a variety of developing systems and experimental methods, with critical interpretation of the results. Open to qualified undergraduates. The first weekend of the quarter is spent at Bodega Marine Laboratory.

228. Experimental Animal Ecology. (3) III.

Lecture—2 hours; 3 weekend field trips, 2 written critiques. Prerequisite: course in animal ecology; selected undergraduates may be admitted with consent of instructor. Discussion of means of generating ecological hypotheses and methods of testing those hypotheses. Topics will include analysis of field observation, experimental design in both field and laboratory, and interpretation of results. Limited enrollment. Mr. Salt

236. Muscle Physiology. (4) II.

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Biochemistry 101A-101B; Mathematics 16B or 21B; consent of instructor. Physical and chemical aspects of muscle function. Mr. Baskin

250. Recent Developments in Zoology. (1) II.

Seminar—1 hour. Prerequisite: graduate standing in Zoology. The Staff

251. Seminar in Advanced Cytology. (2) I.

Seminar—2 hours. Prerequisite: consent of instructor. Topics of current interest in the ultrastructure and function of cells. May be repeated for credit. Mr. Wolfe

266. Seminar in Cell Biology. (2) III.

Seminar—2 hours. Prerequisite: consent of instructor. Discussion of recent literature on the

physical and chemical aspects of the organization and function of living systems. Organizational and functional properties on the molecular and cellular levels of biological systems.

Mr. Baskin

269. Research Conference in Developmental Biology. (1) I, II, III.

Seminar—2 hours. Prerequisite: consent of instructor. Presentation and critique of faculty and graduate student research in developmental biology. Intended primarily for graduate students. (S/U grading only.)

Mr. Armstrong, Mr. Grey, _____

287. Seminar in Animal Behavior. (2) II.

Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on the principles and recent developments in invertebrate and vertebrate animal behavior. _____

292. Seminar in Development. (2) II.

Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on embryology, morphogenesis, and developmental mechanisms. Mr. Armstrong, Mr. Grey

293. Seminar in Invertebrate Zoology. (2) II.

Seminar—2 hours. Prerequisite: course 112 or consent of instructor. Critical review of the literature in selected topics and taxa in the invertebrata. Open to qualified undergraduates. Mr. Miller, _____

294. Seminar in Animal Ecology. (3) I.

Seminar—3 hours. Prerequisite: course 125 and graduate standing. Readings and discussions of advanced topics in the population and community ecology of animals. Mr. Rudd, Mr. Salt

297. Seminar in Systematic Zoology and Evolution. (2) III.

Seminar—2 hours. Prerequisite: consent of instructor. Principles of animal classification, speciation, and the evolution of higher categories; emphasis on modern concepts and pertinent contributions from the fields of genetics and paleontology. Mr. Rudd

298. Group Study. (1-5) I, II, III.

The Staff (Chairman in charge)

299. Research. (1-9) I, II, III.

The Staff (Chairman in charge)

NOTE: For key to footnote symbols, see page 191.

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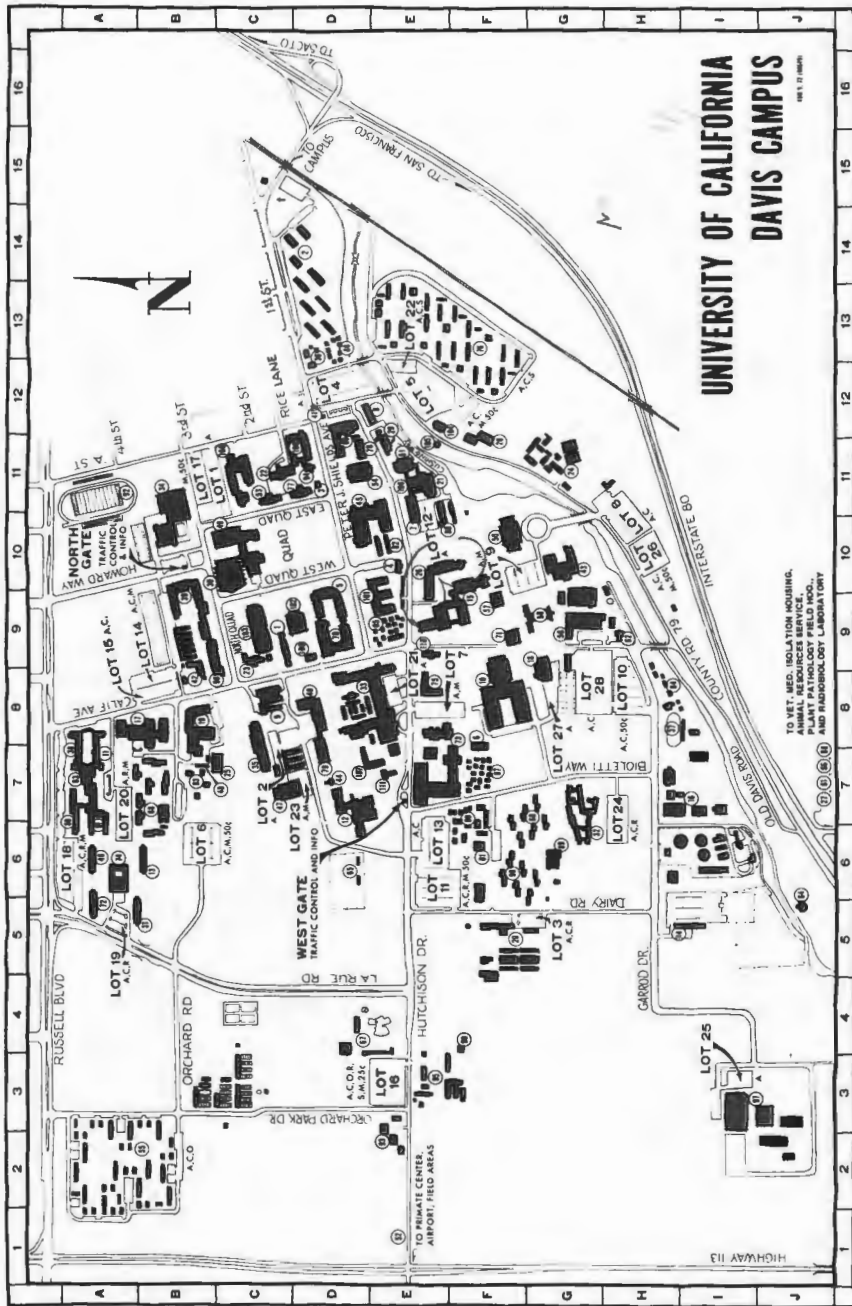
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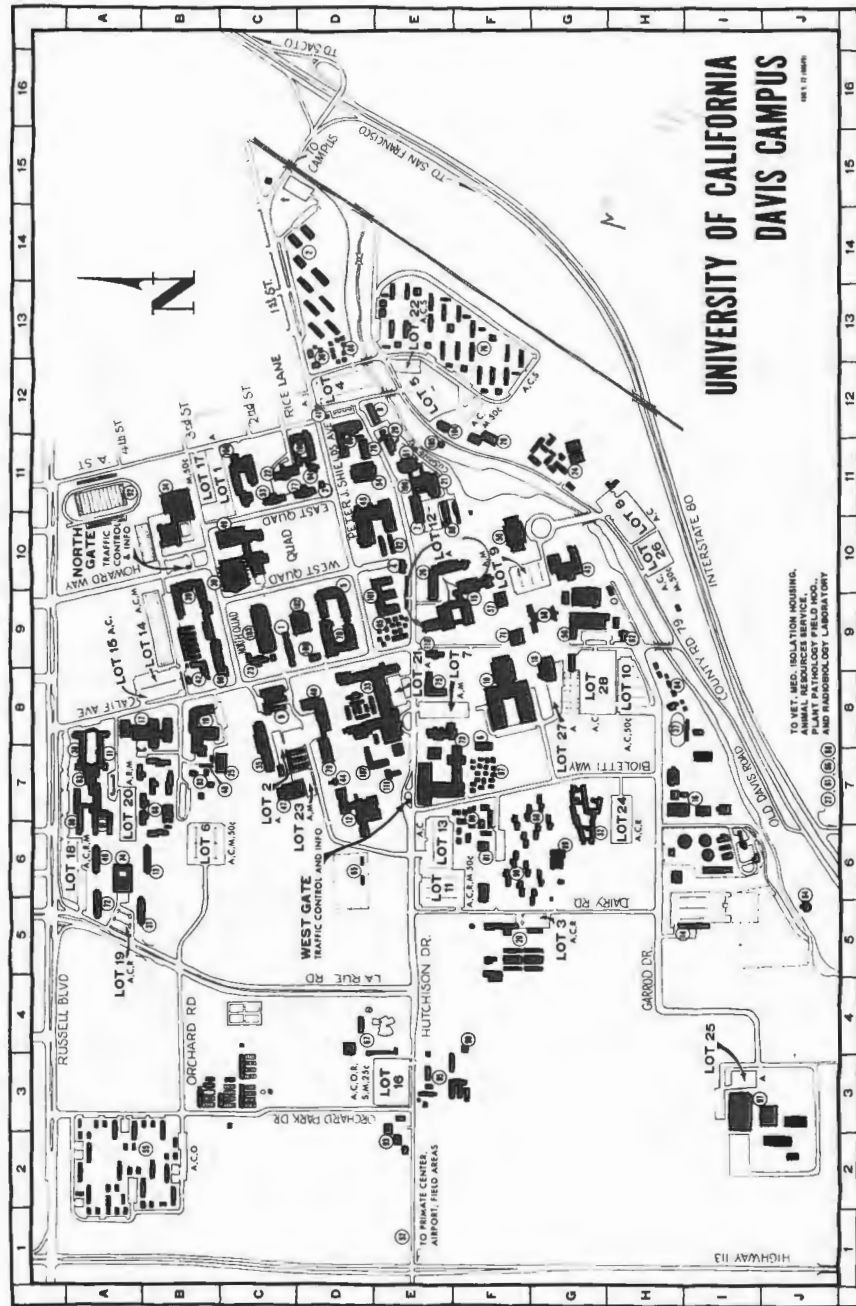


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Correction: page 305 (Environmental Studies)

Following the description for course 102 should come the heading for course 110 (instead of course 111):

110. Social Systems of Animals and Man. (5) II.

(The description that follows is correct for course 110.)

BUILDINGS AND FACILITIES

1. Academic Office Building No. 3 C-9
2. Aggie Villa D-14
3. Agricultural Extension D-11
4. Agricultural Field Stations and Agricultural Practices E-10
5. Animal Science D-9
6. Architects and Engineers F-8
7. Art Building E-10
8. Art Laboratory E-12
9. Asmundson Hall C-8
10. Bainer Hall F-8
11. Becket Hall A-7
12. Briggs Hall D-7
13. Bixby Hall B-6
14. Central Garage I-5
15. Chemistry Building F-9
16. Cole Facility I-7
17. Cowell Student Health Center B-8
18. Crocker Nuclear Laboratory G-8
19. Cruess Hall B-8
20. Dairy Cattle Research F-5
21. Dramatic Art Building E-11
22. East Hall C-11
23. Enology Laboratory C-9
24. Environmental Horticulture G-11
25. Environmental Toxicology C-7
26. Everson Hall E-10
27. Experimental Animal Resources J-7
28. Faculty Club F-12
29. Fire House E-12
30. Freeborn Hall S-10
31. Gilmore Hall B-5
32. Graduate Residence G-6
33. Haring Hall E-8
34. Hickey Gymnasium B-11
35. Hoagland Hall C-7
36. Home Management D-12
37. Horse Arena H-8
38. Hughes Hall A-7
39. Hunt Hall B-9
40. Hutchison Hall D-8
41. Information Booth D-12
42. Irrigation Laboratory B-8
43. King Hall G-10
44. Kleiber Hall D-7
45. Library D-10
46. Malcolm Hall A-6
47. Mann Laboratory C-7
48. Marine Resources Laboratory B-7
49. Memorial Union C-10
50. Mrak Hall F-10
51. Music Building E-11
52. National Center for Primate Biology E-1
53. North Hall C-11
54. Olson Hall D-11
55. Orchard Park Apartments B-2
56. Physical Plant and Storehouse G-9
57. Physical Sciences Library F-9
58. Physics-Geology Building G-9
59. Physics Shops E-10
60. Pierce Hall G-7
61. Plant Pathology Field Headquarters J-7
62. Police Department H-9
63. Primero Dining Commons A-7
64. Putah Creek Recreation Lodge J-6
65. Radiobiology Annex D-6
66. Radiobiology Laboratory J-7
67. Recreation Swimming Pool Complex E-4
68. Regan Hall B-7
69. Roadhouse Hall D-12
70. Robbins Hall D-9
71. Roessler Hall F-9
72. Ryerson Hall A-5
73. School of Medicine E-7
74. Segundo Dining Commons A-6
75. Silo Snack Bar E-8
76. Solano Park Apartments F-13
77. South Hall D-11
78. Sproul Hall D-11
79. Storehouse (see No. 56)
80. Storer Hall D-7
81. Struve Hall A-7
82. Telephone Office F-6
83. Temporary Building (5-6) E-10
84. Temporary Buildings (13-16) B-7
85. Temporary Building (29-35) H-8
86. Temporary Buildings (98-115) E-9
87. Temporary Buildings (116-121, 123, 124) D-13
88. Temporary Buildings (134-158) F-7
89. Tercero Dining Commons G-6
90. Thille Hall F-6
91. Titus Hall A-6
92. Toomey Field A-11
93. University Extension Mini Center E-2
94. University House D-11
95. Vegetable Crops Field Headquarters E-3
96. Veihmeyer Hall B-8
97. Veterinary Medical Teaching Hospital J-3
98. Veterinary Medicine Isolation Housing J-7
99. Visual Aids, Agricultural Extension F-4
100. Voorhies Hall D-11
101. Walker Hall E-9
102. Wellman Hall D-9
103. Wickson Hall C-9
104. Wyatt Pavilion Theatre E-12
105. Wyatt Snack Bar E-11
106. Young Hall C-11

